REDCLIFFE CITY PLANNING SCHEME

Volume 2

8.10 - Planning Scheme Policy 10 – Works (Development Standards Manual)

2005

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PREAMBLE

This Planning Scheme Policy has been designed to provide the user with an easy to access reference document for the development within the City of Redcliffe. This document is to operate in conjunction with Standard Specifications, Guidelines and Drawings for Roadworks, Drainage, Parks, Water Reticulation and Sewage Reticulation. It will act as a useful tool for all designers within the development industry and a tool for council assessment.

Acknowledgment and thanks to parties who have assisted in the preparation this document:

- Gold Coast City Council
- Ipswich City Council
- Pine Rivers Shire Council

PURPOSE OF PLANNING SCHEME POLICY 10 – WORKS (DEVELOPMENT STANDARDS MANUAL)

1. The purpose of the Planning Scheme Policy is:

   (a) to encourage well designed and constructed subdivisional developments;
   (b) to provide the requirements for all types of subdivision within the City
   (c) to achieve "reasonable" and workable general requirements thus maintaining an element of certainty for developers, the community and Council;
   (d) to minimise unnecessary differences in interpretation concerning the implementation of subdivisional design and construction policy;
   (e) to introduce a consistent framework of requirements which will provide a balance between efficiency and economy;
   (f) to provide a benchmark against which different standards, new innovations etc can be justified by the subdivider and assessed by Council;
   (g) to assemble relevant National and State Standards and supplement these with Council's standards;
   (h) to clarify procedural requirements; and
   (i) to provide guidance in the preparation of engineering plans and construction specifications for the design and construction of Public (Municipal) Works and to assist in the assessment and consideration of applications by Council.

STATUS OF THE PLANNING SCHEME POLICY

2. The Planning Scheme Policy has been prepared to be implemented with the planning scheme. The Planning Scheme Policy is intended to supplement the Planning Scheme by providing detailed design criteria and construction standards for the different components of Reconfiguring a Lot (subdivision . design and construction) and other public (municipal) works.

APPROACH OF THE PLANNING SCHEME POLICY

3. Council's philosophy in the adoption of engineering criteria embraces the following values:

   a) serviceability
   b) performance
   c) safety
   d) aesthetics and the environment
   e) recognition of codes of practice

   Serviceability relates to the quality, durability and practicality of the physical infrastructure constructions intended to be handed to Council. In general the capital costs of items will be in inverse ratio to the ownership cost in perpetuity to be assumed by the public sector. For this reason, Council will normally place a greater priority on the latter. For instance, where a small premium is involved in obtaining significant durability advantages, the higher standard will be sought. Specification of equipment of Australian manufacture will generally be favoured unless demonstrably inferior to an imported alternative.

   Performance is the ability of the facility to accommodate the likely loading in its design lifetime; be it hydraulic, structural, mechanical or traffic volumes. These will be specified, often in company with limiting minimum criteria for materials and dimensions.

   Safety aspects will be a consideration in approving the construction and operation of all aspects of the built environment. This includes the future maintenance staff as well as the public.

   The design should pay regard to the finished appearance of the project, following established **aesthetic** principles. The environment created should be capable of ready and economical maintenance after construction. For instance, elaborate labour-intensive landscaping solely to enhance the sales phase of a project will be unwelcome, and unacceptable in the long term.

   Every attempt has been made to incorporate national codes of practice and State Government standards in the design and construction requirements. This should minimise the opportunity for dispute or confusion. Local requirements have been added to satisfy local conditions or ensure conformity to a narrower standard, so as to limit spare parts inventory and delays in supply.

   Where any provision of Codes of Practice or other technical documentation (e.g. Queensland Streets, QUDM) does not accord with the Engineering Works Manual, the provisions of the Engineering Works Manual shall take precedence.

SCOPE OF PLANNING SCHEME POLICY

4. The Planning Scheme Policy extends to all types of development relating to operational works.

DEFINITIONS

"Applicant" means the person or corporation making application to Council for approval for a proposed development.

"Contractor" means the person or corporation bound to execute construction and related work on behalf of the developer.

"Developer" means the person or corporation who has been granted development approval by Council and must prepare a design submission for examination by Council.

"Shall" is used to indicate a requirement of Council which must be complied with under any conditions specified.

"Should" is used to indicate a guideline of Council which must be complied with unless the Director Engineering Services decides that it can be relaxed or deleted, having regard to good engineering practice.

"May" is used to indicate an option, whether for Council or for the developer, as the context makes clear.

"Registered Professional Engineer (Queensland)" or "RPEQ" means an engineer currently registered by the Board of Professional Engineers in Queensland and competent to practice in the relevant field.

"Consultant Engineer" means a Registered Professional Engineer (Queensland) who has been appointed by the developer to provide professional engineering advice for the proposed development.

"Supervising Engineer" means a Registered Professional Engineer (Queensland) who has been appointed by the developer to provide professional engineering advice for the proposed development.

"Licensed Surveyor" means a Registered Surveyor whose registration by the Surveyors Board of Queensland is endorsed to the effect that the person may perform cadastral surveys.

"Registered Surveyor" means a person who is registered by the Surveyors Board of Queensland as a Surveyor.

"Manager Design and Asset Services Representative" means the person provided authority to act and make decisions regarding design and engineering issues.

CHAPTER 1 – INTRODUCTION

1.0 GENERAL

This document has been prepared for the guidance of Consulting Engineers, Surveyors and Contractors engaged in the design and construction of Public (Municipal) Works associated with developments within the City of Redcliffe.

It is hoped that by clearly setting out Council's design criteria for such works, time and effort will be saved on the part of both designers/supervisors and Council staff by reducing the necessity for examination and amendment of submitted designs etc. It is intended to be used as a minimum standard and wherever possible a higher design/construction standard shall be adopted except where maximum requirements have been stated.

This Planning Scheme Policy does not imply limitation in any way of Council's rights to impose differing conditions for development proposals, nor limitation of the discretion of the Manager Design and Asset Services or nominated representative to vary as he/she considers necessary the engineering requirements in respect of a particular development, having regard to good engineering practice.

2.0 REFERENCES

2.1 Introduction

Following is a list of standards, design codes, guidelines and other documents which have been adopted in conjunction with this Planning Scheme Policy. It is not an exhaustive list and the requirements of these documents may be amended by the authority of Manager Design and Asset Services or nominated representative to do so.

2.2 Drawings and Manuals

Applicable Australian and other Standards are:

- AS1000 The International System of Units (SI) and its Application.
- AS1100 Drawing Practice.
- AS1101 Graphical Symbols for General Engineering.
- AS1102 Graphical Symbols for Electrotechnology.
- Redcliffe City Council “As Constructed” requirements.
- Redcliffe City Council Standards Drawings (based on IPWEAQ drawings)

2.3 Roadworks (Geometric Design and Pavement Design)

The applicable code and manuals are:

- Queensland Streets
- "Manual of Uniform Traffic Control Devices" (MUTCD)
- "Roadworks Signing Guide" produced by Mainroads.
- Traffic Engineering Standards produced by Mainroads
- "Urban Road Design Manual" produced by Mainroads
- Pavement Design Manual" produced by Mainroads
- Other design manuals produced by Mainroads and AUSTROADS, as considered appropriate by Council.
- Applicable Australian Standards.

2.4 Stormwater Drainage

The applicable manuals are:

- "Queensland Urban Drainage Manual (QUDM)" - Neville Jones & Associates.
- "Australian Rainfall and Runoff" - Institution of Engineers, Australia.
- "Urban Road Design Manual, Volume 2" - Queensland Transport.
- Water Reticulation Code - Water Services Association of Australia (WSA)
- Redcliffe City Council Policies

2.5 Sewerage

The applicable Guidelines are those produced by the Queensland Department of Primary Industries Water Resources Commission.

- "Guidelines for Planning and Design of Sewerage Schemes" - Volumes 1 and 2.
- Sewage Code of Australia - Water Services Association of Australia (WSA)
- Redcliffe City Council Policies

2.6 Water Supply

The applicable Guidelines are those produced by the Queensland Department of Primary Industries - Water Resources Commission and AWWA:

- "Guidelines for Planning and Design of Urban Water Supply Schemes".
- "Standard Specification for the Construction of Pressure Mains for Local Authority works" (excluding disinfection).

2.7 Safety

- Queensland Workplace Health and Safety Act.

2.8 Environment

Including but not limited to:

- Integrated Planning Act 1997.
- Fisheries Act 1994
- Environmental Protection Act 1994
- Beach Protection Act 1968
- Vegetation Management Act 1999
- Coastal Protection and Management Act 1995
- Environmental Protection and Biodiversity Conservation Act 1999
- ANZECC 2000 Guidelines

3.0 General Engineering Requirements

The following general requirements shall apply where applicable to the nominated development categories.

The categories and engineering requirements for assessment are as follows:

Larger Developments: Classified as new subdivisions

All items outlined in this Planning Scheme Policy apply to Reconfiguring a lot or operational works applications.

Some of the key items required and outlined in this manual are as follows

- Any external catchments discharging to the subject land are to be accepted and accommodated within the development's stormwater system and the development is not to cause ponding of stormwater on adjoining land or roads.
- The Development's stormwater drainage shall be connected by pipe to the Council's stormwater drainage system or other point of discharge as approved by the Manager Design and Asset Services or nominated representative.
- All catchment flow and events to Q100 to be determined and calculations provided. Details and analysis regarding events on new flow is to have on the existing stormwater to be provided. Discharge location to be provided and approved.
- All fill placed on the land is to be compacted in accordance with table 5.1 of AS 3798 - 1990. All fill operations to consider surrounding lots and the effects. Fill plan to be provided to Council for approval in accordance with Local Law No 7.
- Maximum slope of fill - 1 vertical to 6 horizontal.
- The provisions of the following documents are to be adhered to by the applicants:
- Queensland Urban Drainage Manual.
- Queensland Streets.

- The applicants are to bear the cost of any alterations to public utility mains services or installations necessitated by this development.

- A vehicular footpath crossing and/or crossings plus the necessary adjustments to the kerb and channel etc. where applicable shall be constructed to Council's Standard Design.

- Building approval will be required in relation to any building or structure in accordance with the provisions of the Building Act 1975-88.

- All areas on which vehicles are to be driven or parked are to be designed, constructed, drained and maintained to the satisfaction of the Manager Design and Asset Services or nominated representative.

- If required by Manager Design and Asset Services or nominated representative, such areas are to be sealed, linemarking in position and signposted to the satisfaction of the Manager Design and Asset Services or nominated representative.

- Night lighting if provided within the development to be to the satisfaction of the Council and traffic and safety

- The requirements of Water supply and Sewerage Act shall be complied with, and available from Council. .

- All physical connections to the Council's live sewer shall be performed at the Developer's cost by the Council or Council's representative.

- To arrange quotation and connection of live sewerage please contact Eos Civil Solutions on Ph: 3883 9644 and implementation

- Certified testing of sewage and water to be provided to the Council before acceptance "On Maintenance".

- All work included herein is to be to the satisfaction of the Manager Design and Asset Services or nominated representative. This includes submissions and the work undertaken.

4.0 REQUIREMENTS FOR THE CONSTRUCTION OF PUBLIC (MUNICIPAL) WORKS

4.1 General

- In any subdivision involving works which in the opinion of the Manager Design and Asset Services or nominated representative, require detailed working plans, of which specification details are added to the drawings. Such plans and specification shall be properly prepared by a Registered Professional Engineer, and be submitted to the Coordinator Design and Traffic. The Manager Design and Asset Services or nominated representative shall consider the plans and specifications and shall notify the applicant of acceptance or otherwise in writing.

- Designers are encouraged to use Council's free pre-design meeting service to discuss design issues prior to finalising of engineering drawings or Vegetation

Management Plans for submission to Council. Approval of Functional Road Layouts can be obtained prior to submission of the operational works application.

- Fees for application processing and other charges are set annually by Council in its Budget deliberations and typically take effect from the 1st July. Charges or contributions defined in policy are only changed by amendment of the policy. Changes to policies are advertised in the print media.

- In any site development works involving elements which shall become part of Council's infrastructure, (ie, Roads, Stormwater Drainage, Water Reticulation and Sewer Reticulation works) which, as nominated by the Manager Design and Asset Services or nominated representative, require detailed working plans, reports, calculations. All are to be prepared by a Registered Professional Engineer. Details shall be submitted to the Manager Design and Asset Services or nominated representative, and shall consider the plans and specifications.

- In any subdivision or site development involving any works subject to the Manager Design and Asset Services or nominated representative requirements of the above, construction of the works shall be **supervised**, at the Developer's expense, by a Registered Professional Engineer and on completion of such works the applicant shall give to the Council a certificate from such engineer to the effect that the works have been completed in accordance with the plans and specification approved by the Council. The works shall be undertaken by a nominated Principal Contractor experienced in the construction of type works. Council may request evidence of the Principal Contractors competency.

- Works are also to be available for Council to inspect works in accordance with the nominated program of works, and defined works inspection program

- Certification of such works shall include the submission of copies of all relevant test results and certificates as may be required by Chapter 12 "Compliance with Standards for Subdivisional and Site Development Works".

- Certification of such works shall also include the submission of "As Constructed" information surveyed by a Licensed Surveyor in accordance with Council's "As Constructed Requirements for Development and Subdivisional Works" (refer Chapter 2). As constructed details are to be provided prior to "On Maintenance" being awarded. Any amendments made during this time are to be adjusted and provided before "Off Maintenance". Requirements relating to "As Constructed" details are provided under Chapter 15.

4.2 Approval

Before a development permit for operational works is issued or construction work may commence Council requires the following details are to be submitted within the required controls:

(a) Acceptance by the Manager Design and Asset Services or nominated representative of the Design Plans, Drainage flows, Landscaping, Environmental plans with reference to nominated Construction Specifications.

After the documents are accepted by the Coordinator Design and Traffic, three (3) copies of the design plans and one (1) copy of the construction

specifications including a priced schedule of quantities are to be forwarded to the Design and Traffic division.

The above three (3) copies of the design plans are sufficient if all separate services are shown on separate plans. If any of these are combined, additional copies as determined by the Manager Design and Asset Services or nominated representative may be required.

Obtain and submit written approvals with the design from the following as applicable:

- Main Roads;
- DPI – Water Resources;
- Downstream Drainage Discharge Rights;
- Clearance for works in/on land owned by Subdivider;
- Energex ;
- Telstra
- Department of Natural Resources

(b) Notification by the Consulting Engineer of the:

(i) Contractor(s) on-site and after hours telephone number;
(ii) Supervising Engineer(s) office and after hours telephone number;
(iii) Date of commencement of works;
(iv) Program of works showing major components.
(v) Payment of associated Health & Safety costs

Such notification is to be given at least three (3) working days prior to the Date of Commencement listed herein.

(c) An invitation to the Manager Design and Asset Services or nominated representative to attend the prestart conference as an observer.

Prior to the commencement of any Public (municipal) works associated with developments other than the subdivision of land, Council shall require the provision of a bank guarantee or bond equivalent. Refer to Chapter 14 "Bonding".

(d) Submission of consent of property owners affected by the approved works, as required by any approval conditions.

(e) It is required that (where applicable) the consulting engineer ensure adjoining properties which may be affected by the work in any of the following is to occur prior to prestart meeting.

4.3 Inspections

During construction, joint inspections with representatives of the Manager Design and Asset Services or nominated representative should be made for those outlined under Chapter 12, "Compliance with Standards for Subdivisional and Site Development Works". The Council requires notice of all such joint inspections. The notice required for any inspection/meeting to be attended by Council Officers is listed in the above mentioned document.

The Manager Design and Asset Services or nominated representative may waive these inspections at his/her discretion.

Test results, application rates and other relevant information is to be made available as required at or prior to the relevant inspection in accordance with the developer and contractors quality details.

The Council reserves the right to conduct audit inspections of the works and/or materials at all reasonable times during the construction period.

4.4 Alteration to Design

All changes to the approved design effected during construction shall be subject to the prior written approval of the Coordinator Design and Traffic. The Manager Design and Asset Services or nominated representative, may waive this requirement for minor alterations.

Council's examination of the documents should not be taken to mean that the documents have been checked in detail and Council takes no responsibility for their accuracy. If during construction inadequacies of the design are discovered, it is the responsibility of the Principal Consulting Engineer to resubmit amended plans to Council for examination and to rectify the works accordingly.

Notwithstanding any inspection given to engineering documents, where a discrepancy occurs between these documents and Council's standards, then Council's standards shall apply. All works must be performed in accordance with Council Policies, Standards and Local Laws and Policies.

If in fact, there are errors, omissions or insufficient detail on the plans for the purpose of construction, these deficiencies shall be made good during construction and Council reserves the right to withhold approval to proceed with construction until such deficiencies are made good to its satisfaction.

4.5 Indemnity\Workplace Health and Safety

The owner, contractor or consultant engineer shall indemnify the Council against any claim, action or process for damage and/or injury which might arise during the progress of the works for the full construction period.

A copy of policy to be forwarded to Manager Design and Asset Services or nominated representative prior to approval of the project.

No work shall commence unless the requirements of the Workplace Health and Safety Act have been met. The Developer, Contractor, and Consulting Engineers' Representative shall take all necessary steps, in accordance with the Workplace Health and Safety Act, to ensure public safety in relation to construction activities. Council requires a copy of the application for a Notifiable Project to be provided for record purposes.

No work shall commence unless the developer has in place the following insurances:

(a) Public Liability Insurance to a limit of indemnity of not less than $10,000,000 with a notation with Council as an Insured Party.

(b) Workers' Compensation Insurance in accordance with the relevant Laws governing such insurance.

The developer shall take steps to ensure that all contractors employed by them are also covered in relation to the above insurances and that they in turn shall ensure that all sub contractors employed on the job are covered in relation to insurances mentioned above.

Developer responsible to lodge and pay Portable Long Service Levee in accordance with Section 77 of Building and Construction Security Act (1991).

4.6 Practical Completion

Before the works will be passed as "On Maintenance" by Council, satisfactory attention to the requirements of Chapter 12, "Compliance with Standards for Subdivisional and Site Development Works" is required.

The Manager Design and Asset Services or nominated representative shall determine the date upon which the works will be accepted as "On Maintenance" and, such a date shall be upon the receipt of all documentation, test results correction of required works and "As Constructed" plans in the required formats.

4.7 Maintenance Period

The "Maintenance Period" shall require the developer / contractor to maintain the site in a safe, clean and operable condition until approval has been provided at "Off Maintenance" by the Manager Design and Asset Services or nominated representative. Each item of work must be at no cost to the Council.

The contactor shall comply with all required maintenance to ensure safety of the site is addressed immediately.

The site is to be maintained during its Maintenance Period, and have any latent defects of which the Council gives notices promptly rectified. Any rectification not actioned within agreed time between the Council and the developer shall be carried out by Redcliffe City Council, and the associated costs borne by the developer.

Any defect affecting public infrastructure and impacting on public services shall be attended too immediately by the developer. If not responded to within agreed timeframe (depending on issue) Council shall attend to works at Councils cost.

4.8 Traffic Safety

The contractor shall provide all lights, watchmen, barriers, signs and flagmen necessary for prevention of accidents in accordance Chapter 5 - Section 6.0. The above section shall be read in conjunction with the Manual of Uniform Traffic Control Devices (Qld).

An application shall be made for a Permit to Open a Road and/or Temporarily Close a Road to Traffic prior to commencement of works. Payment of the standard fee in accordance with Council's current Register of General Charges shall be made at the time of the application.

4.9 Water Required for Works

An application for a permit and payment of the prescribed fee shall be made to Council where water required for the works is to be drawn from Council Mains.

4.10 Inconvenience/Nuisance to Local Residents

(a) The contractor is to ensure that at no time throughout the entire contract that works under this contract inconvenience or cause nuisance to adjacent residents.

(b) Particular care is to be taken that dust or associated problems do not occur when earthworks are being carried out or combustible materials burned. Details to be provided under Environmental drawings, and in accordance with the site Environmental Management Plan

(c) The Council at any time it becomes warranted, may suspend operations of the Contractor that are causing any inconvenience to residents, until such time as the contractor adopts methods to minimise or eliminate the problem. The Consulting engineer is responsible for addressing any of the Councils above concerns.

(d) Working hours on site shall be as follows:

Monday to Friday	7am - 6pm
Saturday	7am – 12 noon
Sunday & Public Holidays	No work

Any modified hours are to be approved with the Manager Design and Asset Services or nominated representative.

5.0 APPLICATION FOR OPERATIONAL WORKS

The following data has been prepared as a guide for Engineering Consultants and Developers when making an application for Operational Works for Reconfiguring a Lot (subdivision developments) and building developments involving submission of public works to the Redcliffe City Council for acceptance.

The application should be made under cover of correspondence stating the request for review of the documents and clarifying whether it is the initial submission or an amended submission.

Generally, the initial submission shall include:

(a) Development Forms duly completed including payment of the required "design review/works inspection" fees.

(b) A document transmittal noting all engineering plans and documents included with the submission.

(c) Engineering documents and plans in accordance with Chapter 2 - Part A Design Plans.

(d) One (1) copy of specification documents. This requirement may be waived if Council has formally accepted a "master copy" of the specifications by the particular Consultant. In this case, a document detailing any special specifications particular to the development being considered should be submitted. The submission of a priced schedule of quantities shall be required prior to commencement of works.

(e) Three (3) copies of Engineering Plans clearly marked **"Preliminary"**.

One (1) set of A3 size engineering plans if available shall be submitted for use in the field by **Council's Technical Officer** (with final submission).

(f) Hydrological analysis and calculations including but not limited to the minor drainage system, the major drainage system, all drainage structures and drainage channel.

Determination of the overland flow to Q100 and the discharge point of catchment water to be displayed. Identification / Application for drainage easement (where applicable).

(g) Water Reticulation Network to assess flow impacts, and if any modification to existing or system required from with development site to that of the Council asset.

Council shall assess impact on existing stormwater services and provide outcomes.

(h) Analysis of the sewer reticulation capacity, structural certificate for major structures and other submissions as applicable in accordance with Redcliffe Council Policies and Guidelines.

(i) Certificate of design by RPEQ certifying that the design is in accordance with all relevant engineering standards, Council's requirements and standards, Development Approval conditions and sound engineering practice.

(j) Street lighting and Public Utilities plan;

(k) Environmental Management Plan

(l) Traffic flow evaluation comparing the existing system with future traffic flows and movements (by qualified consultant)

(m) Any other matter as determined by the Redcliffe City Council as impacting on the nominated works.

6.0 PRE-START MEETINGS

The following data has been prepared as a guide for Engineering Consultants and Developers concerning the general requirements to be met and general points of discussion to be raised at the pre-start meeting for Reconfiguring a Lot (subdivision developments) and building developments involving public works in the City of Redcliffe:

(a) Prior to arranging pre-start meetings, Council shall be in receipt of approved plans and construction specifications.

(b) Payment of works inspection fee prior to commencement of works (where applicable).

(c) Bond has been provided.

(d) Prior to/or presented at pre-start meeting, relevant information as listed in 4.0 "Requirements for Construction of Works", ie:

(i) contractors' on site and after hours telephone numbers;

(ii) consulting engineer's office and after hours telephone numbers;

(iii) date of commencement of works and expected duration.

(e) Meeting arranged with the Councils Parks and Landscape Planner, regarding tree retention and other environmental aspects.

(f) Permit to Open a Road issued and fee paid (if applicable).

(i) Provision of adequate traffic safety measures, ie: reinstatement of trench works, existing roads.

(ii) Hours of operation (noise nuisance considerations, etc.).
No works Sunday or public holidays.

(iii) Permit from Police (if applicable).

(g) Permit to Draw Water for construction purposes - issue application form.

(h) Bit. Burning – subject to approval.

(i) Arrangements for Private Works in respect to Council connections, ie: Water Reticulation, Sewer Reticulation, Other (reinstatement of road crossing, etc.).

(j) Obligation to obtain consent letters prior to entry into private property. (Clearance letter required upon completion of works).

(k) Any co-ordination required with Service Authorities, Council, Department of Transport, etc.

(l) Changes to the approved design effected during construction shall be subject to prior written approval from the Manager Design and Asset or nominated representative.

(m) Council inspection requirements (consultant to be present).

(i) Roadworks - CBR Results and Proposed Pavement, Submitted for Approval prior to subgrade inspection;

- Subgrade inspection (levels and compaction)
- Pre-seal inspection (moisture and density)

(ii) Sewer - backfill operation
- notification of sewer pressure testing.

(iii) Water - Backfill operation
- notification of water pressure testing.

(iv) Formal "On Maintenance" inspection.
Date for practical completion nominated if works satisfactory by Coordinator Design and Traffic.

(n) Approval of construction materials and products to be used.

(o) Specific issues Consultant/Contractors wish to raise in respect of works.

(p) Workplace Health and Safety Act:

(i) Works to be left safe at all times. Principal Contractor to operate a suitable site specific safety plan.

(ii) Council to sign as owner if notifiable works to be undertaken within existing road reserve

7.0 CONSTRUCTION PHASE INSPECTION REQUIREMENTS

The following data has been prepared as a guide for Engineering Consultants and Developers concerning the inspection requirements for subdivisions and building developments involving works in the City of Redcliffe.

Inspections are undertaken by the appointed Engineering Technical Officer on most operations of the works to ensure adequate quality control is being employed. This entails a number of required inspections, as detailed below, but is not limited to these and random audit inspections may be performed outside of those conducted by the consulting engineer.

Generally inspections are as follows:

Manager Design and Asset Services or nominated representative

Joint Inspections:

- Pre-start Meeting
- Preseal Inspection
- Final Inspection "On Maintenance"
- Final Inspection "Off Maintenance"
- Others (when specific engineering problems arise)

Engineering Technical Officer

Joint Inspections:

- Pre-start Meeting
- Prior to Sewer backfill

- Prior to Drainage Backfill
- Prior to water supply backfill
- Pavement subgrade
- Base course (preseal)
- Witness sewer testing
- Structures prior to pouring or placement
- Witness water testing and chlorination
- Final Inspection "On Maintenance"
- Final Inspection "Off Maintenance"

Random/Audit Inspections

- Pavement Construction
- Allotment fill compaction
- Stormwater and roofwater installation
- Sewerage installation
- Water reticulation installation
- Conduit installation
- Asphalt/bitumen surfacing applications
- Environmental Inspection
- Landscape inspections

8.0 PROCEDURE FOR ACCEPTANCE OF WORKS "ON MAINTENANCE"

The following list has been prepared as a guide for consultants to help facilitate acceptance of works "On Maintenance" by Council.

(a) Preliminary inspections carried out by Consultant of roadworks, sewer reticulation, water reticulation and stormwater drainage systems at or near 'On Maintenance' and the pre-inspection checklist as required by Chapter 12 "Compliance with Standards" completed and forwarded to Council prior to the requested "On Maintenance" inspection date.

All details and testing required to be submitted prior to "On Maintenance" inspection unless discussed with Manager Design and Asset Services or nominated representative.

(b) Formal "On Maintenance" inspection by Council's Coordinator Design and Traffic or nominated representative. Date of practical completion is nominated and any further items requiring rectification listed.

(c) Recommendations will be made by the Manager Design and Asset Services or nominated representative to accept the works "On Maintenance" for the required period from the nominated date of practical completion upon receipt of the following:

(i) Engineer's Certification

Engineer's certificate of the works supported by the following:

- Pre-Inspection Checklist
- Geotechnical and Structural certificates as required by
- Chapter 12 "Compliance with Standards".

(ii) "As Constructed" Drawings

Submission of "As Constructed" plans and electronic data in accordance with Chapter 15, "As Constructed" details.

(iii) Maintenance Security Deposit

A maintenance security deposit in the amount defined under Chapter 14 “Bonding”shall be complied with.

(iv) Private Works

Payment of all outstanding monies pertaining to Private Works for live sewer connections, live water connections and any other works undertaken by Council on the developer's behalf.

(v) Clearances from Property Owners

Clearances shall be obtained from all property owners affected by the works associated with the subdivision/development in writing and provided to the Coordinator Design and Traffic.

(vi) Payment of Outstanding Fees and Charges

ie: Road Opening Permit, Permit to Draw Water and Works Inspection Fee.

9.0 ACCEPTANCE OF WORKS "OFF MAINTENANCE"

The following is a guide for Consulting Engineers to facilitate the acceptance of municipal works "Off Maintenance" by Council.

(a) Council letter notifying of expiration of maintenance period forwarded to Consultant.

(b) Consultant to submit any outstanding items as listed at time of acceptance of works "On Maintenance" with completion date of works 14 days prior to arranged “Off Maintenance” inspection. No inspection to be conducted without submission of details.

(c) Any works items listed during "On Maintenance" inspection to be rectified and works prepared for joint inspection.

(d) Consultant arranges a joint "Off Maintenance" inspection with Council's officers (Manager Design and Asset Services or nominated representative).

(e) Following satisfactory rectification of any items listed during above inspection the Consulting Engineer shall forward a letter to Manager Design and Asset Services or nominated representative advising that project is “Off Maintenance”.

- That the development be taken off maintenance.
- That the maintenance security and any other bond monies be released.

(f) Letter to Consultant notifying of above.

(g) Letter to Owner/Consultant upon formal acceptance of works "Off Maintenance" and confirming release of maintenance security bond by Manager Design and Asset Services or nominated representative.

(h) Updating any changes during “On Maintenance” to the “As Constructed” details as received from the consulting engineers prior to acceptance.

10.0 BONDING OF INCOMPLETE DEVELOPMENT WORKS

Council will give consideration to approving the Plans of Subdivision, prior to acceptance of the works "On Maintenance", subject to the **prerequisites outlined under Chapter 14.**

AT ALL TIMES, COUNCIL RESERVES THE RIGHT NOT TO ACCEPT THE BONDING OF INCOMPLETE WORKS IF IT CONSIDERS THAT SATISFACTORY SECURITY HAS NOT BEEN GIVEN TO ENSURE COMPLIANCE WITH THE REQUIREMENTS OF THE ACT.

APPENDIX 1.0 - EXAMPLE OF DESIGN CERTIFICATION

RCC File:_____
Date:_____

Design Certification

For the Design of Roadworks, Stormwater Drainage, Sewer Reticulation, Water Reticulation, Parks and Associated Works,

AT

_____

FOR

_____

I, _____

_____ of -

_____

Consulting Engineers, being duly authorised in this behalf, do certify that the engineering plans as listed below have been prepared in accordance with Redcliffe City
Council requirements and standards, any relevant development approval conditions, appropriate engineering standards and sound engineering practice.

_____

Designation_____

Certified this _____ day of _____ 20__

Plan No.	Revision

CHAPTER 2 – PLAN AND DOCUMENT PRESENTATION

PART A

The following information is provided as a guide in respect to the preparation and submission of an application for operational works (Engineering Drawings and Specifications associated with Subdivisional Works and Public Works with other types of development).

1.0 PREPARATION AND SUBMISSION OF APPLICATIONS

The full particulars are set out in the Integrated Planning Act 1997.

(a) Three (3) copies of the engineering Plans (2 x A3 size copies and 1 x A1 size copy) and one (1) set of construction specifications;

(b) The application fee of an amount in accordance with a scale of fees outlined in Council's Register of General Charges; and

(c) Any relevant supporting documents (refer 2.0 to 5.0).

The application must be consented to, in writing, by the owner if the application is made by a person who is not the owner.

2.0 GENERAL

2.1 Prior to commencement of construction of any subdivisional and/or public (municipal) engineering works, the following documents shall be submitted for Council's approval:-

(a) Engineering Plans; (all developments)

(b) Specification of Works; (all developments)

(c) Schedules of Quantities;

(d) Hydrology and Drainage analysis and calculations.

(e) Hydraulic analysis of the Water Reticulation Network;

(f) Analysis of the sewer reticulation capacity

(g) Geotechnical Reports (if required)

(h) Traffic assessments (if required)

(g) Structural certification of major structures and other submissions as applicable;

(h) Certification of design by RPEQ, that the design is in accordance with all relevant engineering standards, Council's requirements and standards, Development approval conditions and sound engineering practice.

3.0 ENGINEERING PLANS

3.1 GENERAL

Full engineering plans and specifications shall be prepared by an RPEQ. Relevant details shall be submitted for all earthworks, roadworks, stormwater drainage, sewage, landscaping, public utilities and any additional details outlined in this manual.

Engineering drawings used for approval, shall form the basis for provision of "As Constructed" information and shall comply with the guidelines to record any "As Constructed" alterations from the original design.

Plans are to include:

- Locality Plan
- Layout Plan or Stage Plan
- Plan of each new road
- Intersections, Cul-de-sacs and Speed Control Devices
- Road Longitudinal section
- Road Cross Sections
- Access Cross Section
- Pathways and Bikeways
- Stormwater Drainage Catchment Plans & calculations
- Roofwater Drainage Layout Plan
- Catchment Plan
- Inter-allotment Drainage & calculations
- Earthworks Plan
- Landscaping Plan
- Asset Management Tabulation procedure
- Water Reticulation Plan
- Canal Details
- Line marking and Signage Details
- Public Utility Plan
- Environment & Erosion Plan

(a) Sheet Sizes

All engineering plans shall be drawn on standard size sheets, the following sheet sizes only being acceptable:-

Size	Overall Dimensions
AO	1189mm x 841mm – useable only with approval of the Manager Design and Asset Services or nominated representative.
A1	841mm x 594mm - normal maximum size
A3	420mm x 297mm

Scales

The following scales are to be used in natural scale:-

- Plan - 1:100 or 1:50
- Longitudinal Section Horiz 1:100 and Vert 1:100; or
- Horiz 1: 50 and Vert 1: 50
- Intersection Details - 1:250
- Cross-Sections - New Road Reserve - Horiz 1:100 and Vert 1:100
- Existing Road Reserve - Horiz 1:100 and Vert 1:100

(b) Dimensioning on Plans

Linear dimensions on all plans will be in metres.

(c) Standard Pegging Intervals

Roadworks

Centrelines (or other construction lines) should be pegged and levelled at 20 metre intervals, with further subdivision to 10 metres to 5 metre intervals where necessary due to horizontal or vertical curvature.

Stormwater and Roofwater Drainage:

At all manhole positions and major changes in topography.

(d) Chainage

Chainage on plans shall be expressed to 0.01 metre.

(e) Levelling

All levels shall be reduced to Australian Height Datum.

In general, all levels on plans shall be expressed to three decimal places of a metre.

3.2 ROADWORKS, STORMWATER and ROOF DRAINAGE

(a) Plans should, in general, include the following:-

(i) Title block
(ii) Locality plan
(iii) Layout and stage plan
(iv) Plan of each new road (control line)
(v) Detail plan of each intersection
(vi) Longitudinal section of each road
(vii) Standard cross-sections
(viii) Cross sections of each road
(ix) Longitudinal section of each drainline.

Without limitation, the following information should be included in each of the above.

(b) Locality Plan

Location of the subdivision in relation to adjacent main roads, major streets etc.

(c) Layout and Stage Plan

For large subdivisions, the layout plan should show the relationship of all new roads to each other, and existing roads adjoining the subdivision.

Where development is to be carried out by stages, the boundaries of proposed Stages should be shown on this plan, and the stages identified by numbering. For small subdivisions, where all new roads can be shown on one detail plan, the layout plan may be omitted.

(d) Plan

The plan of each road shall include:-

(i) Road reserve boundaries
(ii) Allotment boundaries, both existing and proposed
(iii) Centre-line, or other construction line
Chainages, on centre-line or construction line or set out coordinates
(v) Bearings of the centreline or construction line (if used)
(vi) Offsets, if the construction line is not the centre line.
(vii) Tangent point chainages or co-ordinates of each curve
(viii) Radius of each curve, tangent length, deflection angle and length of curve.
(ix) Centreline and bearing of each intersecting road.
(x) Chainage or co-ordinates of the intersection point of road centrelines
(xi) Kerb lines, kerb radii and chainage or co-ordinates of all tangent points of the kerb line.
(xii) Edge of pavement, where no kerb is to be constructed
(xiii) Dimensioned road reserve, footpath and pavement widths, where these differ from the standard cross-section
(xiv) Location and details of signs and roadmarkings to be provided
(xv) Drainline locations, diameters and class of pipe.
(xvi) Manhole location, chainage and offset or co-ordinates and inlet and outlet invert levels
(xvii) Gully locations, chainage and offset or co-ordinates and invert and kerb levels

(xviii) Location and levels of existing utilities or other existing works within the site.
(xix) Limits and levels of allotment filling or excavations
(xx) Location and levels of bench marks and reference pegs
(xxi) North point

(e) Detail Plan of Intersections

Intersection detail plans shall include all the relevant information required for plans, as listed in (d) above, together with additional details such as kerb levels on kerb returns (i.e. at TP's plus 3 additional points on curve at equal intervals with max. interval 5 metres), pavement contours (0.2 metre vertical intervals) and channel works.

(f) Longitudinal Sections of Roads

The longitudinal section of each road shall include:-

(i) Chainages
(ii) Existing surface or peg levels
(iii) Design road centreline and top of kerb levels
(iv) Cut or fill depths
(v) Design grades - min 0.5% and radii of vertical curves
(vi) Chainage and levels of grade intersection points
(vii) Chainage and levels of tangent points of vertical curves
(viii) Length and radii of vertical curves
(ix) Details of super elevation where applicable

(g) Standard Cross-Sections

A standard cross-section shall be shown for each road. This can be shown on the first cross section for the particular road.

(i) Road reserve width
(ii) Pavement widths
(iii) Footpath widths
(iv) Crossfall of pavement and footpaths
(v) Pavement Depth
(vi) Type of kerb and channel
(vii) Type of pavement surfacing
(viii) Verge detail

(h) Cross-Sections of Roads

A cross-section shall be drawn such that the maximum interval between cross sections does not exceed 20 metres. Cross sections should include top of ridge and bottom of gully. Cross-sections shall show:-

(i) Road reserve boundaries with labels - i.e. northern property boundary
(ii) Pavement centre-line (or other construction line)
(iii) Natural surface
(iv) Design cross-section
(v) Crossfall of pavement and footpath, pavement and footpath widths, and pavement depths wherever these differ from the standard cross-section.

(vi) Where design is for a road in an existing road reserve the design cross-section must show the existing profile and ultimate profile for the full reserve width.

(i) Longitudinal Sections of Drains

A longitudinal section of each drainline shall be drawn along the centreline of the drain and shall show:-

(i) Chainages
(ii) Existing surface levels
(iii) Proposed surface level
(iv) Design invert levels, obvert level and hydraulic gradeline
(v) Manhole chainages and inlet and outlet invert levels
(vi) Distances between manholes
(vii) Grade of each pipe
(viii) Diameter of each pipe length
(ix) Class of each pipe length

(j) Subgrade Test Results and Pavement Design

It is compulsory that subgrade sampling and testing be carried out and the results submitted to the Council with the engineering submissions.

(k) Drainage Calculations

All stormwater drainage works shall be designed in accordance with the Queensland Urban Drainage Manual.

Full calculations for such drainage design shall be submitted for checking.

A catchment plan, showing the total catchment, and the sub-areas used in the calculations, shall also be submitted. Such plan shall show finished surface contours.

3.3 WATER RETICULATION

(a) Engineering Plans

Full engineering plans, prepared by a Registered Professional Engineer, shall be submitted for all water supply reticulation works.

Plans should, in general, include the following:-

(i) Title block
(ii) Locality plan
(iii) Layout and stage plan
(iv) Layout and reticulation work
(v) Layout and conduits
(vi) Schedule of pipes and fittings to be used.

Without limitation, the following information should be included in each of the above.

(b) Title Block

(i) Estate name (if any)
(ii) Real Property Description
(iii) Locality
(iv) Developer's name
(v) Scales - Bar Scales
(vi) Plan number and sheet number
(vii) Schedule and date of amendments
(viii) Signed design certification by a Registered Professional Engineer
(ix) Street names (where applicable)

(c) Locality Plan

Location of the subdivision in relation to adjacent main roads, main street, etc.

(d) Layout and Stage Plan

For large subdivisions, the layout plan should show the relationship of all new roads to each other, and to existing roads adjoining the subdivision.

Where development is to be carried out by stages, the boundaries of proposes Stages should be shown on this plan, and the stages identified by numbering.

For all small subdivisions where all new roads can be shown on one detail plan, a staging plan will not be required.

(e) Plan

The water reticulation plan shall include:-

(i) Road reserve boundaries
(ii) Allotment boundaries, both existing and proposed
(iii) Kerb lines, or pavement edge where there is no kerb, shall be shown
(iv) Location and levels of other utility services where affected by the water reticulation works
(v) Limits and levels of allotment filling or excavations
(vi) Location and levels of bench marks and reference pegs
(vii) North point.

3.4 SEWERAGE RETICULATION

(a) Full engineering plans, prepared by a Registered Professional Engineer, shall be submitted for all sewerage reticulation and associated works. Plans should, in general, include the following:-

(i) Estate name (if any)
(ii) Real Property Description
(iii) Locality
(iv) Developer's name
(v) Scales - Bar Scales
(vi) Schedule and date of amendments
(vii) Signed design certification by a Registered Civil Engineer
(viii) Street names (where available) and Lot numbers

(b) Locality Plan

Location of the subdivision in relation to adjacent main roads, major streets etc.

(c) Layout and Stage Plan

For large subdivisions, the layout plan should show the relationship of all new roads to each other, and to existing roads adjoining the subdivision.

Where development is to be carried out by stages, the boundaries of proposed Stages should be shown on this plan, and the stages identified by numbering.

For small subdivisions, where all new roads can be shown on one detail plan, a staging plan will not be required.

(d) Plan

The Plan of each sewer shall include:-

(i) Road reserve boundaries
(ii) Allotment boundaries, both existing and proposed
(iii) Location of all existing and proposed services
(iv) Location of all existing and proposed sewer lines and manhole locations
(v) Location of all house connection branches
(vi) Contours at one metre intervals (for terrains of less than 2% contours at 0.5 metre intervals are required)
(vii) Kerb lines or edge of pavement where no kerb exists
(viii) North point
(ix) Roofwater drainage layout
(x) PSM or reference point and level

(e) Longitudinal Sections of Sewer Lines:

(i) Chainages
(ii) Existing surface levels
(iii) Finished surface levels and depth to invert
(iv) Design sewer to invert levels

(v) Design top of Manhole levels
(vi) Type of manhole
(vii) Type of manhole cover
(viii) House connection branch location, type, invert level
(ix) Type of pipe, class, diameter and gradient
(x) Bulkheads (where required)

(f) Landscaping Plans

Full copy of all landscaping and streetscaping plans and specifications to be submitted with Operational works application.

4.0 SPECIFICATIONS, STANDARD DRAWINGS AND SCHEDULE OF QUANTITIES

4.1 GENERAL

All works shall be in accordance with the appropriate Redcliffe City Council Standard Specifications/Drawings or as nominated. Where no Redcliffe City Council Standard Specification/Drawings exists for a particular type of work, Consultants may use their own standard specification/drawings for that work subject to the approval of the Manager Design and Asset Services or nominated representative.
.
Full specifications/drawings covering all aspects of the proposed works shall be included in the documents and shall be submitted for approval.

4.2 Schedule of Quantities

Separate schedules shall be submitted for all outstanding items not completed at time of bonding This shall be used to calculate Bond.

5.0 ENGINEERING CHECKING AND WORKS INSPECTION FEES

5.1 GENERAL

The applicable fee for the checking of engineering plans is to be submitted with the operational works application. Avoidance of paying the nominated fee shall deem the submission as “not properly made”.

Provision of this information with your application will help reduce processing time. Therefore, you are advised that wherever possible you should provide all of the items listed above. If you feel any of the items are not necessary for assessment of your application you should contact the Council prior to lodging the application to ascertain the necessary requirements.

Include any further information as required by provisions of the Act or the Planning Scheme or as required in accordance with the provisions of any Local Planning Policies adopted pursuant to the Act.

Include such other information relative to the application as may be requested by the Manager Design and Asset Services.

PART B - AS CONSTRUCTED INFORMATION

SECTION 1.0 - GENERAL CONDITIONS (ALL DEVELOPMENTS)

Clear and precise details of works undertaken enables Council to respond to searches by prospective purchasers with accurate details of infrastructure and topography.

Any enquires with regard to As Constructed data, presentation or general information, contact can be made with Manager Design and Asset Services or nominated representative or Coordinator Survey and Land Information.

Council requires that Consultants certify the "as constructed" information as accurate and records that the completed works are in accordance with the tolerances required by Council.

In keeping with the above aim, the Consultant shall complete the "Consulting Engineer's Certificate And As Constructed Certification" form.

"As Constructed" information prepared by the Consultant for submission to Council should meet the following minimum criteria and that detailed under Chapter 15.

- Be endorsed by a Licensed Surveyor with an appropriate Q.A. Standard
- All "as constructed" information shall be submitted to Council prior to any formal acceptance of the Works "on maintenance"
- The submission of "as constructed" information is required in the format as specified in Council's current "Standard Electronic Format for As Constructed Data" under Chapter 15.
- Approved street names and correct lot numbers shall be shown on all "as constructed" information
- All significant variations from approved Engineering Drawings (including tolerances outside those specified or set out below) shall be approved by Council prior to or during construction and such changes recorded on the "as constructed" information
- Any amendments required by Council to the submitted "as constructed" information shall be made and resubmitted by the Consultant and approved by Council prior to formal acceptance of the Works "off maintenance"

1.1 CONSTRUCTION TOLERANCES

Following construction of the Works to the construction tolerances specified in Council's Standard Specifications (the specified tolerances) the "as constructed" information will be entered into Council's records provided the tolerances and parameters set out below have been met.

2.0 BULK EARTHWORKS - COUNCIL'S RECORDS TOLERANCE

Certification of the Approved Engineering Drawings is sufficient provided the works meet the following minimum tolerances and parameters:-

2.1 EARTHWORKS GENERAL

- Finished Surface Level +/- 50mm
- Horizontal Alignment +/- 50mm

The Finished Surface Level is at or above the approved Development Level or the adopted Flood Level

The constructed minimum crossfall is not less than 1 in 150

Any variations to the Finished Surface Level of ± 150mm are approved by Council.

2.2 Batters

- Batter slopes are not steeper than 1 in 6 in parklands or 1 in 4 in allotment areas
- Batters do not straddle allotment boundaries or extend into existing or proposed parkland or bushland reserves

2.3 Retaining Structures

Vertical Alignment ± 50mm
Horizontal Alignment +/-50mm
Retaining structures do not straddle allotment boundaries

3.0 ROADWORKS

Deviation from the approved Engineering Drawings shall not exceed:-

3.1 Kerb and Channel

- Vertical Alignment
  Horizontal Alignment
- The constructed minimum kerb grading is not less than 0.5%
- No ponding occurs (refer Council's current Standard Specification) 229

3.2 Pavement

Vertical Alignment
Horizontal Alignment

The constructed minimum crossfall shall be as set out in Standard Drawings

4.0 STORMWATER DRAINAGE - COUNCIL'S RECORDS TOLERANCE

Deviation from the approved Engineering Drawings shall not exceed:-

4.1 Manholes

Location	± 100mm	(Refer Note 1)
Surface Level	± 50mm	(Refer Note 2)

4.2 Gullies

Longitudinal	± 100mm	(Refer Note 1)
Lateral		(Refer Note 3)
Invert	± 50mm	(Refer Note 3, 4)

4.3 Pipework

Invert	± 50mm	(Refer Note 4)
Alignment	± 100mm	(Refer Note 1)
Grade		(Refer Note 4)

(d) Property Pits (Inter-allotment), Field Inlets, Headwalls

Location	± 100mm	(Refer Note 1)
Surface Level	± 50mm	(Refer Note 2)
Invert		± 50mm

4.4 Stormwater Quality Improvement Devices (SQUIDS)

Location ± 100mm

5.0 STORMWATER DRAINAGE - COUNCIL'S RECORDS TOLERANCE

Surface Level (Refer Note 2)

5.1 Oil Separators

Location ± 100mm
Surface Level (Refer Note 2)

Notes:

1. Deviation should not result in conflict or interference with any other service or structure. All services should remain within the approved services corridor.
2. Should match the adjacent finished surface.
3. Deviation should not affect the levels of existing kerb and channel and adjacent roadwork.
4. Not less than minimum and not more than maximum grade. Council's design criteria shall be achieved.

6.0 SEWERAGE RETICULATION - COUNCIL'S RECORDS TOLERANCE

Deviations from approved design shall not exceed:-

6.1 Manholes

Locations	± 50mm	(Refer Note 1)
Surface Levels	+/-25mm	

6.2 Lines

Invert	± 25mm	(Refer Note 3)
Alignment	± 50mm	(Refer Note 1)
Grade		(Refer Note 3)

6.3 House Connections

Location	± 50mm	(Refer Note 1)
Invert (Depth)	±25 mm	(Refer Note 3)

6.4 Ends of Line

Location	± 50mm	(Refer Note 1)
Invert	± 25mm	(Refer Note 3)

7.0 WATER RETICULATION - COUNCIL'S RECORDS TOLERANCE

Deviations from approved design shall not exceed:-

7.1 Fittings

Locations - Horizontal	± 100mm	(Refer Note 1)
Vertical	+/- 50mm	(Refer Note 2)

7.2 Lines

Locations - Horizontal	± 100mm	(Refer Note 1)
Vertical	+/- 50mm	(Refer Note 2)

Notes:-

1. Deviation should not result in conflict or interference with any other service or structure. All services should remain within the approved service corridors.
2. Levels should be adequate for installation of fittings. Tolerances are only critical if design levels are nominated.

8.0 IRRIGATION SYSTEMS

The "As Constructed" information shall be submitted to Council in accordance with the format as specified in Council's current "electronic format for "As Constructed Data".

Generally the "As constructed" information should include the location, size and model etc. of the following:

- Controllers
- Cables (high and low voltage)
- Water meters
- Back flow devices
- Valves

A copy of all manufacturing maintenance manuals to be provided to the Council prior to " On Maintenance" being awarded.

9.0 SEWERAGE RETICULATION - COUNCIL'S RECORDS TOLERANCE

Notes:-

1. Deviation should not result in conflict with any other service or structure. All services should remain within the approved service corridors.
2. Refer Standard Drawing.
3. Not less than minimum and not more than maximum grade. Council's design criteria shall be achieved.

- Sprinkler heads
- Drip irrigation
- Irrigation lines
- Pumps
- Enclosures where applicable

10.0 OPEN SPACE LIGHTING

The "as constructed" information shall be submitted to Council in accordance with the format as specified in Council's current "Standard Electronic Format for As Constructed Data".

Generally the "as constructed" information should include the location and size etc. of the following:

- Cable alignments (high and low voltage)
- Switchboards
- Pole location

11.0 SURVEY CONTROL

Datum for all level information is to be AHD. The origin of which is to be indicated by:

- location and level.
- Location of feature points are to be reduced to the Map Grid of Australia MGA

12.0 SURVEY CERTIFICATION

The following are to be certified to their correctness by a Licensed Surveyor:

(a) Location and level of all underground services including pit/manhole surface location to be provided.

(b) Cadastral boundaries.

(c) M.G.A. and GDA control points.

13.0 ENGINEER CERTIFICATION

The following is to be certified to its correctness by a Registered Engineer:

(a) Type and class of all pipework.

13.1 As Constructed Drawings

Transparencies and electronic format drawings of the design plans adjusted to show construction amendments are to be provided as a full survey.

Details are to be provided prior to "On Maintenance" inspection being carried out and awarded.

14.0 FULL AS CONSTRUCTED SURVEY (SURVEY AND LAND INFORMATION)

Both electronic and tracing paper copy of the following are required:

A full "As Constructed" Survey as per RCC As Constructed Survey Requirements is required as outlined under Chapter 15.
ASCII Tabulation files (for Asset Management)

PART C - PLAN INFORMATION

1.0 GENERAL (ALL DEVELOPMENTS)

(a) Scale 1:500 bar scale to be shown

2.0 CADASTRAL/SURVEY INFORMATION (ALL DEVELOPMENTS)

(a) Land Boundaries.

(b) Lot numbers.

(c) Permanent Survey marks.

(d) Permanent Survey Marks to details provided in Chapter 15.

3.0 TOPOGRAPHICAL INFORMATION (ALL DEVELOPMENTS)

(a) Finished ground levels at all R.P. corners.

(b) Other finished ground levels as required to formulate a "realistic" contour

(c) Contours at 0.1m intervals.

4.0 ROADWORKS INFORMATION (ALL DEVELOPMENTS)

(a) Kerb and channel levels.

(b) Location of islands, roundabouts and levels. Pram ramps and crossings to be detailed with chainages

(c) Permanent signs - street, warning and regulatory with chainage points.

(d) Verge details and footpath alignment

5.0 SEWERAGE INFORMATION (ALL DEVELOPMENTS)

(a) Tables as per Section 4 - Tabulation.

(b) Location of all manholes.

(c) Location of all sewer/rising mains.

(d) Location of house connection branches.

(e) Manhole numbers shown on plan to be tabulated.

(f) Invert level of manhole and pipe entry / exist to manhole

6.0 STORMWATER INFORMATION (ALL DEVELOPMENTS)

(a) Tables as per Section 4 - Tabulation.

(b) Location of all stormwater lines and diameter.

(c) In the case of open drains, show invert and edges of concrete. Invert levels are to be shown at 25m intervals and changes of grade.

(d) Manhole/pit numbers to be shown on plan.

(e) Invert level of manhole and pipe entry / exist to manhole

7.0 ROOFWATER INFORMATION (ALL DEVELOPMENTS) – MAY BE LINKED TO STORMWATER INFORMATION

(a) Tables as per Section 4.

(b) Location of all stormwater lines

(c) Location of connection points.

(d) Manhole numbers to be shown.

8.0 WATER INFORMATION (ALL DEVELOPMENTS)

(a) Tables as per Section E - Tabulation.

(b) Location of all mains including bends, junctions, hydrants, valves etc.

(c) Diameter, type, class of all mains, to be shown on plan view. Where pipe type changes (under roads etc.) indicate on plan view.

(d) Location of all conduits. End points to have dimensions

9.0 PUBLIC UTILITIES (ALL DEVELOPMENTS)

All survey pick up is to be carried out and provided to the Council for all underground and overhead public utilities constructed.

Details to be included are as follows:

- Invert level of the service
- Diameter and alignment of service
- Distance from back of kerb (if in footpath)

10.0 STRUCTURES (RELEVANT DEVELOPMENTS)

Full survey data to be provided of structure. Details to be discussed with Survey and Land Division.

11.0 PARKS AND FURNITURE (ALL DEVELOPMENTS)

The following are some of the key items to be identified. Items may be adjusted by the Parks Vegetation Officer.

- Location of garden beds
- Location of street plants
- Alignment of sprinkler services
- Location of park furniture
- Location details for development entrances
- Fencing alignments

12.0 CANALS (RELEVANT DEVELOPMENTS)

A full survey pick is required for all issues associated above and particular details involved with Canal development.

PART D - ELECTRONIC TRANSFER:

This is applicable to subdivisions and larger industrial, commercial and residential developments.

1.0 GENERAL

Due to the nature of electronic transfer methods, the following are provided as suggested methods. Any additional detailed can be discussed with the Council.

2.0 MEDIA

(a) CD copy preferred if file too large to e mail.

3.0 DATA

(a) Autocad files are the require adoption.

(b) Autocad drawing files are acceptable.

(c) All data should be accompanied with:

1. Details of layering as outlined in Appendix 1 & 2
2. ASCII files containing tabulated data as per Section 4.

(when included in a drawing file must also be provided externally of that drawing file)

PART E - TABULATION:

1.0 THE FOLLOWING TABLES ARE REQUIRED FOR ALL AS CONSTRUCTED IN BOTH HARD COPY AND ELECTRONIC SURVEY:-

(a) Sewerage:

(i) Sewerage Reticulation Line table.

(ii) Sewerage Manhole table.

(iii) House Connection Branch table.

(b) Water:

(i) Water Reticulation Fitting table.

(c) Stormwater:

(i) Stormwater/Pit Manhole table.

(ii) Stormwater Line table.

(iii) Subsoil drain Line table

(d) Roofwater:

(i) Roofwater Pit. Manhole table.

(ii) Roofwater Line table.

(iii) Roofwater Branch Connection table.

(e) Public Utlities

(i) Gas
(ii) Electricity
(iii) Street lighting
(iv) Hydrant locations
(v) Traffic signals
(vi) Telecommunications

(f) Roadworks

(g) Structures

(h) Parks and Furniture

2.0 ATTACHED IS A COPY OF EACH TABLE WITH EXAMPLE INSERT AND COLUMN DESCRIPTION.

GENERAL:

General examples are listed below with required accuracy:-

1. Constructed e.g. 1/5/1992
2. East 475565.640 Two significant figures
3. North 6945674.345 Two significant figures
4. Levels 23.430 Two significant figures

STORMWATER TABLES

Stormwater Line Tables

Setout for the above table as shown below with completed example:

1	2	3	4	5	6	7	8	9	10	11
LINE	USM	DSMH	Dia	Type	Class	USIL	DSIL	Length	Grade	Constructed
15	3	2	300	RCP	X	23.43	23.22	35.0	0.600	1/5/1992

Notes to Tables:
Column 1: Line number (Unique to project).
Column 2: Upstream manhole number.
Column 3: Downstream manhole number.
Column 4: Nominated diameter in millimetres.
Column 5: Type of pipe. Refer Appendix A for abbreviation.
Column 6: Class of pipe.
Column 7: Invert level upstream.
Column 8: Invert level downstream.
Column 9: Length in metres between manholes.
Column 10: Grade of line as a percentage 1 in 100 - 1.00 %
Column 11: Constructed date.

Stormwater Manhole Tables

Setout for the above table as shown below with completed example:

1	2	3	4	5	6	7
Line	MH No.	East	North	Surface RL	Type	Constructed
1	23	475565.640	6945674.345	23.450	PIT	1/5/1992

Notes to Tables:
Column 1: Line number (Unique to project).
Column 2: Manhole number.
Column 3: MGA co-ordinate.
Column 4: AMG co-ordinate.
Column 5: Surface level of centre of manhole/pit lid.
Column 6. Type of Construction. Refer to Appendix A for abbreviation.
Column 7: Constructed date.

GENERAL:

General examples are listed below with required accuracy:-
1. Constructed e.g. 1/5/1992
2. East 475565.640 Two significant figures
3. North 6945674.345 Two significant figures
4. Levels 23.430 Two significant figures

SEWERAGE TABLES

Sewerage Reticulation Line Tables

Setout for the above table as shown below with completed example:

1	2	3	4	5	6	7	8	9	10	11
LINE	USMH	DSMH	Dia	Type	Class	USIL	DSIL	Length	Grade	Constructed
15	3	2	100	FRC	35	23.430	23.220	35.0	0.600	1/5/1992

Notes to Tables:
Column 1: Line number (Unique to project).
Column 2: Manhole number.
Column 3: MGA co-ordinate.
Column 4: AMG co-ordinate.
Column 5: Surface level of centre of manhole/pit lid.
Column 6. Type of Construction. Refer to Appendix A for abbreviation.
Column 7: Invert Level Upstream.
Column 8: Invert Level Downstream.
Column 9: Length in metres between manholes.
Column 10: Grade of Line as a percentage 1 in 100 = 1.00%
Column 11: Constructed Date.

Sewerage Manhole Tables

Setout for the above table as shown below with completed example:

1	2	3	4	5	6	7	8
Line	MH No.	East	North	Cover RL	MH Type	Cover Type	Constructed
1	23			23.450	B	P	1/5/1992

Notes to Tables:
Column 1: Line number (Unique to project).
Column 2: Manhole number.
Column 3: MGA co-ordinate. Centre of manhole lid.
Column 4: AMG co-ordinate. Centre of manhole lid.
Column 5: Surface level of centre of manhole lid.
Column 6. Type of Manhole Construction. Refer to Appendix C.
Column 8. Constructed date.

Sewerage House Connection Branch Table

Set out for the above table as shown below with completed example:

1	2	3	4	5	6	7	8	9	10
Line	RP No.	Lot No.	East	North	ILEnd	SLEnd	Length	Type	Constructed
1	673450	4			23.450	24.100	2.0	A	1/5/1992

Notes to Tables:
Column 1: Line number (Unique to project).
Column 2: Registered Plan number branch is in.
Column 3: Lot number branch is in.
Column 4: MGA co-ordinate on junction.
Column 5: AMG co-ordinate on junction.
Column 6: Invert at end of branch.
Column 7: Surface level at end of branch.
Column 8: Length of pipe from sewer to branch end.
Column 9: Type of branch construction. Refer Appendix C.
Column 10: Constructed date.

GENERAL:

General examples are listed below with required accuracy:-

1. Constructed e.g. 1/5/1992
2. East 475565.640 Two significant figures
3. North 6945674.345 Two significant figures
4. Levels 23.430 Two significant figures

ROOFWATER TABLES

Roofwater Line Tables

Setout for the above table as shown below with completed example:

1	2	3	4	5	6	7	8	9	10	11
LINE	USMH	DSMH	Dia	Type	Class	USIL	DSIL	Length	Grade	Constructed
1	3	2	150	PVC	SW	23.430	23.220	35.0	0.600	1/5/1992

Notes to Tables:
Column 1: Line number (Unique to project).
Column 2: Upstream manhole number.
Column 3: Downstream manhole number.
Column 4: Nominated diameter in millimetres.
Column 5: Type of pipe. Refer Appendix A for abbreviation.
Column 6: Class of pipe.
Column 7: Invert level upstream.
Column 8: Invert level downstream.
Column 9: Length in metres between manholes.
Column 10: Grade of line as a percentage 1 in 100 - 1.00 %
Column 11: Constructed date.

Roofwater Manhole Tables

Setout for the above table as shown below with completed example:

1	2	3	4	5	6	7
Line	MH No.	East	North	Surface RL	MH Type	Constructed
1	23	475565.640	6945674.345	23.450	GIP	1/5/1992

Notes to Tables:
Column 1: Line number (Unique to project).
Column 2: Manhole number.
Column 3: MGA co-ordinate.
Column 4: AMG co-ordinate.
Column 5: Surface level of centre of manhole/Pit lid.
Column 6. Type of manhole construction. Refer to Appendix A for abbreviation.
Column 7: Constructed date.

Roofwater Branch Connection Table

Setout for the above table as shown below with completed example:

1	2	3	4	5	6	7	8	9
Line	RP No.	Lot No.	East	North	ILEND	SL End	Length	Constructed
1	670394	4	475565.640	6945674.345	23.450	23.550	2.0	1/5/1992

Notes to Tables:
Column 1: Line number.
Column 2: Registered Plan number branch is in.
Column 3: Lot number branch is in.
Column 4: MGA co-ordinate on junction.
Column 5: AMG co-ordinate on junction.
Column 6: Invert at end of branch.
Column 7: Surface level at end of branch.
Column 8: Length of pipe from sewer to branch end.
Column 9: Type of branch construction. Refer Appendix B.
Column 10: Constructed date.

WATER TABLES

General examples are listed below with required accuracy:

1. Constructed e.g. 1/5/1992
2. East 475565.640 Two significant figures
3. North 6945674.345 Two significant figures
4. Levels 23.430 Two significant figures

1	2	3	4	5	6	7	8	9
Street	Main	Fitting		Fitting	Co-Ordinates		RL	Construction
Code	No.	No.	Type	Description	Easting	Northing		Date
2060	01	001	Bend	100 x 100	475565.640	6945674.345	23.450	1/2/92

Notes to Tables:
Column 1: Street Name (if unavailable leave blank)
Column 2: Main No. is arbitrary.
Assign a NEW number to each section of main with differing characteristics such as year, size, type etc. or alternately indicate on plan different main type and sizes.
Column 3: Fitting number unique to project.
Column 4: Abbreviated list for fittings.
Column 5: Dimensions/Angle of fitting. (e.g. 100 x 100, 100 x 45, 100 x 150 etc.).
Column 6: MGA co-ordinate.
Column 7: AMG co-ordinate.
Column 8: RL of pipe at top of barrel.
Column 9: Constructed date.

CHAPTER 3 - ENVIRONMENTAL CONSIDERATIONS AND WATER QUALITY

PURPOSE OF CHAPTER

The purpose of this Chapter is to ensure that adequate designs and procedures are adopted and that developments shall prevent and minimise the adverse effect on the environment, and comply with all relevant Acts, Laws, Policies and Local Laws.

Redcliffe City Council defines development into 2 categories, which involve differing degrees of environmental exposure. Both categories have an obligation to meet environmental control standards.

1. Small Developments

Small developments are classified as the subdivision / redevelopment of a small residential block.

Sites of this nature are to comply with environmental requirements, and to submit an environmental plan. The complexity and issues of concern will vary depending on the scale of the development and the impacts on the local area.

The items of submission are as follows:

- Site Erosion and Sediment Control plan
- Stormwater Management Control plan

A work method statement is to be provided explaining the issues associated with Erosion and Sediment Control and Stormwater management plans of the specific site, and the controls to be used.

Any concerns are to be discussed with Council Officers or raised at the Pre design meeting.

2. Large Developments

A detailed Environmental Management Plan outlining the environmental concerns, potential impacts and control and measures is to be submitted. The issues to be covered our outlined below. The issues are to be addressed daily through the course of the development.

Supervising agent to ensure the Principal Contractor implements and manages the Environmental Management Plan.

General:

Issues regarding the environment are subject to random and regular inspection by the Council Officers.

PART A - ENVIRONMENTAL CONSIDERATIONS

1.0 CONSERVATION AND HERITAGE

Developers and Consultants shall conform with design limitations and constraints imposed by:

- Integrated Planning Act 1997.
- Environmental Protection Act 1994 and Environmental Protection Policies.
- Vegetation Management Local Law
- Nature Conservation Act 1992;
- Marine Parks Act 1982:
- Marine Parks (Moreton Bay) Zoning Plan 1997
- State Coastal Management Plan 2001;
- Regional Nature Conservation Strategy for South East Queensland 2001 – 2006;
- Strategy for the Conservation and Management of Queensland's Wetlands 1999;
- Environmental Protection and Biodiversity Conservation Act 1999;
- RAMSAR;
- CAMBA; and
- JAMBA.

The advice of Council Officers should be sought early in the planning phase of development projects to ensure conservation and heritage issues are addressed. Applications and designs shall demonstrate consideration of Policies, Local Laws, the above mentioned Acts, Local Planning and Strategies.

2.0 CONTAMINATED LAND

Where land to be developed may have been subjected to contamination, a Site Contamination Report shall be prepared to the satisfaction of the Environmental Protection Agency (EPA). Approval from the EPA and Council will be required to be undertake the proposed development on the subject site.

The development will need to be undertaken in accordance with the requirements of the EPA and Natural Resources and Mines.

Investigation of the site needs to be carried out to identify whether Potential Acid Sulphate soils are present.

A management plan needs to be submitted with the application to highlight methods of inspecting, identifying and controlling acid sulphate which may be encountered.

3.0 NOISE

Prior to approval of Engineering Design for the development, a report from a suitably qualified acoustic consultant may be required to demonstrate that developments comply with relevant legislation, (including the Environmental Protection (Noise) Policy 1997) policies and Australian Standard 2107 - (Acoustics) - Recommended Design Sound Levels and Reverberation Times for Building Interiors and Australian Standard 3671 - Acoustics - (Road) Traffic Noise Intrusion - Building Siting and Construction. The report should recommend noise control measures to be employed at the premises to achieve satisfactory noise levels as outlined in the noise EPP and detail all methodology and calculations. This applies to development both during construction and when operational.

4.0 QUALITY

While a development is under construction, the Contractor is to implement methods of controlling and reducing the amount of dust the project impacts on surrounding businesses, vegetation and residents.

The Engineering Supervisor is to monitor the methods implemented in accordance with the Environmental Management Plan. Any reports of excessive air pollution shall be acted on by the Council in accordance with relative legislation.

5.0 LAND ISSUES

The Contractor is responsible to ensure waste on the site is effectively managed and disposed at registered waste fill sites.

Waste material shall meet requirements of that classified as fill material to be used on site.

Potential Acid Sulphate (PAS) plan and management method to be included under the plan and submitted to Council for inspection. All relevant investigations shall be carried out at the cost of the developer to identify and treat PAS on any site.

PART B - WATER QUALITY CONTROL

1.0 DRAINAGE

Council is committed to minimising erosion and sedimentation, and the degradation of surface and groundwater quality which can result from development, both during and after construction.

Effective water quality control involves:

(a) Integration into the design of both permanent and temporary water quality control measures.

(b) Programming of works to minimise erosion potential.

(c) A commitment to the monitoring and maintenance of water quality control measures.

The Contractor shall maintain all sediment control measures proposed on the sediment control plan.

(d) The Contractor shall install Gully baskets suitable to the requirements of Redcliffe Council as permanent control devices. Associated with the installation shall be the regular maintenance of the devices (every 3 months) as defined under "On Maintenance" details.

2.0 EROSION AND SEDIMENT CONTROL PLAN

An Erosion and Sediment control program including plans and specifications shall be prepared for both temporary and permanent control of sediments, erosion and gross pollutants.

The Consultant Engineer shall prepare the sediment and erosion control plan in accordance with reference to Institution of Engineers, Australia (QLD) "SOIL EROSION AND SEDIMENT CONTROL", Engineering Guidelines for Queensland Construction Sites, June 1996.

The associated plan(s) must show:

(a) The site's existing topography;

(b) How and where it will be altered;

(c) The sediment and erosion control measures that are proposed to be used (marked distinctively on plan);

(d) The catchment boundaries and the direction of flow for the different drainage areas before and after development;

(e) The stormwater management system proposed.

Upon inspection by the Coordinator Design and Traffic to the adequacy of the measures proposed, the sediment and erosion control plan shall then be produced as a drawing forming part of a construction set.

It is emphasised that no matter which measures are selected and implemented they shall be properly maintained by the Contractor to ensure that they adequately fulfil their function.

The Council may carry out random inspections of the site to identify if maintenance is being carried out (especially after storm events).

3.0 PERMANENT METHODS OF WATER QUALITY CONTROL

3.1 Design of Structures

The design of the erosion and sediment control structures deemed necessary by the Development Assessment Manager shall be in accordance with QUDM and Institution of Engineers, Australia (QLD) "SOIL EROSION AND SEDIMENT CONTROL" Engineering Guidelines for Queensland Construction Sites.

3.2 Gross Pollutant Traps

A Gross Pollutant Trap (GPT) is a structure which acts as the initial water pollution control measure in the stormwater system. Gross Pollutant Traps are designed to intercept and retain coarse, trash and debris. Traps typically comprise a concrete lined basin, a trash rack to intercept trash and debris and provision for maintenance and cleaning of the trap.

3.3 Gully Baskets

A drainage basket which is used as a control measure to collect matter and sedimentation before entering the stormwater systems are to be installed on all new development gullies.

Details regarding suitable methods and requirements are available from the Manager Design and Asset Services or nominated representative prior to submission of the design.

The developer is responsible for the maintenance associated with all devices to ensure effective flow throughout project duration, and until "Off Maintenance" is awarded.

4.0 TEMPORARY METHODS OF WATER QUALITY CONTROL

Temporary erosion control devices and techniques shall generally be in accordance with the Institute of Engineers, Australia (QLD) "SOIL EROSION AND SEDIMENT CONTROL" Engineering Guidelines for Queensland Construction Sites.

Devices which divert or concentrate runoff will not be approved.

Where the development involves trenching or other ground disturbance within 10 metres of existing downstream or downhill properties, turfing of the disturbed areas shall be Council's minimum requirement for protection of the downstream properties, unless it can be demonstrated to the satisfaction of Council's Representative that other means would prove equally effective.

Gully inlet protection shall be provided to all gullies, in accordance with Institution of Engineers, Australia (QLD) "SOIL EROSION AND SEDIMENT CONTROL" Engineering Guidelines for Queensland Construction Sites. They shall be maintained until contributing catchments have stabilised to the satisfaction of Council's Representative.

The works should, wherever possible, be programmed to minimise the areas exposed to erosion at any one time and to stabilise the disturbed areas before moving to fresh areas. Topsoiling and seeding shall occur no later than seven days after final trimming of earthworks.

4.1 Vegetative Treatments

To stabilise batters drains and swales, vegetative treatments may be used.

5.0 MAINTENANCE

5.1 Inspection after any storm event

(a) repair breaches; and
(b) remove accumulated slit/debris when 50% of the design capacity of the measures is lost.

The removal of the sediment shall be done in such a manner so as not to damage the sedimentation structure. Any damage shall be immediately rectified at the contractor's expense.

CHAPTER 4 - EARTHWORKS

1.0 AIM

The aim of this guideline is to provide developers and consulting engineers with criteria for the execution of earthworks associated with subdivisions, and other types of developments in the City of Redcliffe.

Many of the issues outlined in this chapter apply to all developments encountered in City of Redcliffe

1.1 Compressible Soils

Existing areas which have compressible soils and are intended to be developed for urban use (including roads and parks) will be required to be preloaded (or other approved methods) in order to achieve a suitable level of consolidation and stability.

It is the consulting engineer's responsibility to provide an appropriate design and to ensure that the quality and workmanship provided on the development are consistent with the design provisions, relevant Australian Standards and relevant codes of practice.

Council will require areas identified to be preloaded (or other approved method) to be detailed on the design engineering drawings. Prior to Council formally accepting the works 'on maintenance', certification by the consulting engineer and test results must be submitted (for standard and modified compaction refer to Australian Standard 1289).

Filling of developments and results to be carried out in accordance with Local Law No 7.

2.0 ACKNOWLEDGMENTS AND REFERENCE MATERIAL

The criteria in this guide have generally been adopted from the Australian Standard AS 3798-1990 “Guidelines on Earthworks for Commercial and Residential Developments”, modified to suit local conditions and practices. Reference should be made to that standard for any additional guidance.

Geotechnical report to be carried out to identify soil condition and parameters.

3.0 CONTAMINATED SOILS AND FIRE ANTS

(a) Contaminated Soils

Pursuant to a site contamination report as required under the Act, **any areas of soil known to be contaminated and required to be removed should be shown on the plans**.

A management plan highlighting details and means of identifying, removal and treatment of the contaminated sites (ie Acid Sulphate Soils) are to be provided with the application

(b) Fire Ants

Movement controls are special regulations that will help the DPI eradicate the Red Imported Fire Ant (RIFA). Movement controls prohibit the human-assisted movement of high-risk materials, such as soil, from inside the restricted area to outside the restricted area. The restricted area is the area currently being treated for fire ants. Maps of the restricted area are be available at:

- Local, state and federal government electorate offices in Brisbane, Ipswich, Logan, Redlands and Maroochy
- Fire Ant Control Centre, 81a Seventeen Mile Rocks Road, Oxley, Brisbane
- Libraries in Brisbane, Ipswich, Logan, Redlands and Maroochy
- DPI website
- Movement controls vary according to:
- Whether fire ants are present
- What type of material is being moved
- Destination of the material
- Whether the material has been treated or not

Conditions for moving extracted or waste soil

Where soil has been sourced or originates from a property **inside the restricted area** and the site of the soil to be excavated and a 10m buffer around it has been inspected by a QDPI approved person and found to be:
- **Visually free** from Red Imported Fire Ants (RIFA) within 28 days prior to moving soil. This soil may **only** be moved to a destination within the restricted area**.**

or

- **Visually free** from RIFA and the soil has been heat treated so that the total mass has reached 65.5 degrees Celcius and stored so as to prevent infestation. This soil may be moved anywhere in Queensland.

or

- Visually infested with RIFA, and the nest have been treated on site by QDPI within 28 days prior to moving. This soil may **only** be moved to a QDPI approved disposal site for infested soil within the restricted area under secure conditions to prevent the escape of the material.

or

- **Visually infested** with RIFA, and the nests have been treated on site by QDPI within 28 days prior to moving and the soil has been heat treated so that the total mass has reached 65.5 degrees Celsius and stored in a manner to prevent infestation. This soil may be moved anywhere in Queensland.

Businesses moving extracted or waste soil from within the restricted area require an Approved Risk Management Plan or a Fire Ant Declaration (FAD).

Conditions for moving retail/sold soil (eg. landscaping)

The property has been inspected by a QDPI approved person and found to be either:
- **visually free** from Red Imported Fire Ants (RIFA)
or
- **visually infested** with RIFA and the nests have been treated on site by QDPI within 28 days prior to moving soil
and the soil has been either:
- sourced from outside the restricted area
or
- heat treated so that the total mass has reached 65.5 degrees Celcius and stored in a manner to prevent infestation. This soil may be moved anywhere in Queensland.
Businesses moving retail soil from within the restricted area require an Approved Risk Management Plan or a Fire Ant Declaration (FAD).

4.0 MATERIALS FOR FILLING

Filling or excavation must not cause any flooding or drainage problems.

4.1 Unsuitable Materials

Structural fill is defined as any filling which will, or may be required to support structures or pavements or for which it is intended time dependent settlement will be restricted.

The following are generally considered unsuitable as structural fill:-

(a) organic soils;
(b) silts;
(c) materials prone to dissolving or which undergo physical or chemical changes on exposure to moisture;
(d) contaminants including noxious, hazardous and deleterious materials.
(e) Building or ex road construction material (ie asphalt products). Any material of this nature to be disposed at a registered dump facility.

Such material except for (d) should be confined to non-critical areas eg parkland or within the minimum setback area from the front property alignment (less 2 metres) for allotment fill. Contaminants shall be dealt with in accordance with State Government laws and regulations such as Contaminated Land Act 1991.

(f) Embankment material within 300mm of finished subgrade level of roadway to be constructed of minimum CBR 15 material. Details regarding material gradings and testing to be provided.

4.2 Suitable Materials

Most naturally occurring earth, soil and rock, with the exceptions stated above, capable of being compacted to form a homogeneous mass to support commercial and residential developments and associated infrastructure.

Special consideration will be required for the use of:-

(i) Natural Material

(a) clays of high plasticity which may be reactive and need to be selectively placed within the filling and under strict moisture and density control;
(b) material which, after compaction, contains large particles and may lead to difficulties in the excavation of trenches for footings or services or driving of piles or drilling of piers if this is necessary.
(c) overwet materials, as may be encountered in low lying areas;
(d) single-sized or gap graded gravels or rock fill which will not break down upon compaction, leaving voids into which finer material may subsequently migrate;
(e) saline, chemically aggressive, or polluted soils; and
(f) carbonate soils where acid dispersal may occur.

5.0 CLEARING

Clearing shall be executed in accordance with Council's current Standard Specification SS3 - Specification for Clearing and Grubbing for Infrastructure, Roadways and Designated Areas and generally kept to a minimum to comply with current Regulations, By-Laws and Council's Conditions of Approval. Indicative minimum environmental considerations are detailed in Section 9.00 of QUDM.

Prior to the design phase, trees and vegetation of significance (as nominated by Council) should be identified by the Developer in order that damage/disturbance can be minimised by appropriate design and practices. Trees and vegetation that form part of riparian or dual buffer zones along rivers, creeks, waterways or the ocean beaches are of special significance and should be clearly identified and planned for by the Developer.

Prior to clearing commencing the Developer shall submit for Council's approval a completed "Application for Vegetation Management Approval".Council will assess the application in accordance with these requirements. Where fauna relocation is required by Council the Developer shall comply with the Habitat Permit Guidelines in the Nature Conservation Act.

Where areas of Development are to be dedicated under the control of Council (eg parks) no trees or vegetation shall be damaged or removed without the prior written permission of Council. However, subject to specific written direction from Council dead dying or dangerous trees should be removed from these areas. These written instructions will have emerged from general criteria established in Section 2.2 (Preliminary Development Layout).

Trees on existing roads shall not be damaged or removed without the approval of Council. All such trees affected by the works are to be shown and detailed on a

Layout Plan. The Plan together with proposed protection measures are to be submitted to Council for approval.

Where clearing for developments in eroded areas is proposed, the vegetation retention criteria in the I.E. Aust (Qld) Soil Erosion And Sediment Control publication shall be considered and in particular the following quote:-

"The identification of high-value vegetation requires the advice of local experts".

The following general criteria should be considered when developing sites:

- Leave critical areas (such as watercourses, floodplains, steep slopes and wetlands) with desirable trees in their natural condition or only partially cleared.
- Locate roadways, storage areas and parking pads away from valuable tree stands. Follow natural contours, where feasible, to minimise cutting and filling in the vicinity of trees.
- Select trees to be preserved before sighting roads, buildings, or other structures.
- Minimise trenching in areas with trees. Place several utilities in the same trench.
- Designate groups of trees and individual trees to be saved on the erosion and sedimentation control plan.
- Do not excavate, traverse, or fill closer than the drip line, or perimeter of the canopy, or trees to be saved.

On slopes steeper than 10%, special consideration should be given to the retention of ground cover. The cost penalty for the removal of the existing ground cover should be increased requirements for the use of erosion control blankets, mulch, and/or other suitable erosion control measures. Similarly, special consideration should also be given to the retention of vegetation on shaded areas or steep slopes with a southern aspect."

Attention is drawn to the requirement for disposal of timber and refuse as set out in Council's current Standard Specification SS3

Compaction

Minimum standard compaction values are given in Appendix 4-1 for areas of structural filling.

6.0 CONSTRUCTION

The earthworks shall be carried out in accordance with AS 3798 Section 6.

Filling or excavation is not to occur within flood regulation lines.

Filling or excavation is not located in any waterway corridor, or wetland.

The importing or removal of fill material is to take place only between the hours and along routes approved by the development conditions. Dust generated from the site and from earthworks is to be controlled so as not to adversely affect adjoining properties. Water carts or alternative processes should also be provided on non-working days where it is necessary to control dust problems.

If following a formal request by Council to take the necessary measures to alleviate any dust problems, the principal contractor/builder fails to heed such request, Council

may arrange for Council employees to undertake such measures as may be necessary at the contractor's/builder's expense.

During and immediately following periods of rain the contractor/builder shall undertake the necessary measures to ensure that mud from the development site is not deposited on to existing roads by construction traffic. Mud deposited onto existing roads shall be removed immediately so as not to affect the safety of traffic.

Mud or silt transported onto the road or channel surface is to be removed immediately to avoid transfer into the stormwater system. This is to be recorded under Environmental Management Plan and Stormwater Management Plan of the Principal Contractor.

If rectification is not carried out immediately following identification or notice by Council, and considers the material may impact on the surrounding environment or water course, Council shall arrange for the clean up to be carried out. All associated costs involved with the clean up are to be borne by the Developer.

7.0 TESTING

Frequency:	Testing of fill for adequate compaction shall be in accordance with Appendix 4-2.
Level of Responsibility:	Council will **not** give blanket approvals to any consulting body to carry out geotechnical testing at a particular level ie Levels 1, 2, or 3 as set out in Appendix B of AS 3798. The level of testing will vary with the nature of the project and the locality.

8.0 EROSION AND SEDIMENTATION CONTROL

8.1 General

Controls to avoid the siltation or erosion of adjoining lands, streams, watercourses, and downstream piped drainage systems during both the construction phase and the maintenance phase of a development are required.

Erosion potential needs to be identified at the planning stage and measures to alleviate or ameliorate any effects must be included in engineering drawings submitted to Council for approval. Erosion control will be a condition of subdivision/development approval.

8.2 Principles of Erosion and Sediment Control

The following principles should be used as a guide in controlling erosion and sedimentation on construction sites.

1. Critical Locations

   Minimise excavation or earthworks on steeply sloping land, along streams or in other environmental areas.

2. Plan Controls

Complete detailed erosion and sediment control plans, prior to commencing works.

Design developments to fit existing land contours in ways which minimise potential soil erosion and sediment discharge.

3. Protect Drainage Paths

Establish or maintain wide buffer zones of dense vegetation along streams, watercourse and other drainage paths. Prevent erosion by controlling channel velocities and by providing erosion resistant surfaces.

4. Minimise Soil Exposure

Minimise the area of soil disturbed and work in staged sections. Retain existing vegetation wherever feasible (ie steeper batters). This will reduce the erosion potential and hence the need for erosion control.

5. Install Sediment Traps, Dams and Basins

Where required, install sediment traps, dams or basins to good engineering standards prior to commencing earthworks.

6. Install Drainage Early

Install stormwater drainage pipes, if required, as soon as possible to control rill and gully erosion. Sediment traps and litter screens near inlets can prevent the blockage of pipes.

7. Stabilisation

Completely vegetate, pave, cover or stabilise all ares of exposed soil as early as possible. Use mulch where needed to assist plant establishment, and retain ground moisture.

8. Stormwater Diversion

Divert water along stable diversion drains, banks or bunds around or away from exposed areas of soil or loose material. This will reduce the volume of runoff that will need to be treated.

9. Control Waste

Ensure that no oil, scum, foam, grease, litter, floating material, toxic substance or other polluting material flows from the site.

10. Maintain and Re-Assess Controls

Maintain pollution control works on a frequent basis. Improve their effectiveness wherever possible.

It may not be possible to identify beforehand all the situations where and when erosion will occur, especially during the construction phase. When any erosion or siltation does occur, immediate action is required to rectify the situation and

repair any damage, including the removal of silt. Otherwise Council shall undertake the necessary works at the Developers expense.

Any environmental harm which occurs, is required to be reported to the Environmental Protection Agency.

8.3 Construction Phase

Details of any proposed temporary erosion and sedimentation controls are to be shown on an Erosion and Sediment Control Plan and are to be included in the engineering drawings submitted for approval. The plan(s) should show the site boundaries, contours, drainage paths, discharge point, any stockpile areas, proposed construction works, and the proposed erosion and sediment control measures.

No vegetation shall be injured or removed from the site without the prior approval of Council's Park Landscape Planner.

During excavation, vegetation above and below the cut and fill areas is to be retained as far as practicable to stop runoff water coming onto the site and into the excavation and to prevent soil leaving the site.

All excess material is to be removed immediately after excavation to prevent bogging and soil washing away.

Soil stockpiles must be stored within areas of the site nominated on the plans.

Cut-off drains should be provided where necessary above and below the cut and fill area to minimise water coming into the excavation.

8.4 In-Service Phase

It is a mandatory requirement that all unpaved areas where earthworks have been undertaken be grass seeded and that a good grass cover be achieved before the development can be accepted Off Maintenance.

Following the placing and spreading of topsoil to a minimum depth of 75mm won from the site or imported, the allotments and other disturbed areas shall be seeded. Seed shall be classed as couch general seed mix or equivalent. Details are to be forwarded to Parks Landscape Planner.

Verges, medians (designated) and other nominated areas are to be grassed in accordance with Landscaping Plan and details.

Immediately prior to the spreading of the seed mixture the areas shall be thoroughly watered to promote seed germination.

After seeding, the areas seeded shall be kept moist by watering until the grass is "established". Such watering shall be continued throughout the maintenance period to ensure the continued growth of the grass.

Grassing shall be deemed to be "established" when vigorous green growth is in evidence from the planted seeds.

The works will not be taken "off maintenance" until at least eight (8) square metres of grassing in each and any area of ten (10) square metres over the allotments, footpaths and other disturbed areas is "established".

8.5 Liability

Liability for any damage caused to other properties or to Council assets arising from erosion on the development site rests with the developer and/or his consultant(s) and contractor(s).

It is the responsibility of the developer to inspect and carry out maintenance of erosion and sediment control devices still established during the maintenance period.

The developer shall maintain all stormwater management devices during the maintenance period, ensuring appropriate matter and silt removal is carried out to avoid blockages in the system. Any areas reported to the developer by Council during this period which is not acted on immediately, shall be carried out by Council at the cost of the developer. This process shall be implemented subject to repeat attempts to have the incident rectified.

The developer shall ensure at all times the new and existing road surfaces are maintained in a clean manner, with silt in kerb and channel to be removed to ensure "NO" movement into the stormwater system.

The conditions outlined above apply to both the construction and on maintenance phase of the development.

9.0 Fill Batters and Earth Retaining Structures

9.1 Certification

Any earth retaining structures including, but not limited to:

- boulder walls
- gravity retaining walls
- cantilever retaining walls
- crib walls
- sleeper walls

are to be shown on the engineering plans submitted for approval to Council. These are to be shown on plan and in detailed cross-section elevation. Each shall be covered by a Structural Certification or Building Application approval for walls over 1 metre in height.

It shall be responsibility of the developer to ensure the retaining wall is certified by an RPEQ, and complies with all applicable standards to be inspected by the Council. As the council takes on maintenance associated with retaining walls following "Off Maintenance" compliance must be achieved or approval shall not be required of the Council.

Proposed fill areas and cut areas are also to be shown on plan and any significant fill or cut batters ie steeper than 1:6 slope and greater than 0.8m height shall be covered by a separate Consultant's certification with respect to stability and erosion. In

special cases, a Geotechnical Certificate may be required. Details regarding fill adjoining existing properties to be discussed with Council prior to submission.

This requirement applies whether the batter or wall is within subdivision allotments or the development boundary or on an existing or proposed dedicated road.

If batters and earth retaining structures are not shown on the plans but are constructed, the development will not be accepted On Maintenance until the necessary certifications are received. These are also to be shown on the "As Constructed" drawings.

9.2 Adjoining Properties

Where cut or fill operations are carried out adjacent to boundaries with existing residential or commercial developments, cross-sections showing the batter or retaining wall in relation to the adjoining land use must be shown. If any proposed fill or cut is likely to have a deleterious effect on the visual amenity of the adjoining property, batters should not exceed 1:6 unless otherwise treated in a way acceptable to the Manager Design and Asset Services or nominated representative.

In any case, the toe of any fill batter or top of any cut batter is to be a minimum 300mm clear of the boundary line with an adjoining property.

The effects on the drainage of adjoining properties of any cut or fill operation must be considered and details shown on the engineering drawings. No ponding or nuisance from stormwater runoff will be accepted.

Developments should avoid designing surface drainage to run to rear of blocks. If this process is to be adopted a drainage easement should be the initial consideration. Further discussion regarding matters of this nature are to be discussed with Council Officers. A full assessment of hydrology and existing drainage is to be carried out prior to submission.

Unless the approval of the Manager Design and Asset Services is obtained, all batters or walls abutting existing or proposed road reserve are to be contained within the proposed allotments and not encroach on the road reserve.

Should batter construction in road reserves be approved, a low retaining wall, either stone-pitched or boulder or similar, minimum of 600mm high, to stabilise the toe of the batter is required.

Appendix 4-1 - Earthworks - Guidelines for Minimum Standard compaction

Item	Project	Minimum standard compaction, percentage	
		Minimum dry density ratio (Cohesive Soils) (See Note 1)	Minimum Density index (Cohesionless soils) (See Note 2)
1.	Residential Lot fill	95 (3)	65
2.	Commercial, fills to support minor loadings	98 (4)	70
3.	Roads embankments		
	(a) > 0.3m below pavement subgrade	95	65
	(b) < 0.3m below pavement subgrade	100	80

SOURCE: ADAPTED FROM TABLE 5.1 - AS 3798-1990

NOTES:

1. All dry density ratios relate to AS 1289.E4.1 or AS 1289.E7.1 and standard compaction energy input (see AS 1289.E1.1 and AS 1289.E1.2).
2. Density index as a means for control of achieved standard compaction may be difficult to use and interpret. Local correlations with other methods may exist and can be used where these are well established.
3. Developments on this fill will be restricted to single and some double storey free standing houses with floor slab average loadings not exceeding 20 Kpa, and strip or pad footings not exceeding bearing pressures of 100 Kpa. Residential developments other than these are considered as commercial. A minimum dry density ratio of 98% or higher may need to be considered if collapse on saturation, excessive settlement, or dispersive soils are likely to occur. Not applicable where differential settlement is likely to occur. Building platform is to comply with Unified Building Code and the requirements of the Building Section.
4. Commercial developments are likely to impose loads on fills which will have a more severe effect than those of free-standing houses, even when contact pressures are limited. The engineer must assess the load carrying capacity and associated deformations associated with proposed filling to satisfy himself/herself the fill can perform its required function. Where highly loaded fills are proposed, the minimum standard compaction may need to be increased.

Appendix 4-2 - Earthworks - Guidelines to Frequency of Field Density Test

SCOPE OF EARTHWORKS	MINIMUM FREQUENCY OF TESTS (See Note 2)
Large scale operations (eg subdivisions, large industrial lots, road embankments)	Greatest of: (a) 1 test per 500m^3 distributed reasonably evenly throughout full depth and area; or (b) 1 test per layer per material type per 2500m^2; or (c) 1 test per 200mm thickness per material type per 2500m^2; (d) 1 test per lot
Small scale operations (eg residential lots)	Greatest of: (a) 1 test per 200m^3 distributed evenly through full depth and area; or (b) 1 test per layer(3) per 1000m^2; or (c) 1 test per 200mm thickness (3) per 1000m^2; or (d) 1 test per lot
Concentrated operations (eg filling of gullies,etc)	Greatest of: (a) 1 test per 100m^3 distributed reasonably evenly throughout full depth and area; or (b) 1 test per layer (3) per 500m^2; or (c) 1 test per 200mm thickness (3) per 500m^2
Confined operations filling behind structures (4)	1 test per 2 layers per 50m^2 ie test every second layer once per 50m^2
Trenches under pavements and structures	1 test per 2 layers per 40 linear m ie test every second layer once per 40m

NOTES:

1. These guidelines refer to the determination of standard compaction using a direct method. However, where an indirect method is used, eg Perth sand penetrometer (AS 1289.F3.3), some interpretation of the guidelines may be required.

2. Tests in visually doubtful areas, and retests of failed areas should be carried out and are additional to the testing recommended in this table.

3. Where the geotechnical testing authority has been engaged at level 2 or level 3, it may be acceptable to test more than one layer per site visit by excavating to the test level.

4. Implies hand operated or small equipment.

5. All test locations are to be shown on a sketch

CHAPTER 5 - ROADWORKS

1.0 SITE AND ROAD LAYOUT

1.1 The Transport Network

Site and road layouts for developments within the City shall conform to the philosophies, design principles, performance criteria and/or deemed to comply criteria of Queensland Streets, where applicable, exceptions as varied in this document shall apply in accordance with Council's Policies or Local Laws, or the conditions of development approval.

Full engineering plans and specifications prepared by a Registered Professional Engineer (Qld) shall be submitted for all roadworks and associated works for approval by Council. Such plans and specifications shall be in accordance with Chapter 2 Part A, Design Plans. All work shall be supervised by a Registered Professional Engineer (Qld) competent in roadworks and shall be undertaken by a nominated Principal Contractor experienced in the construction of Public (Municipal) Works. Council may request evidence of the Principal Contractors competency.

On the completion of the works a certificate shall be submitted to Council from the supervising engineer to the effect that the works have been completed in accordance with the approved plans and specifications. Certification shall include the submission of "as constructed" plans and copies of all relevant test results. The maintenance period for roadworks shall be for a period of twelve (12) months.

The Council shall, prior to acceptance of the works "on maintenance", require the provision of a bank guarantee or bond equivalent to detailed under Chapter 14 “Bonding” as security for the performance of the maintenance obligations. Each item of work must at no cost to the Council: Prior to approval of bonding all “As Constructed” details are to be submitted to the Manager Design and Asset Services or nominated representative, and a letter of acknowledgment provided.

- be maintained during its Maintenance Period; and have any latent defects of which the Council gives notices promptly rectified.

- Failure to perform the maintenance obligations entitles the Council to call up the whole or any part of a bank guarantee or bond and apply the monies to meet the cost of Council performing those obligations.

Note:

Prior to the commencement of any Public (municipal) works associated with developments other than the subdivision of land, Council shall require the provision of a bank guarantee or bond equivalent of not less than 10% (minimum $1,500) of the value of the works as security for the performance of the various construction obligations (including the provision of engineering certification and “as constructed” information).

The bond shall be reduced to an amount not less than 5% of the value of the works upon formal acceptance of the works "on maintenance" which shall be retained by Council during the maintenance period as security for the performance of the maintenance obligations. The bond shall be returned upon formal acceptance of the works "off maintenance".

1.2 Engineering Constraints

The ideal site and road layout resulting from consideration of social, environmental, traffic and development layout constraints may need to be modified to satisfy engineering constraints.

Although the engineering design of roads is the province of the Consulting Engineer, it is essential that the Surveyor, Landscape Architect or Planner preparing the development proposal plan be fully aware of the engineering constraints to ensure that the road layouts proposed are satisfactory in this respect. Major alterations to the development layout may otherwise be necessary to accommodate engineering constraints.

These engineering constraints include drainage overland flow paths, vertical alignment, horizontal alignment, reasonable access to allotments etc. The Consultant shall be responsible for a layout to suit these constraints.

Streets and Roads have been classified in accordance with the recommendations of Queensland Streets .

Prior to preparing the development layout plan, the Manager Design and Asset Services or nominated representative shall be consulted to ascertain if a layout already exists for the area in question and to ensure that the road network proposed will generally conform with the overall road hierarchy and open space plan envisaged by Council.

Approval of the development layout is subject to stormwater design calculations being submitted to satisfy the Manager Design and Asset Services or nominated representative that the overland flow from a storm of 100 year ARI can be conveyed through the subdivision clear of all proposed allotments.

As detailed in Chapter 6, consideration of the design overland flow impacting on the existing stormwater system or natural catchment levels is to be evaluated and submitted with the design submission.

It is also essential, that full and accurate topographical information be available at this stage, to enable an accurate assessment of the suitability of the proposed road locations.

1.3 Geometric Design

The geometric design of Streets should be based on Queensland Streets Section 2.10 except as specifically varied hereafter.

The geometric design of Roads should be based on relevant Queensland Department of Main Roads or AUSTROADS design manuals; except as specifically varied hereafter.

1.3.1 Design Speed

The principals of Queensland Streets shall be applied to the proposed street layout to confirm that the nominated design speed has been achieved. Design speeds shall be as recommended in Queensland Streets unless specified otherwise by the Council.

1.3.2 Horizontal Alignment

Horizontal alignment shall generally comply with the requirements of Queensland Streets, Queensland Department of Main Roads or AUSTROADS manuals, as applicable.

1.3.3 Grades

a) Residential

The minimum grade for all Roads which will ultimately include kerb and channel shall be 0.5%. The maximum grading will be 16%.

Recommended grades for streets are 3% crossfall.

Roads constructed shall have kerb and channel to details provided in Standard drawings. Requests for alternatives in accordance with a design shall be submitted for approval by the Council.

b) Industrial Streets

The minimum grade for all Roads which will ultimately include kerb and channel shall be 0.5%. The maximum grading will be 5%.

Roads constructed shall have kerb and channel to details provided in Standard drawings number R-0080.

1.3.4 Vertical alignment

A vertical curve, of parabolic form, shall be provided at every change of grade, where the algebraic change of grade exceeds:

- Access Places, Access Streets, Collector Streets 1.0%
- Sub Arterial, Arterial, Major Arterial 0.6%

Every effort should be made to provide vertical curves as long as possible, for improved appearance.

The vertical alignment of Streets should be based on Queensland Streets Section 2.10.

In general the following minimum lengths shall be:

Residential Streets, Park Residential and Rural Streets - 20m

(iii) Major Traffic Routes (Two Lane Road – Urban), Industrial and Commercial - 35m

(iv) Major Traffic Routes (Four Lane Road – Urban) - 60m

(v) Major Traffic Routes (Two and Four Lane Roads – Rural) - As per Main Roads requirements

(vi) At intersections (excluding Major Traffic Routes) - 10m

Notwithstanding the minimum vertical curve lengths nominated, Consultants shall consider the requirements of Section 2.10 of Queensland Streets for Sight Distance and Headlight Sight Distance.

The tangent point of a vertical curve in the side road shall be located at, or outside of the kerb line of the through road.

Roads shall be designed in accordance with relevant AUSTROADS design manuals.

The situation where a crest vertical curve masks the commencement of a horizontal curve is to be avoided, as such a combination is potentially dangerous.

1.3.5 Crossfall

Carriageway crossfall for Streets shall conform to the requirements of Queensland Streets Section 2.10, Main Roads and Austroad Publication. The following minimum crossfall shall apply:

(i) Carriageways with asphalt surfacing……...3%
(ii) Carriageways with concrete segmental paving……...3%
(iii) Carriageways with 2 coat chip seal…….3%

At intersections and cul-de-sac heads Council requires a contoured detail to demonstrate that there is no ponding of water. Where minimum crossfall cannot be achieved the longitudinal grades may be used to shed the water.

Median Crossfall - The maximum crossfall on grassed medians on divided roads shall be desirably 1 in 6 with an absolute maximum of 1 in 4. Refer also Queensland Department of Main Roads Design Manuals. However, at median openings, the pavement crossfall should not exceed 5%.

The longitudinal grade should also be considered in relation to high vehicles turning through an intersection.

Split level roads/streets should be avoided. Where this is not possible, prior written approval shall be obtained from the Manager Design and Asset Services or nominated representative.

1.3.6 Truncations

Truncations of the real property boundaries shall be provided at speed restriction devices, bends and intersections, such that roadway and footpath widths are maintained at not less than the minimum specified widths at any point unless approved otherwise by the Manager Design and Asset Services or nominated representative.

1.3.7 Pavement Tapers

Pavement tapers to existing construction shall be designed in accordance with the current AUSTROADS design manuals based on the design speed.

Detailing should include lengths, typical section (s), linemarking and signing. Tapers shall be constructed to the same standard as the proposed full road pavements.

1.3.8 Frontage Streets/Roads

Street Frontage to be design to requirements set down by Council

Minimum road width shall 8m (kerb to kerb) to ensure effective road width. Any variances from this are to be detailed to Councils design office (Manager Design and Asset Services)

An allowance of the following design minimum is to be applied. Two travel lanes and allowance for parking (subject to frontage size). Any parking allowance to have truck movement width. The developer is to provide off street parking. Parking bays shall consider entry and exit from individual property sites for small and larger vehicle sizes. These details shall be reviewed by Council prior to offering approval.

Any confirmation of details can be discussed with the Manager Design and Asset Services or nominated representative.

1.3.9 On Street Parking

For residential streets, on-street parking shall be provided in accordance with Queensland Streets Section 2.4. Refer to **Standard Drawing R-0032** for details of indented parking bay requirements.

1.3.10 Intersections

All new intersections of Access Places, Access Streets, Collector Streets, Trunk Collector Streets, Rural and Industrial Roads shall be the three way intersection unless otherwise approved by the Manager Design and Asset Services or nominated representative.

Four way intersections shall be designed only at the junctions of Arterial and Major Arterial Roads where signalling or roundabouts are proposed.

Intersections on Streets shall be designed and located in accordance with Queensland Streets, Section 2.11 for residential streets.

Intersections on Roads shall be designed in accordance with AUSTROADS "Intersections at Grade" after design criteria have been discussed with the Manager Design and Asset Services or nominated representative.

Any intersections on Arterial Roads to be designed in accordance with Main Roads

Channelling

Warrants for the provision of channelling at intersections will be traffic volumes and intersection layout, and the Manager Design and Asset Services or nominated representative will determine at which intersections channelling is required.

In general, channelling will be required:

- at all arterial intersections;
- at most collector to arterial intersections;
- at occasional collector to collector intersections.

Due to the many variations of both traffic requirements (e.g. turning volumes) and intersection geometry which may occur, it is not possible to set out standards which are applicable to all situations.

Unless approved otherwise by the Manager Design and Asset Services or nominated representative all channelling shall be designed to accommodate a Design Semi Trailer, providing a clearance of not less than 0.6 metres between the outer wheel track and the kerbs at all points. It is to be noted that many major intersections are now required to be designed to the B Double Semi-Trailer Turning Path. The Manager Design and Asset Services or nominated representative shall nominate when this criteria shall apply.

- Traffic Islands

  Traffic islands are preferably indicated by raised kerbs, however, other physical barriers or pavement marking may be appropriate in certain circumstances.

  Islands may be classified as:

  - channelling (or directional) islands;
  - roundabouts;
  - median islands;
  - medians;
  - separators;
  - pedestrian refuge islands.

  For details on islands and their classification, refer to the Manual of Uniform Traffic Control Devices (Qld).

  Raised kerbed islands less that 12.0m² or less than 2.0 metres width between kerb faces shall be constructed with minimum 100mm thickness N25 reinforced concrete on a compacted sand base. The surface treatment shall be as approved by the Manager Design and Asset Services or nominated representative.

  Raised kerb islands greater than 12.0 m² and wider than 2.0 metres shall be grassed or provided with other surface treatment as nominated and approved by the Manager Design and Asset Services or nominated representative.

A water service conduit shall be installed every 80 metres approximately, with a minimum of one service per median.

Not withstanding the above provisions, where the fall across an island is greater than 1 in 4, the island shall be surfaced with concrete or other treatment approved by the Coordinator Design and Traffic.

Sub-soil drainage shall be required in islands where surface treatment other than concrete has been provided. The drainage shall be connected to an underground drainage system.

Traffic islands shall be designed in accordance with the current Main Roads or AUSTROADS Design Manuals. Particular attention shall be given to sight distance when commencing islands at horizontal and vertical curves.

All traffic islands shall be signed and delineated in accordance with the requirements of the Manual of Uniform Traffic Control Devices (Qld).

- Auxiliary Lanes

The pavement of a left or right turn auxiliary lane should not be less than 3.0 metres wide, and preferably 3.7 metres wide. Where barrier kerb is used in accordance with Standard kerb types, these widths should, where practicable, be increased by 0.3 metres and preferably 0.6 metres.

- Median Openings

On collector roads, median openings should be provided at all intersections except at intersections with very minor streets. On sub-arterial and arterial roads, the minimum spacing of median openings should be approximately 400 metres, however, criteria will be provided by the Manager Design and Asset Services or nominated representative for specific developments.

- Roundabouts

Roundabouts may be proposed as a design solution or nominated in the development approval conditions and shall be subject to approval by the Coordinator Design and Traffic.

Design of roundabouts shall be in accordance with current Main Roads Manuals or AUSTROADS, Part 6.

The maximum design speed through a roundabout shall be 50km/hr, however, the provisions of Queensland Streets shall apply to roundabouts in streets.

Whenever the centre island or part thereof, is landscaped, a water service conduit and perimeter sub-soil drainage shall be provided. An irrigation system shall be required and approved by the Manager Design and Asset Services or nominated representative.

1.3.11 Cul-De-Sac - Turning Areas

The turning areas at the ends of cul-de-sacs in streets shall be designed in accordance with Queensland Streets, Section 2.12 excepting, where a full turning circle is not

provided to the minimum radius below, provision for turning within the kerbs by Council's design garbage truck must be demonstrated.

Where a full turning circle is provided the minimum kerb radii shall be:

Approach curve tangential to the turning circle -	20m
The turning circle	9m

Turning areas at the ends of cul-de-sac in industrial developments shall be full turning circles based on criteria nominated by the Manager Design and Asset Services or nominated representative for the specific application, with the following minimum kerb radii:

Approach curve tangential to the turning circle	-	30m
The turning circle	-	12.5m

(a) Three Point Turns

Three point turns shall be generally designed in accordance with Section 2.12 of Queensland Streets and the criteria established in section 2.2.3.3 (d) (General Planning Principles) as follows:

- Provision of additional off-street parking
- Off-street parking areas shall have a minimum pavement thickness not less than that of the adjacent street
- A “No Parking” delineation line shall be provided within the turning area (100mm wide continuous yellow line) adjacent to the lip of kerb.

(b) Access Lanes

Access lanes shall be generally designed in accordance with the criteria established in Section 2.2.3.3 (d) (General Planning Principles) as follows:

- Provision of additional off-street parking
- The access lane and associated crossover shall be designed and constructed in accordance with Council’s **Standard Drawings R-0032**.

1.3.12 Access to Allotments (Crossover)

Steep side slope of the natural surface can result in difficulty in providing vehicular access to allotments fronting the road. Crossover grades should be limited for safety and amenity.

Refer to Standard Drawing for crossover access details STROO5 for residential and R-0051 and R-0052 for commercial. Council requires that every allotment have satisfactory vehicular access taking into account the following:

- Physical constraints
- Sight distances
- Access, verge and allotment grading / cross section
- Street design / layout
- Minimum depth of cover requirements to underground services
- The functional road hierarchy of the road being accessed.

- Vehicle loads accessing the site currently and the future.

The design details and subsequent construction of vehicular access shall be submitted to Council for approval where:

- Particularly restrictive physical constraints exist
- Legal access is by way of combined access eg battleaxe

Crossovers are to mountable and accessible by vehicles to avoid under vehicle damage and ensuring wheel chair accessibility in accordance with AS1428.

Council requirements are that only one crossover shall be constructed per lot site. Any additional accesses requested shall be forwarded to the Council in writing with details supporting the application.

The Council requires that all sites have a compliant crossover inspected prior to pouring.

Standard footpath profiles are to be maintained to match into the crossover.

1.3.13 Verges

The cross-section of the verge (ie. that portion of the road reserve between the kerb and the property alignment), shall conform to the **Standard Drawing R-0031 and R-0032** unless otherwise approved by the Manager Design and Asset Services or nominated representative.

Verge widths shall be in accordance with Council's Standard Drawings and shall not be less than 4.0 metres wide for new developments. Existing allotments and verges to be discussed with Manager Design and Asset Services or nominated representative for evaluation of existing features and design proposal.

When the conditions of development approval require the construction of concrete footpath paving, it shall be 1.2 metres in width or minimum of 2.0 metres where required as a shared footpath/bikeway and located in accordance with **Standard Drawing No P-0012 and R-0065** and AS 1742.9.

Further discussion may be required with the Council, as increased pedestrian movement will require increased width.

Services and utilities shall be in accordance with **Standard Drawing No R-0100, 101** and as approved with utility authority.

Where Energex and Telstra share a joint user trench, conduits shall be located in accordance with the current policies of those Service Authorities.

Any design concerns are to be directed to the relevant authority for approval and acceptance.

1.3.14 Pathways

Concrete paving shall conform to the Standard Drawing No R-0065.
The concrete pavement within a pathway shall generally be constructed to the adjacent kerb and channel together with a pram ramp.

In accordance with Council recommendations all new developments shall make comply with footpath criteria:

- Arterial, Sub Arterial and Collector roads = footpath both sides
- Residential = foothpath one side

1.3.15 Bikeways

The minimum width of land dedicated to Council for a bikeway shall be in accordance with RCC Standard Verge layout for bikeways.

Bikeways located in Parks shall be constructed above the flow of a storm event with an ARI of 1 year, unless approved otherwise by the Manager Design and Asset Services or nominated representative.

For the purpose of this section of the Guidelines, the following definitions regarding "Bikeways", "Bikelanes" and "Bikepaths" shall apply:

- "Bikeway" – A designated route or corridor for bikes
- "Bikelanes" – A designated section of on road pavement used as a bikepath.
- "Bikepath" – The actual facility on which bikes travel off road.

Special Bikeway design consideration should be applied at the following locations:

- Pinch points
- Traffic calming devices
- Roundabouts
- High speed/high volume traffic interfaces

Consideration shall be given to the effect of various bikeway surface treatments at change of directions under wet conditions.

For bikeway design details Council has adopted the Austroads "Guide to Traffic Engineering Practice - Bicycles Part 14" (Austroads). In particular the following requirements of bike lane widths should apply to new developments:-

(i) Exclusive Bike Lanes, on road 2.0 metres
(No car parking or restricted at peaks) Clause 4.3.4 of Austroads

(ii) Wide Kerbside Lanes, on road 4.0 metres to 4.5 metres
(No car parking or restricted at peaks) Clause 4.3.2 of Austroads

(iii) Shared Bicycle/Carparking Lanes, on road 4.0 metres to 4.5 metres
Clause 4.3.1 of Austroads

(iv) Exclusive Offstreet 2.5 metres to 3.0 metres
(2 way) Clause 6.3.1 of Austroads

(v) Exclusive Offstreet 1.5 metres to 2.5 metres
(1 way) Clause 6.3.1 of Austroads

(vi) Regional Shared or Dual-use Paths within Open 3.5 metres to 5.0 metres
Space Reserves (Pedestrians and Cyclists) Clause 6.3.2 of Austroads

Where bikeways are located on the footpath verge a 1.0 metre setback from the nominal kerb line is required to provide clearance from car doors and kerb returns at crossovers (where allowable). Clause 6.2 and Figure 6.3 of Austroads refers.

For a Local dual-use bikeway (Pedestrian and Bicycle) within the street verge width the required minimum width is 2.0 metres with a 1.0 metre clearance to the property boundary (Refer Fig 2.8B in Queensland Streets).

On Major Traffic Routes Council may require a minimum width of 2.5 metres

Design and construction of the bike path shall comply with Council's Standard Drawing.

For bicycle parking provisions Council has adopted as a minimum requirement the recommended bicycle parking provisions according to land use as specified in Austroads Guide to Traffic Engineering Practice: Part 14: Table 5.1.

Table 3.4A Bicycle Parking Provisions

1.3.16 Kerb and Channel

Concrete kerb and channel shall be provided on both sides of all roads except where otherwise stated in the relevant Development Approval.

The standard kerb and channel for residential streets shall be "Barrier " kerb, in accordance with **Standard Drawing No ST-R001 and ST-R002**.

- Barrier type kerb and channel with 450mm channel (type B1) shall be used in the following cases:
  - Residential streets
  - In streets adjacent to parks where required by Council.
  - Industrial Roads, where heavy duty barrier type shall be used (i.e. standard barrier type, with additional 50 mm base thickness)
  - Shopping Centres and in locations where high pedestrian volumes are
  - likely, e.g., on the frontage of schools and major sporting facilities and
  - parks, where, for greater pedestrian safety, barrier type kerb and channel

  in accordance with Council's Standard Drawing shall be used. Heavy duty barrier type shall be used where required by the Manager Design and Asset Services or nominated representative.

- Semi-mountable type kerb shall be used in the following cases:

  - Medians and Traffic Islands, semi-mountable or low profile kerb type in accordance with Council's **Standard Drawing No R-0080**.

- Existing Kerb and Channel

  Where proposed construction adjoins existing kerb and channel the Manager Design and Asset Services or nominated representative shall decide whether the existing profile shall be extended or whether the new construction will be tapered smoothly to the existing kerb and channel.

- General

  The grading of kerb and channel will normally conform to the road centre line grading. However, at locations where the kerb and channel grading diverts from the centre line grade, such as at intersections or on superelevated curves:

  - Minimum channel grade shall be 0.5%
  - Every endeavour shall be made to improve the appearance, by providing vertical curves of as long a length as possible, at all changes of grade.

  At all changes in horizontal alignment, kerbs and kerb and channel shall be constructed with horizontal curves.

  Pram ramps shall be provided at all kerb returns, at park entrances and at any other locations where required by the Manager Design and Asset Services or nominated representative.

  Ramp Ramps to be constructed in accordance with Standard Drawing No R-0084,85,86.

1.3.17 Signs and Road Markings

Permanent signing and road marking shall be in accordance with the current Queensland Department of Main Roads "Manual of Uniform Traffic Control Devices" (MUTCD) and where relevant, the Main Roads "Urban Roads Design Manual" and AUSTROADS design manuals and to the satisfaction of the Manager Design and Asset Services or nominated representative.

The relevant sign reference number from MUTCD shall be included on the plans against each sign;

All signs and pavement markings shall be adequately dimensions to ensure an accurate setting out;

Vandal proof bolts and fittings shall be used on all permanent signing.

Temporary or construction signing and road marking shall be in accordance with current "Roadworks Signing Guide" (Part 3 of the MUTCD) and to the satisfaction of the Manager Design and Asset Services or nominated representative.

1.3.18 Road Edge Guide Posts and Guardrails

Road edge guideposts shall be provided at all locations where concrete kerb and channel is not constructed e.g. half road construction; tapers; ends of roads; etc.

For the warrants and locations of guardrails refer to the Main Roads URDM - Volume 1.

There may be circumstances where the Manager Design and Asset Services or nominated representative will require guardrails in additional locations. Guardrail to be installed in locations associated with safety or vehicle concerns.

1.3.19 Street Names

Street names submitted for Council approval should be easy to pronounce, consist of one word and be socially acceptable. The designation 'Court', 'Crescent', 'Street', 'Road' etc shall be consistent with the future road hierarchy.

Specific street names are to be submitted to Council for approval prior to the submission of Engineering Drawings. All Engineering Drawings shall display the approved street names.

1.3.20 Tactile Paving

Tactile paving at crossing or nominated locations to be constructed in accordance with Standard Drawing and Specification.

Design details to comply with AS1428.4.

2.0 FLEXIBLE PAVEMENT DESIGN

2.1 General

This section is intended to facilitate the checking and approval of proposed pavement designs for roadworks associated with subdivisions, building development and re development works. It is not intended to be used in lieu of design manuals. However, any pavement designs not satisfying the minimum requirements of this guideline will require consultation with Council.

The process to be followed includes issues outlined under Austroads Pavement Design Manual

- Determine Design Parameters
- Subgrade Evaluation and laboratory testing
- Submit details with design
- Subgrade Inspection
- Pre seal / asphalt inspection

2.2 Determination of Subgrade Strength

A design CBR is to be determined for each identifiable unit defined on the basis of topography, geological and drainage condition of the site. The four day soaked CBR at a compaction of 100% Standard compaction is to be the standard test. Tests are to be carried out in a NATA registered laboratory.

Test results and pavement design are to be submitted to the Manager Design and Asset Services or nominated representative for acceptance prior to a request for subgrade box inspection.

- Design CBR to be detailed on plans.

THE SAMPLING IS TO BE RANDOMLY LOCATED WITHIN EACH LENGTH OF THE PROPOSED ROADWAY WITH CONSTANT SUBGRADE MATERIAL. IT IS REQUIRED THAT A MINIMUM OF 1 TEST PER MATERIAL TYPE BE CARRIED OUT. THE LOCATION OF MATERIAL TYPE VARIANCES TO BE DETAILED IN ACCORDANCE WITH SAMPLE TEST AND ADJOINING LOT. FOR LESS THAN FIVE RESULTS THE DESIGN CBR SHALL BE THE LEAST ESTIMATED INSITU CBR RESULT. FOR MORE THAN FOUR RESULTS, THE

DESIGN CBR SHALL BE THE 10TH PERCENTILE OF ALL ESTIMATED INSITU CBR RESULTS. THE SAMPLES SHALL BE TAKEN GENERALLY IN THE POSITION OF THE OUTER WHEEL PATH ON BOTH SIDES OF THE PROPOSED ROAD. A SKETCH PLAN SHOWING THE LOCATION OF ALL TESTS IS TO BE SUBMITTED WITH THE TEST RESULTS FOR PAVEMENT DESIGN APPROVAL.

IT IS REQUIRED THE PLACED EMBANKMENT WITHIN 300MM OF DESIGN SUBGRADE HAS A CBR VALUE OF MINIMUM 15 ACROSS THE FULL PAVEMENT WIDTH.

The frequency of testing required shall be in accordance with the following:

TESTING TYPE	Roads < 120 m	Roads > 120 m
LABORATORY	Sample at 2 sites	Sample at 1 site every 60 to 100 m
Soaked CBR's and Routine Soil Tests	Lab tests on all relevant materials	Lab tests on all relevant materials
FIELD	3 tests on subgrade	1 test on subgrade every 50m
Dynamic Cone and Field Moisture Content	routine soil tests on sub-grade from 1 of these	routine soil tests on subgrade from 1 site in 3

2.3 Pavement Materials

Pavement materials shall be in accordance with the Council Specification.

Pavement materials shall be equivalent to Type 2 in accordance with the Main Roads Specification (MRS 11.05). However, the Contractor may be permitted to use Type 3 or Type 4 pavement material in special circumstances if prior approval is granted, in writing, by the. Manager Design and Asset Services or nominated representative before placement of material.

A copy of the material grading and CBR are to be provided to the Manager Design and Asset Services or nominated representative at the time of sub grade inspection , and attached to Council check sheet.

If kerb is to be laid on finished pavement layer, levels are to be taken on the finished layer in accordance with details outlined in Chapter 12.

Compaction testing results carried out in accordance with details in Chapter 12 are to be recorded and provided to the Manager Design and Asset Services or nominated representative upon their request. If these details are not available the Contractor shall carry out testing suitable to verify the stability and quality of the pavement layers.

2.4 Determination of Design Traffic

Design traffic loadings for the various road classifications are defined below:

TABLE 1
Design ESA's by Road Class

DESCRIPTION	ROAD CLASS	ESA's

Access Place	A (30 Lots Max.)	5×10^4
Access Street	A1(75 Lots Max.)	1.0×10^5
Collector	B (300 Lots Max.)	2.0×10^5
Distributor/Trunk Collector	C (1000 lots Max.)	1.0×10^6
Sub-Arterial	D	2.0×10^6
Industrial	E	7.0×10^6
Arterial	F	MRD Design Standards

2.5 Minimum Pavement Thickness

- General

  Minimum pavement thickness shall be 200mm. This table has been derived from Austroads to allow for sub base and base levels. The minimum pavement depth does not allow for the asphaltic surface or minimum 25mm on through roads and 40mm for cul de sac heads.

- Pavement with Low Subgrade CBR

  If the Design CBR determined for the subgrade is less than the minimum CBR 3, then one of the following approaches should be taken:

  For subgrades that are expected to be of sufficient strength to allow pavement construction to proceed (ie. the subgrade does not exhibit visible signs of deformation or instability under proof rolling), the designed pavement thickness shall be modified to ensure pavement strength is developed.

  - Redesign pavement depth to allow for low strength value.

3.0 PAVEMENT CONSTRUCTION

3.1 General

Each pavement course should not be commenced until the previous course, i.e. subgrade, subbases, base or existing pavement, has been inspected and approved and certified by the consultant with respect to compaction, finished levels and texture of finish. Compaction tests of each layer are required and consultants must ensure that all tests are satisfactory before proceeding to the next layer. All test results should be provided to the inspecting Council officer prior to asphalt surfacing.

- Subgrade preparation

  Subgrade is to be trimmed to an even surface free from loose material and graded to be free-draining. Unsuitable material such as organic matter is to be removed. Subgrade affected by rainfall after final trimming shall not be accepted until appropriate drying out treatment has been affected.

- Unbound Pavement Course Placement

  Unbound pavement course material is to be placed only on underlying layers maintained at the correct moisture content. Prepared subgrades and preceding layers of base course shall be moistened immediately prior to spreading the next course.

Pavement material should be maintained at the specified moisture content prior to and during spreading. The leading edges of the pavement material are to be kept moist. Minimum compacted layer thickness shall be 100 millimetres and maximum compacted thickness shall be 150mm.

3.2 Compaction Testing

Determination of the compaction performance of the subgrade and pavement gravel materials - laboratory reference density, field density, optimum moisture content, field moisture content - shall be carried out in accordance with AS1289 Methods of Testing Soils for Engineering Purposes, in particular the E series tests. The laboratory reference density shall be:

- Subgrade 100% Standard Maximum Dry Density (MDD)
- Pavement 102% Standard Maximum Dry Density (MDD)

- **Frequency**

  The minimum frequency of testing shall be as follows:

  - 1 per $200m^3$
  - 1 per layer per $1000m^2$
  - 1 per 200mm thickness per $1000m^2$

  A minimum of 3 tests per project will be required. A sketch plan showing the location of the tests is to be submitted with the results. All tests are to be distributed reasonably evenly through the full depth and area of pavement.

  The testing frequencies stated above are based on a "not one to fail" basis. Failure of material quality tests will generally require removal of the material or further "insitu" testing. Failure of compaction tests will require:

  (a) Re-testing of the same depth and location if the failure is minor, e.g. localised single failure by 1% - 3%.

  (b) Removal of, or reworking of material, if the failure is significant or widespread.

  Subgrade and base courses shall be compacted to the densities specified below:

-	Natural Subgrade	100%	MDD
-	Base Courses	102%	MDD

  Any failed test results on any layer together with the remedial treatment undertaken at the Consultant's directions must be submitted with other test results prior to the preseal inspection.

  Testing for material quality compliance and allowable tolerances for pavement construction shall be as set out in Chapter 12 "Compliance with Standards.

3.3 Pavement Depth Verification

Pavement depths shall be verified by the provision of "as constructed" levels of the subgrade and preseal stage (or top of kerb if installed) at a frequency of 3 levels (RHS, centre and LHS) every 50 metres. The surveyed information is to be provided in a tabulated format and is to be certified by both the surveyor and consulting engineer.

4.0 SUBDIVISION ROADWORKS/ACCESS

4.1 General

4.1.1 Definition of Terms

Soils can be broken up into four (4) components based on the size of particles. A soil may consist of one or more of the following:

Component	Size of Particle	Comment
Gravel	(Particles > 2mm in size)	Particles are visible
Sand	(0.06mm to 2mm)	Particles are visible
Silt	(0.002mm to 0.06mm)	Particles are not visible
Clay	(0.002mm)	Particles are not visible

Soil characteristics are classified in terms of gradings which indicate the particle size distribution of the soil. Soils can be defined as either:-

- Poorly Graded One or more intermediate particle sizes poorly represented.
- Well Graded Approximately all particle sizes are represented.
- Gap Graded One or more intermediate particle sizes are absent.
- Uniform One particle size present.

4.1.2. Physical Access

Physical access is defined as the entry from the excised allotment onto a Council maintained road from the property boundary to the road shoulder. When access is onto a gravel road this shall require either a gravel invert crossing if situated on the crest of a road or alternatively the installation of a concrete stormwater pipe/s placed within the invert of the table drain with concrete headwalls, wingwalls and apron to Standard Drawings. All access works are to be to the satisfaction of the Manager Design and Asset Services or nominated representative. A road base material with a minimum CBR 45 shall be used as cover pavement material in either case and shall comply with those pavement material properties as specified hereunder.

A 150 – 300mm layer of 40 – 60mm rounded stone is to be placed at the development access to minimise the quantity of environmental transferred onto authority roads. These details are to be confirmed with Council.

5.0 ASPHALTIC CONCRETE SURFACING

Asphalt surfacing (in accordance with Council's Standard Specification SS8) is the only wearing surface in all residential, park residential, industrial / commercial precincts and major traffic routes within the City of Redcliffe.

5.1 Provision for Traffic

All necessary signs, barriers etc. required for the control and protection of traffic shall be provided and erected in accordance with section 6.0 Traffic Control Devices and Provision for Traffic.

Special care shall be taken to ensure that vehicles and pedestrians are not sprayed with primer or tack cost material and that entry to areas treated with uncovered primer tack coat or hot paving mixture is prevented.

A copy of all traffic control and device layouts, are to be maintained in accordance with the Principal Contractors Traffic Management Plan. These details may be subject to auditing by Council Officers.

5.2 Defective Work or Materials

The Contractor shall make good at his own expense any work, which, is not in accordance with this nominated Council or Consultant specification, whether caused by bad workmanship, or defective materials supplied by the Contractor, or by materials made defective by his operations.

5.3 Waste Materials

Waste aggregate, bitumen, empty containers or other materials remaining after completion of the work shall be disposed of to the satisfaction of the Consultant, and the work shall be left in a neat and tidy condition.

5.4 Maintenance

From the completion of each section of the work until the end of the maintenance period of the Contract shall be responsible for the maintaining of the surface.

During works any affect on existing roads adjoining the project are to be the responsibility of the developer should damage or impact outside of that prior to commencement of work occur.

During the on maintenance period the developer shall be responsible the damage incurred to the surface as a result of damage or impact from outside influences. All defects are to be corrected to the satisfaction of the Manager Design and Asset Services or nominated representative before “Off Maintenance” is awarded.

6.0 TRAFFIC CONTROL DEVICES AND PROVISION FOR TRAFFIC

6.1 General

Street signs, road linemarking and road furniture shall be designed, constructed and erected in accordance with all relevant current Australian Standards, including:

- AS 1743 - Road Signs
- AS 1744 - Forms of Letters and Numerals for Road Signs
- AS 1906 - Ratio - reflective Materials and Devices for Road Traffic Control Purposes. Part 1 - Retro-reflective Materials
- AS 2709 - Paints for Road Signs
- Manual of Uniform Traffic Control Devices

6.2 Location and Erection of Signs and Road Furniture

Street signs and road furniture shall be located as specified in the above Australian Standards.

The signs and road furniture shall be erected at heights recommended in the above Australian Standards and using the prescribed method of fixing to ground.

Sign posts shall be steel in accordance with Main roads and relevant Australian Standards for street circular hollow sections, hot and cold rolled steel sections.

Installation in accordance with **Standard Drawing No R-0130**.

6.3 Traffic Control Devices

Traffic control devices shall conform to the requirements of the Manual of Uniform Traffic Control Devices and such other additional standards as may be issued by the Main Roads .

All traffic control devices shall be maintained in an effective and clean condition whilst used at the roadworks.

Devices which are damaged or worn (including faded signs), or which do not conform to the above requirements, shall not be used at the roadworks.

Placement of traffic control devices shall be in accordance with the requirements of the Manual, except that where the Consultant/Council deems additional warning devices to be necessary for the roadworks, the Contractor shall supply and place such additional devices. All devices used on the site should be recorded under the site Safety Management Plan, and available for inspection by the Manager Design and Asset Services or nominated representative.

Subject to the approval of the Manager Design and Asset Services or nominated representative, the Contractor may supply and place any other traffic control devices which he deems necessary for the roadworks.

6.4 Detouring of Traffic

If traffic is to be detoured away from the roadworks via existing roads, the Contractor shall liaise with and make all necessary arrangements with Council or other Authorities concerned.

The above arrangements shall include making provision for such matters as the issuing of public notices in respect of the detour, any repair or upgrading work on the roads concerned which may be required prior to the detouring of traffic, maintenance of the roads concerned during the detour period, and any restoration work which may be necessary following cessation of the detour period.

The Supervising Engineer shall provide Council with details of the arrangements made for detouring of traffic. Such details shall be provided and approved prior to commencement of detouring.

Should existing traffic flow be affected, all necessary licensed Traffic Control persons to adequately control traffic affected by the works shall be provided.

6.5 Entrances to Private Properties

The roadworks shall be carried out in a manner such that existing entrances to private properties affected by the roadworks operations shall either be maintained in useable condition during the period of construction of the roadworks or alternative entrance arrangements made which are acceptable to the property owners concerned.

The Contractor shall, at the developer's expense, make good any damage to entrances to private properties which result from the Contractor's operations during construction of the roadworks. All such work shall be to the satisfaction of the Manager Design and Asset Services or nominated representative and the property owner.

6.6 Dust Control

The Contractor shall take adequate precautions to effectively minimise any dust problems which may occur during the construction of the roadworks, and which may affect the safety and general comfort of the travelling public and surrounding residences.

In this respect, the Contractor shall carry out regular applications of water or other palliative measures along the sections of the roadworks.

The Contractor shall make available resources sufficient to maintain and rectify dust issues during out of work hours. All required measures are to be carried out at no cost to the Council. Should rectification not be carried out by the Contractor to reasonable satisfaction, or the matter not addressed at the time of the event, Council reserves the right to rectify the matter. All associated costs are to be borne by the Developer.

6.7 Use of Police

Where Police officers are to be employed to assist in the control of traffic around or through the roadworks, the Contractor shall be responsible for making all necessary arrangements with the local station or relevant branch of the Queensland Police Department.

6.8 Protection of Traffic and Pedestrians Adjacent to Works

It will be the responsibility of the Supervising Engineer to supply to Council, prior to commencement of construction, a traffic management plan, setting out the safety measures, signs and personnel involved in maintaining the protection of traffic and pedestrians for the duration of the works. The traffic management plan will be in accordance with the aforementioned Australian Standards and Main Roads, to the satisfaction of the Manager Design and Asset Services or nominated representative (and Main Roads if relevant).

Works shall not be commenced without the prior approval of Manager Design and Asset Services or nominated representative and the procurement of a Road Opening Permit from Council in accordance with the Local Government Act and a Permit from the Redcliffe Police in accordance with the Traffic Act.

6.9 Urgent Repairs and Protective Works

If by reason of any emergent circumstances arising in connection with the work, any remedial, protective, repair or other work shall in the opinion of the Coordinator Design and Traffic, be urgently necessary to prevent damage to the work or to provide protection for pedestrians and traffic and the Contractor shall be unable or unwilling at once to do such work, the Manager Design and Asset Services or nominated representative may arrange for Council employees to do such work as he determines is necessary. If the Manager Design and Asset Services or nominated representative determines that the Contractor was liable to do at his own expense the work done by Council, the reasonable costs incurred by the Council and the amount so determined shall be paid by the Developer to the Council.

A copy of the receipt of payment shall be required prior to acceptance of the works "on maintenance".

The Manager Design and Asset Services or nominated representative shall as soon as practicable after the occurrence of any such emergent circumstances notify the Contractor and the Supervising Engineer thereof in writing.

7.0 SUB-SOIL DRAINAGE OF PAVEMENTS

7.1 General

For design and estimating purposes, it should be assumed that sub-soil drainage will be required at all locations where the bottom of the pavement is below the natural surface.

Where the road centreline is approximately parallel to the contours, a side drain will in general be required on the high side of the road. Where the centreline is approximately at right-angles to the contours, mitre drains may be required

Subsoil drainage to be installed with a minimum longitudinal grade of 0.5%. Drains to be tested before "On Maintenance" to show sufficient flow conditions are in place

7.2 Location of Sub-Soil Drains

- Longitudinal Drains

  - Kerb to Kerb Asphalt

  Where kerb and channel has been/will be constructed, the sub-soil drains shall be constructed immediately below back of kerb as detailed in Redcliffe City Council **Standard Drawing No R-0032, 0140, 0141**.

  - Unsealed Shoulders

  Where the road shoulders are unsealed the sub-oil drains shall be placed as directed by Manager Design and Asset Services or nominated representative except where kerb and channel will be constructed in the future in which case the sub-soil drain shall be located as above unless directed otherwise by Council.

  - Other

  Not withstanding the above requirements, the Manager Design and Asset Services or nominated representative may direct the location of sub-soil drains to suit particular site conditions.

7.3 Order of Construction

Sub-soil drains shall be constructed after placement of lower sub-base material (CBRI5), or after preparation of pavement box on minimum depth pavements.

The Manager Design and Asset Services or nominated representative may, when conditions are suitable, approve the construction of the sub-soil drains prior to placement of subgrade replacement material or lower sub-base material subject to the bedding/filter material being brought to the underside of upper sub-base level.

7.4 Excavation of Drains

Trenches for pipe drains shall be excavated to the required line to a depth of such gradients that pipe is 100mm into subgrade or as directed by the Manager Design and Asset Services or nominated representative (minimum 1%).

Trenches shall be a minimum of 100mm wider than the nominated pipe outside diameter.

7.5 Type of Pipe

All sub-soil drainage pipes shall be perforated plastic drainage pipe complying with AS 2439 - Part 1 1981 - Perforated Plastics Drainage Pipe and Fittings, subject to the approval of the Manager Design and Asset Services or nominated representative.

Joints shall be constructed in accordance with the manufacturer's recommendations.

Where approved by the Manager Design and Asset Services or nominated representative, strip drains may be used.

Strip drains shall be a proprietary product comprising a regular patterned cusp - shaped plastic core of nominal thickness not less than 40mm encased by a non-woven geotextile.

The plastic core shall permit the passage of high volume water flows and shall have a crush strength not less than 120 KPa.

7.6 Pipe Size

The minimum pipe size shall be 100mm outside diameter. Under heavy traffic loads and subject to excessive conditions may require 300mm deep plastic core pipe. Details are to be discussed with the Manager Design and Asset Services or nominated representative.

7.7 Bedding and Filter Materials

The pipe shall be bedded on a minimum of 50mm of graded filter sand. The filter sand shall be a sand consisting of clean, hard, tough, durable, uncoated grains of uniform quality, and shall conform to the gradings shown in the table below. the filter sand shall completely surround the pipe and the trench shall be backfilled to underside of the upper sub-base level with filter sand.

Sieve	% Passing
9.50mm	100
4.75mm	90-100
1.18mm	45-80
300µm	10-30
150µm	0-10
75µm	0-1

Other filter media may be used for bedding and backfill subject to approval by the Manager Design and Asset Services.

Where approved by the Coordinator Design and Traffic, a continuous knit seemless durable synthetic fabric filter sleeve may be used.

7.8 Pipe Laying

All sub-soil drainage pipes are to be laid on a prepared filter or sand bed, to ensure a uniform grade.

7.9 Outlets

The pipes shall be connected to gully pits, as shown in Standard Drawing No Drawing No 59207A pen channels below the edge of the road shoulder or at the edge of an embankment. For outlets not connected into gully pits, a concrete headwall shall be provided to the outlet. The headwall shall be at least 100mm thick and shall extend for a minimum of 150mm on all sides of the pipe.

The outlets to the pipes shall be fully enclosed by vermin proof flaps.

7.10 Clean Outs

Clean-outs as shown in Standard Drawing, shall be located at the head of the sub-soil drain and at subsequent spacings not exceeding 50 metres or as discussed with Manager Design and Asset Services or nominated representative.

Clean outs may be located at gully pits where they shall be constructed with caps or plugs as shown in Standard Drawing.

A marker shall be installed in the kerb adjacent to clean out points

7.11 Joining

Sub-soil drains shall be joined in accordance with the manufacturer's recommendations. Clean out pipes shall be joined to the sub-soil drains using oblique tee connections.

7.12 Flushing

After the drains are constructed they shall be flushed out. Flushing shall continue until the outlet water is clean and flows consistently. If so requested the Manager Design and Asset Services or nominated representative may request a demonstration to be carried out to show drains are operating without blockages.

Drains are to be flushed and a record provided to the Manager Design and Asset Services or nominated representative prior to “On Maintenance” and “Off Maintenance” periods, so the asset is functioning in a maintained manner.

7.13 Treatment of Islands and Speed Control Devices

For islands and speed control devices a mitre drain shall be constructed to drain sub-surface water from these structures into the nearest relief, either a gully box or access chamber.

Landscaped or partly landscaped islands shall have perimeter sub-soil drainage discharging into the nearest relief, either a gully box or access chamber.

CHAPTER 6 - STORMWATER

1.0 AIM

This guideline has been prepared to serve as a guide for consulting engineers in the preparation of design plans and specifications for stormwater drainage works undertaken within the boundaries of Redcliffe City Council.

2.0 GENERAL

Council's Stormwater Drainage Standards are based on the Queensland Urban Drainage Manual.

The following key points should be noted.

The developer is required to meet the full cost of providing an appropriate drainage system, with capacity sufficient to pass through the subject land, and allow for the design runoff from all adjoining upstream catchments which are to impact on the development.

Runoff rates and pollutant loads shall not be made worse on downstream properties.

Detention Basins and water quality control devices are generally required for developments as an alternative to upgrading of stormwater lines.

All dry weather flows and runoff for the first 15mm of rainfall from the subject land must be treated prior to discharge into rivers, creeks or watercourses.

Major overland flow paths are not permitted within urban residential lots;

Channelling of existing creeks and watercourses for the purpose of maximising development area is not permitted.

All watercourses (as defined under the Water Resources Act) within or adjoining the subject land are required to be revegetated by the developer;

Existing watercourse erosion and bank stability problems within or adjoining the subject land are required to be repaired and corrected with suitable engineering practises by the developer.

Erosion and Runoff Controls are required during the development construction stage.

The Contractor is required to provide temporary works to control sediment and erosion during the construction phase.

The Queensland Urban Drainage Manual (QUDM) shall be the basis for the design of stormwater drainage.

The design of the proposed drainage system, and earthworks, for the development shall be such that the upstream drainage is not adversely affected and that the downstream drainage system is capable of adequately catering for the discharge of the additional flow produced as a result of the development. If the downstream system is not capable of carrying the increased discharge the Consultant shall indicate what measures are proposed to ensure the downstream system is capable of carrying the increased discharge or the proposed method of detention of stormwater on the site. Such measures shall include, but not be limited to, investigation for upgrading the existing downstream system.

The design of the proposed drainage system shall accommodate both existing and future developed flows from upstream catchments.

The consulting engineer shall be responsible for assessing the existing and future developed flow regime entering the development site from upstream catchments.

Drainage Reserves over downstream drainage paths, and written approval from the respective property owners is required from the development site to the point of discharge as determined by the Manager Design and Asset Services or nominated representative.

All development applications are to include a Stormwater Management Plan (SMP) demonstrating the feasibility and function of the proposed drainage system(s) within the site, its compliance with any relevant Master Drainage Scheme and connection to the legal point of discharge.

In general, the minimum stormwater drainage works to be constructed by the Developer include:

(a) Urban Areas

Residential Precincts and Industrial and Commercial Precincts.

(i) Minor Drainage System

- Kerb and channel on both sides of all roads
- Gully pits at locations such that the flow in the channel does not exceed specified limits
- Roof and allotment drainage systems. In particular, drainage from lots that front waterways shall be discharged to the street unless topographical constraints determine otherwise.
- Full piped drainage from all gully pits and other inlets to discharge at the boundary of the Development at a legal point of discharge approved by Council. Where the piped system traverses private property an easement of up to 3 metres shall be dedicated in favour of Council.
- Where block falls away from the road, stormwater may be collected and drained if a drainage easement is available to the rear of the site. Confirmation to be made with Council.

(ii) Major Drainage System

An overland flow system for runoff in excess of the capacity of the pipe system, such that the design flow is carried through the Development clear of allotments (ie via Road, Park or Drainage Reserve

(b) Park Residential Precincts

The minor and major drainage system is to generally consist of open natural water courses within allotments and full piped drainage within road reserves, with:

- Generally kerb and channel on both sides of all roads.
- Gully pits at locations such that the flow in the channel does not exceed
- specified limits.
- Full piped drainage from all gully pits and other inlets, to discharge into defined natural watercourses or at a legal point of discharge approved by Council.
- Stabilised overland flow paths/watercourses where required for scour and erosion protection.
- Pipe or precast concrete box culvert structures (including drainage aprons) should be located at road crossings of all natural watercourses and shall extend to the limits of the road reserve. Cross drainage design shall take into account the possible debris load from the catchment and in this regard the provision of precast reinforced concrete box culverts is Council's preferred option. Masonry block construction is not permitted.

In addition to the discharge approvals required above, written approval is required from adjoining property owners authorising any engineering works on their property. A copy of approvals are to be submitted to the Manager Design and Asset Services or nominated representative with the design submission details.

Full engineering plans and specifications prepared by a Registered Professional Engineer (Qld) shall be submitted for all stormwater drainage and associated works for approval by Council. All work shall be supervised by a Registered Professional Engineer (Qld) competent in stormwater drainage works. The works shall be undertaken by a nominated principal contractor experienced in the construction of Public (Municipal) Works. Council may, at its discretion, request evidence of the principal contractors competency.

On the completion of the works a certificate shall be submitted to Council from the supervising engineer to the effect that the works have been completed in accordance with the approved plans and specifications. Certification shall include the submission of "as constructed" plans and copies of all relevant test results before the contract will be placed "on maintenance".

The maintenance period for general stormwater drainage works shall be for a period of twelve (12) months as required by Council. The maintenance period for detention basins (including gross pollutant traps and associated works) shall

be for a period of twenty four (24) months. The Council prior to the acceptance of the works "on maintenance" shall require the provision of a bank guarantee or bond equivalent to that detailed under Chapter 14. Each item of works must at no cost to the Council :

- be maintained and provide evidence of such maintenance during its Maintenance Period ; and
- have any latent defects of which the Council gives notice promptly rectified.

Failure to perform the maintenance obligations entitles the Council to call up the whole or any part of a bank guarantee or bond and apply the monies to meet the cost of the Council performing those obligations.

Refer to Chapter 14 for conditions of "Bonding".

2.1 Existing Drainage

This section is to be read in conjunction with QUDM Section 3. The design of the proposed drainage system (both major and minor) and earthworks for the development shall be such that the upstream drainage is not adversely affected and that the downstream drainage system is capable of adequately catering for the discharge of any additional flow produced as a result of the development. If the downstream system is not capable of carrying the increased discharge the Consultant shall indicate what measures are proposed to ensure the downstream system is capable of carrying the increased discharge. Such measures should include, but not be limited to, investigation of upgrading the existing downstream system, on site detention and regional detention facilities.

2.2 Downstream Drainage Requirements

(a) General

At the time of the relevant approval Council will determine if one or more of the following is required:-

(i) All downstream drainage paths have easements/reserves as appropriate in favour of Council

(ii) Written approval from adjoining property owners affected by the Works is required from the development site to the legal point of discharge (Legal point of discharge refer Section 3.02 QUDM and additional requirements nominated in Section 3.5.5 (b)

(iii) Hydraulic calculations are required from the Consultant indicating that post development stormwater flows do not adversely affect downstream properties or increase flood heights.

(b) Legal Point of Discharge

In addition to the above requirements Council will determine which one or more of the following is required as a lawful point of discharge:--

(i) To concrete kerb and channel, gullies or existing enclosed stormwater drainage system abutting the development. The applicant must obtain approval from Council for any connection to Council Infrastructure .
(ii) To the road reserve provided the concentration of stormwater does not adversely affect the drainage capacity of the road and/or adjoining properties.
(iii) Through adjoining private property providing written permission is obtained from the relevant adjoining property owner/s and this written permission is contractually binding to the property and its future owners.
(iv) To an existing enclosed drainage system within 100 metres of the site provided the system has the capacity required. Calculations must incorporate future upstream developments.
(v) To concrete kerb and channel and then to a new stormwater inlet to be provided by the Developer at a location removed from the site.
(vi) To kerb and channel or existing enclosed drainage system higher than the development from a drainage pit within a site by pumping. This method will only be considered on merit when all other alternatives have been exhausted. The pumping infrastructure will remain the asset of the site owner, and will not form part of Council's drainage scheme. The applicant is to clearly demonstrate in this instance that the alteration to catchment boundaries will not cause a worsening of any kind to existing drainage systems, property or public safety.

(c) Easements (refer QUDM 3.04)

Notwithstanding the requirements of QUDM Section 3.04 (h) (i) regarding easement widths, Council's requirement is for a minimum easement width of 3.0m for single pipes up to 1050mm diameter. For pipe sizes larger than 1050mm diameter, multi cell pipe drainage and/or box culverts, Council requires minimum easement widths in accordance with QUDM unless approved otherwise. Construction within an existing drainage easement, near or over existing stormwater infrastructure is not permitted and Consultant's should refer to the requirements of Council's "Building Near or Over Council Water, Sewer or Stormwater Services" policy.

3.0 DESIGN CRITERIA

3.1 Design Parameters

Design parameters shall be in accordance with the criteria listed in the Queensland Urban Drainage Manual.

3.1.1 Major / Minor Drainage System

The major and minor drainage systems as described in Section 5.08 of QUDM forms the basis of the drainage system within the urban area. The major definitions are as follows:

- Major drainage system: Part of a drainage system in a catchment which is designed to convey major design storms, eg 50 year ARI and 100 year ARI events. The system may comprise open space, floodway channels, road reserves, pavement, overland flow paths, detention basins.
- Minor drainage system: Part of the drainage system in a catchment that controls flows from the minor design storm, eg 2 year ARI and 10 year ARI events. The system usually comprises kerb and channel, roadside channels, gully inlet pits, underground pipes, manholes and outlets.

  - 2-5 dwellings per hectare (typically in rural environment)
    Minor System Design Standard: Minimum 2 yr ARI
    Major System Design Standard: Minimum 50 yr ARI

  - >5 and ≤ 20 dwellings per hectare (typically in low density residential area comprising mainly one and two storey houses)
    Minor System Design Standard: Minimum 2 yr ARI
    Major System Design Standard: Minimum 100 yr ARI
    Roof Water and Allotment Drainage: Level 11 QUDM Section 5.18

  - > 20 dwelling units per hectare (typically low – medium to high density residential areas comprising multi unit dwellings, multi level apartments
    Minor System Design Standard: Minimum 10 yr ARI
    Major System Design Standard: Minimum 100 yr ARI
    Roof Water and Allotment Drainage: Level 11 QUDM Section 5.18

  - Industrial Areas
    Minor System Design Standard: Minimum 10 yr ARI
    Major System Design Standard: Minimum 100 yr ARI
    Roof Water and Allotment Drainage: Level 11 QUDM Section 5.18

3.2 Gullies/Access Chambers

- • Gully pits shall be constructed in accordance with Redcliffe City Council Standard Drawing No.59301, 302 "GULLY ROADWAY TYPE CHANNEL LIP IN LINE".

- Wherever possible the stormwater line from structure to structure shall be located beneath the kerb and channel unless otherwise approved by the Coordinator Design and Traffic. The stormwater pipe is not to be located behind the back of the kerb.

- Gully pits shall be located on a straight wherever possible, and so as to reduce the likelihood of conflict with future driveway locations. Overland flow paths shall be provided at all sag points.

- Anti ponding gullies in curves shall be side entry type, chamber and grate only.

3.3 Pipes

(a) General

- Pipes used may be either reinforced concrete or fibre reinforced concrete type.
- Minimum pipe size - 375 mm diameter
- Pipes up to and including 600 mm diameter shall be rubber ring jointed.
- Pipes greater than 600 mm diameter shall be internal flush jointed with pipe manufacturers proprietary external bands.
- Minimum clear cover shall be 600 mm in all instances, unless approved otherwise by the Coordinator Design and Traffic.
- The minimum vertical and horizontal clearance between a stormwater pipe and any other pipe or service conduit shall be 300 mm.

Council requires that in locations where the drainage system will be subjected to a salt water environment and/or aggressive ground water conditions, Consultants should liaise with the relevant suppliers for an appropriate product designed to comply with the current Australian Standard and to meet the specific site conditions.

b) Roof And Allotment Drainage System (Refer Table 5.18.3, Table 5.18.4 and Table 5.18.6 QUDM)

The level of inter allotment drainage required will be as follows (refer QUDM Table 5.18.3):-

LAND USE	DRAINAGE LEVEL
Residential A (Low Density)	III
Residential B, C, D Commercial and Industrial	III, IV, V

For design recommendations associated with the "Rear of Allotment Drainage System", refer Table 5.18.4, the following minimum pipe sizes should be adopted:-

ITEM	LEVEL APPLICABLE				
	I	II	III	IV	V
Minimum Pipe Size (mm)	n.a.	150	225*	375	375

Note: *The minimum diameter pipe size for level III will be as shown above except in some waterfront developments where a smaller size may be approved by Council.

Typically the alignment of the allotment drainage shall be central to the drainage easement. When a stormwater allotment pipe shares an easement with a sewerage line, the stormwater pipe shall be 1m offset from the boundary line.

For design criteria associated with Inter Allotment Drainage refer QUDM "Level III Rear Allotment Drainage System" Table 5.18.6. **Consultants should note that the nominal pipe diameter of 150mm is not acceptable**

3.4 Drainage Calculations and Catchment Plans

Drainage calculations and catchment plans shall be presented in accordance with Chapter 2 and prepared in accordance with QUDM.

Any additional calculations in support of overland flow path capacities, weir flows over kerbs, flood fill studies shall be submitted with the design for approval.

3.5 Detention Basins

Detention basins shall be designed in accordance with QUDM to criteria nominated by the Manager Design and Asset Services or nominated representative for specific applications.

The Manager Design and Asset Services or nominated representative is to be consulted prior to proceeding with the design.

3.6 Residential Subdivisions

a) Lots falling to the street

In residential streets, an approved full height kerb adaptor must be provided in the kerb. One kerb adaptor per lot is permitted unless approved by the Manager Design and Asset Services or nominated representative.

b) Lots falling away from the street

All designs that do not fall directly towards the road must be provided with a rear allotment roof water drainage system or easement. The system will also be required where allotments fall towards parkland unless defined by Manager Design and Asset Services or nominated representative.

An easement is required irrespective of pipe size when the roofwater line is designed for more than 3 allotments.

No Lots (nominal 180m2 roof area at each lot)	Minimum Pipe Diameter	Easement Width	Minimum Pipe Slope
1 –3	150mm	Not Required	1.0%
4 – 6	225mm	1.5m	0.5%
7 – 10	300mm	1.5m	0.5%

3.7 Roofwater Inspection Pits

Roofwater inspection pits must be in accordance with Standard Drawing. Roofwater inspection pits / manholes must be provided every 100metres and / or at changes in

pipe sizes and / or where direction changes more than 15 degress and/or where the line terminates.

3.8 Kerb Adaptors

Only approved full height kerb adaptors are permitted. The kerb adaptors must be placed in a location where the service pits on the footpath will not conflict with the future pipe location.

The opening in the kerb must be sawcut and kerb adaptors must be installed flush with the top of the kerb. Kerb adaptors must be fixed in accordance with the manufacturers specification and all gaps must be filled with approved materials.

Any damage to council kerb and channel as a result of installing kerb adaptor to be bourne at the cost of the developer.

Should there be a consideration for the roofwater to be pi[ped directly in through the back wall of a gully then an inspection of the opening and finish shall be carried out by a council inspector. Should this not become approved then Council may request alternative locations be adopted based on structural defects.

4.0 CONSTRUCTION REQUIREMENTS

4.1 Pipework

Pipes shall conform in all respects to the Australian Standard No. 4058. Pipe work to be in accordance with **Standard Drawing No: D- 0030 and 0031.**

Reinforced concrete pipes shall be subjected to the Load and Absorption Test as specified in AS3725. The load shall be the three edge bearing method.

Pipes up to and including 600 mm diameter shall be rubber ring jointed; pipes larger than 600 mm diameter shall be flush jointed with manufacturers external bands.

The class of pipe shall be as specified or as shown on the drawings in accordance with the strength requirements of pipes in roadways, or in deep trenches or under fills. Where the class of pipe is not specified they shall be a minimum of Class 2.

Pipes damaged as an apparent result of handling and cracked in one or more places so as to show clearly visible cracks (exceeding 0.10 millimetres) inside or outside will be rejected and not used on the project in any location, unless approved by the Council. If any damaged materials are used and identified by the Manager Design and Asset Services or nominated representative, all materials shall be removed and replaced with new products at the cost of the Developer.

Pipes showing clearly visible shrinkage cracks inside or outside, and opening of the crack is more than 1.25 millimetres for a length of 300 millimetres or more on either inside or outside, will be rejected.

Pipes showing only internal cracks or only external cracks may be accepted, provided such cracks do not visibly penetrate full thickness or do not exceed 0.10 millimetres opening for 300 millimetres or more of length.

Pipe quality checks should be recorded under the Principal Contractors site Quality Plan.

4.2 Pipe Laying

Pipes shall be laid true to line, grade and level to the tolerance below and shall be free draining and firmly bedded. Pipes shall be laid from the discharge end upstream.

Tolerances:

- invert levels + 50 mm, - 50 mm
- Records of pipe levels at inlet and outlet are to be recorded under the Contractor Quality Plan ,and to be provided if requested by the Manager Design and Asset Services or nominated representative.

Unless otherwise shown on the drawings or ordered by the Supervising Engineer during construction, pipes shall be bedded as shown on Standard Drawing 59309 (Type 3 - Roadways Type 2 - Elsewhere) on coarse clean sharp river sand, or other approved bedding (minimum bed depth shall be 100 mm).

Pipe laying is to be in accordance with the recommended pipe laying practice as set out in the current Standard Specification.

4.3 Jointing Pipes

- Rubber Ring Jointed Pipes

Where specified, spigot and socket pipes shall be joined by rubber ring joints. Rubber joint rings shall be in accordance with AS1646.

4.4 Laying and Jointing of Box Culverts

Box culverts shall conform in all respects to AS1597. Unless otherwise specified all precast box culverts shall consist of a separate invert slab and a single invert u-shaped section forming the deck and the two walls.

The base of the box culvert shall be laid true to line and grade to the tolerances specified in part 4.2 above and free draining before the upper portion of the box culvert is laid. The top of the culvert shall be joined to the base with cement mortar.

Unless otherwise specified, joints between lengths of box culverts, tops and sides shall be covered outside by a mortar band not less than 150 mm in width and a minimum of 20 mm thickness. Mortar bands shall be reinforced with chicken wire for a minimum width of 130 mm. Approved jointing tape, applied in accordance with the manufacturer's instructions, may be substituted for mortar bands.

4.5 Backfilling

- General

  Backfill shall not be placed until the pipe drain or box culvert has been inspected and approved by the Supervising Engineer.

All backfilling shall be spread in 150 mm layers and compacted as hereunder specified.

- Under proposed pavements

  The backfill material used for backfilling to a point 300 mm above the crown of the pipe or culvert shall be the approved bedding material. The trench above the approved bedding material to subgrade level shall be backfilled with approved subgrade replacement material with a minimum California Bearing Ratio of 15, placed in layers not exceeding 250 mm loose and compacted until the dry density is not less than 95% Modified Maximum Dry Density.

- Under Existing Pavements

  The edges of the trench shall be cut with a clean, straight line prior to excavation. The trench shall be backfilled to a level 350 mm below finished pavement level with the approved bedding material. The trench above the bedding material shall be backfilled with 300 mm of lean mix concrete. The top 50 mm of the trench shall be filled with asphaltic concrete. The surface shall be restored to a condition at least equal to that of the original pavement.

- Under Footpaths and Allotments

  Backfilling shall be carried out using selected material from excavations. The material shall be placed in layers not exceeding 250 mm loose in depth and shall be compacted to a minimum consolidation of 95% Standard Compaction.

4.6 Sand, Silt and Debris

Removal of all sand, silt and debris in the pipelines is the contractor's responsibility and provision should be made in the contract for removal of all sand silt and debris before the works will be accepted on and off maintenance.

4.7 Drainage Structures

- Access Chambers and Inlet Pits

  Inlet pits and access chambers shall be constructed to the form and dimensions shown on the plans and drawings. The thickness of walls of inlet pits and manholes shown on the plan or on Council's Standard Drawings shall be the minimum adopted when inner and outer forms are used.

  Formwork shall be substantially constructed and braced to ensure that there shall be no visible deflection of the formwork and that the concrete shall finish accurately to the dimensions shown on the plans or Standard Drawings. Formwork shall remain in position for at least twenty-four (24) hours prior to stripping.

  Provision shall be made in the walls of pits and access chambers for weep holes to drain the pipe bedding and surrounds.

  Provision shall be made where required in the walls of manholes and pits for the entry of sub-soil drainage lines.

Concrete in manholes and inlet pits shall be placed continuously without any construction joints other than the base and the top of the walls, unless otherwise approved. At any construction joints, the concrete shall be well roughened to ensure a good bond; a coat of mortar with or without additives shall be spread over the contact surfaces thus prepared, after which the concrete shall be put in position and well rammed and worked so as to make a thoroughly bonded and water tight joint.

Concrete shall be well rodded and sliced or vibrated to ensure maximum density and good surface finish. No foreign material shall be allowed to enter the forms during placing of concrete and concrete shall not be placed unless the excavation has been properly cleaned out and dewatered to the satisfaction of the supervising Engineer.

Concrete surfaces shall be protected from drying out for at least seven (7) days after placing.

The concrete used in the construction of the floors and walls of the unreinforced access chambers and inlet pits shall be grade N25 in accordance with AS1379 and AS3600. The concrete used in the construction of reinforced access chambers and inlet pits shall be as shown on Standard Drawing No Drawings or as detailed on the approved engineering drawings.

- Rendering and Benching

  Cement rendering shall be undertaken on all construction joints and rough surfaces.

  The bottoms of inlet pits and access chambers to at least the height of the half diameter of the highest pipe connecting thereto and such other concrete surfaces as shown on the plans shall be benched with cement mortar. Special benching may need to be undertaken using N20 concrete in large access chambers at angle junctions in pipe lines.

- Access Chamber Covers and Frames

  Cast iron access chamber covers and frames shall be of the best quality cast iron, free from cracks, flaws and porous spots and shall be approved by the Supervising Engineer before placing. All cast iron surfaces shall be coated with hot bitumen before being placed in the works. Covers and frames shall comply with the details shown on the standard drawings. The initials SW shall be clearly visible on all access chamber covers.

  The covers shall be cast iron where access chambers are situated within the road boundaries or other trafficable areas and concrete infilled elsewhere.

  Frames shall be cast in the reinforced concrete access chamber topslabs and topslabs shall be bedded on a maximum of 12 mm cement mortar on top of the concrete collar of the manhole such that the top of the cover shall be flush with the finished pavement or ground surface.

  The concrete used in the construction of the access chamber lid shall be grade N32/10 in accordance with AS 1379 and AS3600.

- Inlet Pit Grates and Backstone

  The precast backstone shall be of an approved type as shown on the drawings.

- Inlet and Outlet Structures

  Headwalls, embankment walls and aprons shall be constructed to the form and dimensions shown on the approved engineering drawings.

  The inlet and outlet headwalls, embankment walls and aprons shall be constructed in such a form that will produce a smooth transition of stormwater flowing in the open drain into the pipe and culvert inlet or out of the pipe or culvert into the open drain in order to reduce energy losses and reduce upstream backwater. Energy dissipators and scour protection, where required shall be constructed as shown on the plans. The final form of all inlet and outlet structures shall be subject to on-site discussion with Council officers.

  Precast headwalls may be permitted for use provided they are constructed to the following criteria:

  (i) Precast headwalls shall be laid on a clean stable foundation and shall be bedded in a minimum 200 mm deep layer of grade N25 concrete which shall be sluiced, pumped or vibrated in place to ensure no voids are present in the completed work.

  (ii) Apron cut-off walls shall extend below the edge of the apron by a minimum of 600 mm and shall be constructed of minimum grade N25 concrete.

  (iii) The headwalls shall be backfilled with approved free draining material.

  (iv) All headwalls are to be constructed with adequate protection so as to prevent scouring occurring behind or around the headwall. “Stone pitching” or the use of “no-fines” concrete shall be used where directed and such works shall be a minimum depth of 150 mm.

  (v) Weepholes are to be provided to drain the bedding material.

5.0 KERB AND CHANNEL CONSTRUCTION

5.1 Kerb and Channel Foundation

The foundation shall comply with the requirements of the plans. Where no requirements are set, the depth of approved foundation material will be determined by the Supervising Engineer although the foundation shall consist of at least 100 mm thickness of material with a minimum soaked CBR of 45% which shall be compacted by watering and rolling or tamping until 95% of the maximum dry density as determined by the modified A.A.S.H.O. test method has been obtained. The foundation shall extend at least 150 mm behind the back of the kerb. No concrete shall be placed until the foundations have been approved by the Supervising Engineer.

5.2 Concrete Works

The concrete used in kerb and channelling work and vehicle crossings shall be Grade N32 concrete and shall conform in all respects with the drawings and plans. Concrete shall be placed true to line and grade to the depths, thicknesses and dimensions as shown on the plans and drawings. Any kerb and channel not true to line or with noticeable kinks, bends or other faults or not of the required dimensions may be condemned and shall be broken out and removed from the site.

The channel shall be shaped in true conformity with the drawings. The invert of the channelling shall be finished in true grade and alignment and no channelling will be accepted in which water is found to pond.

Channelling that ponds water and surfaces that are chipped, cracked or otherwise damaged shall be cut away to a clear surface and rendered 12 mm minimum thickness.

The concrete kerbing and channelling shall join neatly and transition smoothly with existing kerb and channel or shall be finished such that it will join neatly with channelling to be constructed.

Where kerbing and channelling joins inlet pits, the width of channel shall be uniformly widened as shown on the drawings to join neatly with the pit.

Kerb Ramps shall be constructed at all street intersections as shown on Standard Drawing No R-0084.

5.3 Kerb and Channelling Forming

To be performed to details nominated in the Standard Drawings for design kerb type.

5.4 Curing of Concrete

Concrete kerbing and channelling, vehicle crossings and other concrete work shall be cured by the use of an approved curing compound, unless any other method of curing is approved by the Supervising Engineer.

Approved curing compounds shall consist of waxy constituents cut back with a volatile solvent, resulting after application in a film of microcrystalline petroleum wax.

Curing compounds comprising a bituminous emulsion base or a varnish or other resinous base shall not be used and plastic (p.v.a.) based compounds may be used only if explicitly approved by the Supervising Engineer. The curing compound shall be pigmented white, but other colours are acceptable provided they disintegrate or leach off the surface within a reasonable time.

The curing compound shall be applied evenly, at the rate recommended by the manufacturer, over all exposed surfaces immediately on completion by either spraying or brushing and shall thereafter be protected from mechanical damage for at least seventy-two (72) hours.

Curing by means other than with a curing compound will be approved only under special circumstances.

If in the opinion, of the Supervising Engineer, curing was not applied efficiently, he may order the cutting of cores for the testing of the concrete insitu, irrespective of whether test cylinders had been taken previously and irrespective of the test results on such cylinders and the cost of such testing shall be borne by the Contractor.

6.0 ROOFWATER AND INTERALLOTMENT DRAINAGE SYSTEMS

6.1 Concept

The drainage system provided within allotments for the disposal of roof and allotment drainage depends upon the topography, the importance of the development, and the consequences of failure. The provisions of a piped drainage system, within allotments to receive roof and allotment runoff may be necessary in the following circumstances:

(i) Where allotments fall away from the street;

(ii) Where the proportion of impervious area within a development is such that surface runoff is likely to be intolerably high, e.g. industrial and multi-unit allotments;

(iii) Where zoning may permit construction of buildings up to side or rear boundaries thus blocking or concentrating natural flow paths.

The provision of the drainage system in the above noted circumstances shall be as determined by the Council.

The requirements in this standard are not intended to conflict with the relevant requirements of the Queensland Urban Drainage Manual (QUDM). Should any conflicts arise between the requirements noted herein, and the requirements of the Subdivision Code or the QUDM, Council shall determine the particular criteria to be adopted.

6.2 Design Criteria

In all circumstances, the design shall comply with the Subdivision Code and Section 5.18 of the Queensland Urban Drainage Manual.

- **Pipe Size**

  The minimum pipe size shall be 150 mm diameter, and the maximum pipe size shall be 375 mm diameter.

- **Pipe Types**

  The following pipe types may be used:

  - uPVC, sewer Class SH Solvent Welded AS 1260 ;
  - FRC, Class 2 Rubber ring jointed AS 4139 ;
  - RC Class 2 Rubber ring jointed AS 1342.

  Standard manufacturers fittings shall be used in all cases.

- **Location of Pipe**

  The main "line" shall be located 0.6 meters from rear boundaries and 1.2 metres from side boundaries.

- **Flexible Joints**

  Flexible joints in the form of a short pipe 600 mm maximum at the junction of all stormwater drainage structures shall be provided.

  For uPVC systems flexible joints will not be necessary however rubber ring jointed connections shall be provided at all drainage structures to accommodate expansion or contraction. Such pipe shall have sanded ends suitable for bonding to concrete.

- **Access Chambers**

  These shall be Type 1 - Cast Insitu in accordance with nominated drawings. Access chamber dimensions shall be as follows :-

  - 600mm diameter pit - maximum depth shall be limited to 750mm ;
  - 900mm diameter pit - these shall be installed for depth ranges between 750mm and 1500mm ;
  - 1050mm diameter manhole - these shall be installed in special circumstances and where depths exceed 1500mm.

- **Access chambers shall be provided at the following locations :-**

  - change of grade
  - change of pipe size
  - change of direction
  - end of line

  Covers to cast-in-situ access chambers shall be a standard concrete infilled access chamber cover and frame. This shall be embossed ROOFWATER. Infill concrete shall be grade N25. Covers must match finished surface ground slope and sit 50mm proud. Grate installations if approved by the Manager Design and Asset Services or nominated representative will be permissible in certain instances where surface flows are to be directed into the system.

  Access chambers shall be benched in a similar manner to that required for sewer installations.

- **Branch Connections**

  At least one connection point shall be provided on the main line for each property. This connection shall be in the form of a Slope Junction installed in the line with the property branch line diameter being a minimum of 100 mm

  In addition, an inspection opening shall be located at the end of the property branch line similar to a sewer house connection branch. The connection point is to terminate 0.5 metres past any adjacent sewer. Stormwater marking tape shall be tied to the cap of the inspection opening and shall extend vertically to be tied to a wooden peg at finished surface level.

- **Outlets**

  Generally, all roofwater drainage systems of this nature shall discharge into a suitably located point on the street.

  Where the design of the street drainage system is such that up to a maximum of two (2) properties are so isolated from a stormwater pit or access chamber that their private drainage system could be reasonably be expected to connect, discharge may be allowed into the kerb and channel. However, this shall be subject to a hydraulic analysis as to the existing road flows and capacity of the roadway for the increased discharge.

  Such discharge shall be via an appropriate number of galvanised steel rectangular hollow sections of 75mm maximum height exiting from an access chamber located 0.5m inside the property across the footpath into the kerb and channel with the RHS cut to match the profile of the kerb and channel.

- **Minimum Cover**

  In private property a minimum cover of 450mm is required. Where discharge into kerb and channel is allowed, it may be necessary to vary this requirement over the last section (i.e., from the last access chamber).

  Pipes are be laid with minimum cover, unless approved by the Manager Design and Asset Services or nominated representative with the design submission.

- **Design Plans**

  The roofwater drainage system location shall be shown on both the stormwater drainage and sewer plans for the subdivision. The distance from the property boundary to the main line pipe centre-line shall be shown as an offset from the property boundary.

  Invert levels shall be provided for all inspection manholes on the sewerage reticulation layout plans. The invert level of any connection of the private drainage system to the street drainage systems shall be provided on both plans. Distances upstream of the property boundary to the property branch line connection point shall be shown on the sewerage reticulation layout plans.

  The pipe diameter and type (uPVC, FRC, etc) shall be shown on the sewer plan. In addition, the private drainage system shall be shown using a different line type to that showing the sewer.

CHAPTER 7 - SEWERAGE RETICULATION WORKS

1.0 AIM

This guideline has been prepared to serve as a guide for consulting engineers in the preparation of design plans and specifications for sewerage reticulation works undertaken within the boundaries of Redcliffe City Council.

2.0 GENERAL

Reticulation sewers are hereby defined as sewers of 150mm, 225mm and 300mm diameter used to collect and convey sewage from properties. Designs for larger diameter sewers shall be subject to specific criteria to be outlined in the design submission.

Design and construction of reticulation sewers shall comply with

- Queensland Water Resources Commission "Guidelines for Planning and Design of Sewerage Schemes"
- Redcliffe City Council nominated Drawings
- Redcliffe City Council Specification and this guideline.

Full engineering plans and specifications prepared and certified by a Registered Professional Engineer (Queensland) shall be submitted for all sewerage reticulation and associated works. All work shall be supervised by a Registered Professional Engineer (Queensland) competent in sewerage work.

The works shall be undertaken by a nominated principal contractor experienced in the construction of Public (Municipal) Works. Council may, at its discretion request evidence of the principal contractor's competency.

On the completion of the works a certificate shall be submitted to Council from the supervising engineer to the effect that the works have been completed in accordance with the approved plans and specifications. Such certification shall include the submission of "as constructed" plans and copies of all relevant test results, including pressure testing on the main.

Where sewers are proposed through land other than that owned by the Developer, written approval shall be obtained from the property owner and submitted to Council with the design drawings. A similar written clearance shall also be required upon completion of the works.

The design shall submit all drawings and design calculations, outlining any assumptions made. Design calculations to be submitted in both electronic and hard copy format for easy data storage.

Redcliffe City Council wish to maintain all design data and records in accordance with the Asset Management Program for the city.

Where an external catchment would be serviced by gravity sewers into the proposed development, the boundaries and area of the catchment shall be shown on the layout plans. Sewers within the development shall be sized to accept the ultimate design flows from the external catchment and the sewers shall be constructed to the external boundary (ies) of the development at lines and levels for the connection of future sewers.

Developer to reference the requirements in accordance with Chapter 14 “Bonding”.

2.1 Preliminary Sewer Concept Plan

Prior to proceeding with detailed design the Consultant shall:-

(b) Obtain from Council "as constructed" sewer information relevant to the proposed development and the approved connection points for the development.

(b) Liaise with Council to ascertain whether a Preliminary Sewer Concept Plan is required. Where Council requires a concept plan, it shall be completed by the Consultant and include the following information:-

- Location, size and alignment of gravity sewers
- Location, size and alignment of rising mains
- Location of pump stations and lift stations
- Contour information generally at 5 m intervals
- Approved sewer connection points
- Contributing catchments (internal and external) showing the equivalent population (EP)
- The flow contributing to each section of main including the estimated design capacity. See Example below:-

EP 965	
Flow	15.4 l/sec
Pipe Size	225 diameter
Max Pipe Cap	25 l/sec

Access for maintenance of the system should be considered when locating manholes etc.

2.2 Trunk Mains

Trunk mains are those major components of Council's Sewerage Scheme deemed necessary to provide services on a regional and district basis. Trunk mains are generally referred to as Headwork mains and are outlined in Council's Policy for Developer Contributions for Water Supply and Sewerage. Construction within Redcliffe City shall be coordinated by Council.

It is a mandatory Council requirement that no sewer connections will be allowed from trunk mains 375mm diameter or larger. In such cases a separate reticulation main shall be provided to service the development.

2.3 Pipe Sizes, Types and Class

(a) Non-Pressure Pipes

The type and class of pipe shall comply with Council's Standard Specification For Construction of Sewerage Reticulation and Associated Works.

Non-pressure reticulation shall be of the following diameters: 150 mm, 225 mm and 300 mm.

Non-pressure house connection single branches shall be a minimum 100mm diameter

Ductile iron class K9 (min) non-pressure pipe may be used in special circumstances where approved by Council as shown on the engineering drawings.

(b) Pressure Pipes

The type and class of pipe shall comply with Council's Standard Specification SS1. Pressure mains shall be of the following diameters: 100mm, 150mm, 225mm and 300mm.

For pressure rising mains, the maximum pressure permitted within the main at any point is 90m. Where pressures exceed 90m then the written approval of Council shall be obtained prior to the lodgement of the engineering drawings.

2.4 Sewage House Connections

(a) General

A single house connection shall be provided at the lowest point of each allotment and at sufficient depth to serve the entire allotment. Single house connections shall not be provided to each dwelling within an allotment or Community Title Scheme.

Council will not permit combined house drains.

House connection branches shall be connected into manholes wherever practical in preference to in line connections.

It is a mandatory Council requirement that where house connection branches cross or commence from road carriageways they shall connect into manholes and be 150 mm diameter minimum.

(b) Size

The minimum diameter of a single house connection branch shall be 100 mm for Residential Precincts and 150 mm diameter in Industrial and Commercial Precincts as per Council's Standard Drawing N^{o} 59706, 59702.

(c) Depth

The upstream invert level of the 45^{o} oblique junction at Council's reticulation sewer (control point) shall be low enough to control the whole of the allotment to be serviced using the following criteria:

- Minimum cover to top of house drain 300mm
- Minimum grade for 100 dia 1 in 60
- Minimum grade for 150 dia 1 in 80

For calculation purposes, the house drain alignment shall generally be 1 metre from side and rear boundaries and 6 metres from the front boundary (may vary in waterfront properties and reduced building alignments). Variation subject to Council approval.

Subject to the above criteria being met the depth of any house connection at the inspection tee as defined on Drawing N^{o} 59706 shall be between:-

- Minimum .....600 mm to top of pipe
- Maximum .....1500 mm to top of pipe

2.5 Alignment of Mains

Mains shall be located as shown in Council's Standard Drawing N^{o} . Any proposed alteration to the alignment must be approved by Council and the relevant Public Utility Authority.

When designing the sewerage system consideration must be given to the accessibility of the mains and manholes located within properties or within Access and Collector Street Roadways where specifically approved by Council (refer above).

Mains shall generally traverse kerb and channel alignments at 90°.

Common trenching for water and sewerage together with any other utility is not permitted.

The minimum clearance between pipe centrelines for pipes of the same "Utility" use shall be the standard trench width for the specific size main in accordance with Council's Standard Specification SS1.

A solid or physical trench separation distance of 300mm minimum shall be maintained for pipes of different "Utility" use eg. power/water, sewerage/water.

No mains shall be located within the rear of a canal estate allotment.

Where Council approves gravity mains within allotments the following offsets shall generally apply:-

- Front and rear boundaries 1.5 metres
- Side boundaries 1.5 metres

Where distances provided above cannot be obtained, details are to be submitted to the Council. Discussions regarding solutions are available for discussion prior to submission.

In extreme circumstances Council may allow an alignment of less than 1.5 metres from front (or rear) boundary. The absolute minimum alignment shall be 0.5 metre offset from boundary line under these circumstances. Approval must be obtained from the Manager Design and Asset Services or nominated representative for a 0.5m offset.

Where sewer lines are located along the road frontage of allotments, the preferred alignment is 1.5 metres inside the allotments, however, to reduce the number of access chambers where truncations occur, the sewer may be located within a zone from 0.5 metres to the building setback less 1.5 metres. A sewer may cross a road to reduce the number of access chambers to be used, provided house connections are not located under the roadway. Approval must be obtained prior to design.

The sewer alignment shall be increased to 2.0 metres from rear boundaries adjacent to inter allotment drainage lines to avoid clashes of access chambers.

Sewer connection to main is to be carried out by Redcliffe City Council sewage operations at the cost of the developer. Contact to be made with eos Civil Solutions on 3883 9644.

2.6 Depth of Sewer

Sewers shall be designed at the shallowest possible depth such that:-

(a) All allotments are served based on the house connection design criteria as per Section 5.2.6

(b) **Council's minimum cover to the top of a pipe is:-**

- **Allotments 0.45m to top of pipe**
- **Footpath 0.6m to top of pipe**
- **Roadways 0.9m to top of pipe**

Where the above minimum covers cannot be achieved consideration may be given to special designs where specifically approved by Council.

(c) There are no clashes with other services including stormwater and Public Utilities and a minimum vertical clearance between services crossing each other of 150mm clear.

(d) Where a main is located in a cut area or its cover reduced by the provision of a driveway to service an allotment then the minimum cover shall be maintained as per (b) above.

The maximum cover to sewer mains shall be in accordance with the manufacturers technical specifications and recommendations for the type and class of pipe used together with bedding trench conditions and soil type and shall not exceed 5.0 metres.

Where design calculations allow the laying of sewers at depths greater than 5.0 metres specific written approval from Council shall be obtained by the Consultant following discussions with Council.

Where deemed appropriate sewers shall incorporate drainage of sewer trenches in accordance with the Councils **Standard Drawing No 59704.**

3.0 DESIGN CRITERIA

3.1 Design Paramaters

3.1.1 Introduction

REDCLIFFE CITY COUNCIL HAS GENERALLY ADOPTED THE WATER RESOURCES – DEPARTMENT OF PRIMARY INDUSTRIES (NOW DEPARTMENT OF NATURAL RESOURCES) GUIDELINES FOR THE PLANNING AND DESIGN OF SEWERAGE SCHEMES, AS THE BASIS FOR ALL SEWERAGE PLANNING ACTIVITIES.

The purpose of this section is to supplement the Department of Natural Resources (DNR) Guidelines with planning information peculiar to Redcliffe City. This section addresses those areas where the specific needs of Redcliffe City differ from the planning and design criteria prescribed in the DNR Guidelines, particularly in relation to information on population densities for various land uses and design flows.

3.1.2 Equivalent Populations

The relationship between population densities (Equivalent Populations – EPs and Equivalent Tenements – Ets) and the various land use zones has been determined through recent planning work. A significant number of planning reports have been prepared which encompass the greater proportion of the City. As part of this process, flow information has been reconciled against populations derived from Census data to establish average flows per EP.

The outcome of this work is to establish typical population densities for various land uses and hence anticipated design flows. This information is to be obtained to perform design calculations. Information based on Census data is available from Peninsula Business Centre or Planning and Environment Division in Redcliffe Council Office. This then forms the basis for deriving design flows for future development scenarios.

Existing population and flow generation is established using Census derived populations and pump station flow records.

3.1.3 Flow Generation

For hydraulic sizing and design purposes, Council has adopted the following sewage generation factors.

- **Dry Weather Flows**

- **Wet Weather Flows**

The Peak Wet Weather Flow (PWWF) shall be 5 x ADWF which is equivalent. The PWWF is the design flow to be adopted in the planning of all sewers, rising mains and sewage pumping stations.

The peaking factor of 5 x ADWF is to be used regardless of the size of the catchment population and is not a 'sliding scale' as adopted in the DNR Guidelines. This figure is assumed to include an allowance for infiltration/inflow (I/I) to the sewer system.

As a general rule, 'if the actual flow in the major sewers and pumping stations exceeds 5 x ADWF, then it would normally be an exceptional wet weather event caused by major flooding and as such, the whole sewerage system would likely be drowned out and unable to cope under such circumstances. If flows in the system exceed 5 x ADWF and occur at a less than acceptable frequency regardless of major flooding, then the sub-catchment should be targeted for an I/I management study.

3.1.4 Sizing/Grades

Pipe Sizing

Generally, sewers of 150mm diameter will flow no more than ½ full at PWWF to provide adequate ventilation in reticulation systems and provide some spare capacity for future redevelopment. Sewers of 225mm diameter or larger will flow no more than ¾ full under PWWF conditions.

However, there is some scope to design sewers of 450mm diameter or larger to flow full at PWWF> The sizing of these large sewers would be considered on a case by case basis taking consideration of the characteristics of the catchment and the particular situation.

Minimum Grade/Self Cleansing Flow

Table 2 provides minimum grade information for various pipe diameters. It also provides capacity and equivalent populations served relative to minimum grade construction.

Adoption of the minimum grades outlined in Table 2 will satisfy self cleansing flow requirements.

Table 2 Sewer Capacity at Minimum Grade

Pipe Dia Mm	[1]Minimum Grade	[2]Capacity of Pipe at Minimum Grade l/s	[3]Equivalent Population Served EP
150	1 in 200	5.38	404
150	1 in 1504	6.22	467
225	1 in 290	24.05	1807
300	1 in 420	43.03	3233
375	1 in 570	66.98	5032
450	1 in 730	96.24	7231
525	1 in 900	130.74	9823
600	1 in 1000	177.08	13304
675	1 in 1200	221.06	16608
750	1 in 1500	261.89	19676

Notes:
1. Minimum grades are as recommended in the DNR Guidelines. A minimum grade of 1 in 150 is preferred for 150 dia sewers, but 1 in 200 is permissible where 1 in 150 is impractical.
2. Capacities are based on 150 dia sewers flowing ½ full and larger diameters flowing ¾ full, with Mannings 'n' taken = 0.013 and internal diameter = nominal diameter.
3. The last length between two manholes or the last length to an end shall have a minimum grade of 1 in 80.

3.1.5 Industrial and Commercial Trade Waste Discharges

Planning for sewage flows from industrial and commercial areas shall be based on EPS as per Table 1. Actual flows should be used wherever available. Predicted flows may be based on information relevant to specific industry discharges.

3.1.6 Pumping Stations and Rising Mains

For planning purposes, pumping stations and rising mains shall handle PWWF with all duty pumps running in parallel. One pump shall be sized to handle maximum flow on a normal day or PDWF (where possible). Generally, pump stations shall incorporate a minimum of 3 to 4 hours storage under ADWF conditions to attend to emergencies such as power failure or mechanical breakdown. This storage can be accommodated in a combination of pump well and sewer capacity.

The design horizon for electrical and mechanical components (pumps, motors etc.) shall be fifteen years and twenty-five years respectively. Civil assets are generally designed for a design horizon of fifty years.

All details regarding electrical and mechanical components are to be provided to Manager Design and Asset Services or nominated representative prior to "On Maintenance" to ensure details are provided to advise of maintenance of components installed.

The minimum velocity in rising mains shall be 0.75 m/s for single fixed speed pumps. A velocity of 0.6 m/s is suggested for dual speed pumps running at single low speed.

The developer is responsible for the supply and installation of all equipment and materials associated with pump and lift stations. This includes the concrete benching in wet well base, provision of the protective and anti-slip coating system, pumps,

electrical cabinet and associated wiring, level control, telemetry, internal pipework, well washer and safety netting system.

Council requires that for each station the location and access to the station be shown on the engineering drawings

Overflows where required, reference shall be provided in accordance with Council's **Standard Drawing Nº 59716A, 59720, 59722, 59723**.

Where stations are not readily accessible from a public road, particular attention to Council's criteria is required as follows:

(i) Vehicle access and site manoeuvrability. For large stations attention should be given to the vehicle type accessing the site

(ii) Access road cross section and drainage

(iii) Width of land required for access road

(iv) Dedication of land for pump and lift stations and access road to Council in fee simple

(v) Access roads for pumping and lift stations shall not be utilised as a part of a stormwater flow path

(vi) Fencing is required for all pumping and lifting stations as follows:-
- In remote or isolated locations
- In Commercial and Industrial Land Zonings
- As required by Council

Pump and lift stations shall be designed in accordance with Council's Standard Drawings including completion of the required details on the diagrammatic layout drawing. The details shown on Council's Standard Drawings are typical only and it is the Consultant's responsibility to provide engineering drawings for the specific pump station.

The noise emitted by infrastructure elements shall conform with the current Noise Protection provisions.

Pumping stations shall be located 10 metres clear of any ground mounted energex transformer and preferably 20 metres clear of the nearest dwelling

The location and design of pump stations will be such that they do not create inconvenience to any adjacent residences in respect to visual amenity and odour.

The Consultant shall complete and submit for approval all tabulations and level information required on Council's Standard Drawings

3.1.7 General Comments

For sizing of components in the planning phase, engineers should use the land use/area basis adopting the EPs for areas that are not developed, and tenement counts applied with the appropriate population density for developed areas to determine equivalent populations. Where census and flow information is available for developed areas, this data should be used. Known trade waste discharges shall be used where available.

Any available I/I information for individual catchments and sub-catchments should be used for the comparison of theoretical and actual peaking factors.

* at ends of lines where ends are more than 35 metre from previous access chamber
* at ends of lines where more than two properties are connected
* at the lower side of the allotment
* clear of property boundary

3.2 Pump Well Criteria

Pump wells shall meet the following criteria:-

- When determining the well diameter and opening size, particular attention should be paid to the type and volute size of the pumps chosen to ensure the pumps are free of obstruction for installation and removal
- Stations with incoming flows in excess of 30 l/sec shall have a dividing wall and inlet structure in accordance with Council's Standard Drawing.
- The minimum storage depth allowable is 300 mm
- Each station shall have only one inlet. A receiving manhole shall be provided where more than one sewer main is to discharge to the station
- Stations shall be fitted with an automated well washing facility approved by Council
- All internal surfaces shall be protected by a suitable protective coating system
- When determining the civil design of pump station structures over 4.0m deep, calculations shall be provided to Council with regard to flotation where applicable. The design factor of safety shall be 15% (structure only)
- The velocity for sewerage pump and lift station internal pipework shall be in the range of 1.5 to 2.5 m/sec
- Flanged pipes within the wet well shall be provided with a factory applied external epoxy protective coating system
- Flanged fittings within the wet well shall be provided with a factory applied thermal bonded polymeric protective coating system
- Pump and lift station light weight aluminium covers shall be externally coated with an anti-slip protective coating system in accordance with Council's **Standard Drawing No. 59721**.
- Pump well and valve chamber openings shall be provided with an approved safety netting system in accordance with Council's Standard Specification.

3.3 Connection to Existing Mains

All connections and disconnection's to live sewer mains shall be made by Council at the Developers expense. The contract for development work should make provision for adequate liaison with Council regarding Council's scheduling of the works.

All requests for works to Council's live mains shall be in writing and include design details of the work required.

The Contractor is responsible for any "as constructed" data associated with connections to existing mains.

3.4 Easements

An easement in favour of Council shall be provided by the Developer as follows:-

(a) Over all sewers (gravity or pressure) in industrial and commercial sites

(b) Council maintained sewers (gravity or pressure) in group title developments

(c) Any gravity main located more than 1.5 metres off the property boundary or located in any position which could be legally built on within an allotment

(d) All pressure mains located other than within the footpath verge - the minimum acceptable easement width shall be 3.0 metres.

For all of the above, the actual width of the easement shall be determined subject to the following:-

- Size of main
- Depth of main
- Location of main
- Soil conditions
- Topography
- Vehicle access requirements

The information to be detailed on the sewerage reticulation drawings is set out in Chapter. The scales for Sewerage reticulation drawings shall be:-

(a) Plans - generally at a scale of 1:500 or 1:1000
(b) Longitudinal Sections - at a scale of 1:1000 Horizontal and 1:100 Vertical

Longitudinal Sections shall show the equivalent populations, flow and design capacity of all sections of mains.

3.5 End of Lines

The maximum spacing of access chambers shall be 90 metres centre to centre. The access chamber may be omitted from the end of a line provided it has a maximum length of 35 metres and not more than two (2) properties are connected and the gradient of the sewer is not less than 1 in 60. In this case, the line shall end with an approved dead end cap adjacent to the house connection branch.

3.6 Sewer Pump Stations and Pressure Mains

Sewer pump stations and pressure mains shall be designed in accordance with the Queensland Water Resources Commission "Guidelines for Planning and Design of Sewerage Schemes".

Pressure mains shall be minimum 100 mm diameter RRJ uPVC of minimum Class 9 with DICL FBE or equivalent, coated fittings, laid within the verge on a standard alignment of 1.75m (high side) from property boundary with minimum 1.0 m cover.

New sewage pump stations shall make provision for connection to Council's Telemetry Alarm System as follows:-

(a) .Collect a copy of the Council Specification from the Redcliffe Council Engineering Division.
(b) Details to be submitted with design details and submission.

4.0 CONSTRUCTION REQUIREMENTS

4.1 Pipework

The types of pipe allowable for use in reticulation sewers are:-

(a) Unplasticised PVC (uPVC) Class SEH in accordance with the latest revision of AS1260.
(b) Verified Clay Class Z in accordance with the latest revision of AS1741.
(c) Ductile Iron Heavy Concrete Lined Class 9 in accordance with the latest revision of AS2280. All ductile iron pipework shall be poly wrapped to the manufacturers specifications.

uPVC Class SH shall be used for 100 mm diameter house connection branches and a PVC Class SEH for 150 mm diameter house connection branches.

Pipes used for sewer pressure mains shall conform to the latest revision of the following standard:-

100 mm and 150 mm diameter: AS2977 Part 1 Unplasticised PVC (uPVC) pipes for pressure application, compatible with cast iron pipe outside diameters. Rubber ring jointed, Class 16;

Fittings used for pressure mains shall be fusion bonded epoxy coated ductile iron minimum Class K9 and have current approval from the Water Resources Commission.

Pressure test mains by certified party.

4.2 Bedding of Sewers - Sewer Construction Types

The standard types of sewer construction are detailed on Redcliffe City Council **Standard Drawing No. 59702, 59703**. It is the responsibility of the Consulting Engineer to determine the actual type of bedding to be constructed after consideration of actual conditions in the trench.

Pipe bedding material shall be as outlined in Standard Drawing. Any alternative methods are to be submitted with the design proposal and acknowledged by the Manager Design and Asset Services or nominated representative.

Approved filling shall consist of loam or decomposed rock free from vegetable matter and lumps of clay with more than 70% by weight passing the Number 7 BS Sieve. Not more than 30% by weight shall pass the Number 200 BS Sieve. The material passing the Number 7 BS Sieve shall have a miniature abrasion loss not exceeding 15% and the material passing the Number 36 BS Sieve shall have a linear shrinkage not exceeding 6%.

The approved filling material shall be placed in uniform layers not exceeding 150 mm and shall be compacted with the moisture content within the range of 80% - 90% of the optimum moisture content for the material. The compaction standard obtained shall be 95% Standard Compaction.

4.3 Backfilling

(a) *Private Property and Other Non Trafficable Areas*

Backfilling shall be carried out using material from excavation. The material shall be placed in layers not exceeding 300mm in depth and shall be placed by methods to ensure a minimum consolidation of 95% Standard Compaction.

(b) *Roadways and Other Trafficable Areas*

Material used for backfilling shall be a selected material conforming to the requirements detailed in **Standard Drawing 59703**.

(c) *Existing Road*

Refer **Standard Drawing No Drawing No .59703**.

4.4 Flexible Joints

(a) Access Chambers

Short pipes shall be cast into access chamber walls so that the first flexible joints in the pipeline outside the manholes are 150 mm from the outside faces of manhole walls. uPVC or GRP pipes cast into access chamber walls shall be coated or sanded for the entire length of wall penetration to ensure bonding. Propriety brand sanded end connections shall be used, sanded ends manufactured on site will not be accepted.

The first and last pipes outside the access chamber in a line of sewer shall be a length of short pipe equal to three times the diameter. Special care shall be

exercised in compacting the backfilling around the first and last pipes to ensure they are not displaced.

(b) House Branch Junctions

Short lengths of pipe are not required upstream and downstream of an oblique junction for flexible pipes. Where rigid pipes are used a 500mm long pipe shall be located on each side of the house connection branch.

Flexible joints shall be provided to house connections from manholes.

4.5 House Connection Branches

House connection branches shall be constructed in accordance with Standard Drawing details.

Sewer marking tape shall be tied to the cap of the inspection opening and shall extend vertically to be tied to a wooden peg at finished surface level.

4.6 Access Chambers

Access chambers are to be constructed in accordance with the Standard Drawings:-

Standard access chambers shall be designed to permit entry for the purposes of maintenance and shall have a minimum depth in accordance with the above drawings unless otherwise approved. If access chambers shallower than 1.5 metres are approved, a rectangular opening shall be provided.

100 mm diameter black corrugated PVC slotted drainage pipes shall be installed around **all** access chambers to a distance of 1.5 metres minimum upstream and downstream along the sewer pipe. Where possible, drainage relief shall be provided into the stormwater drainage system at convenient locations.

Full cast iron covers in accordance with Standard Drawing No Drawing No.59711 shall be provided in all trafficable areas, park, commercial and industrial areas.

All covers shall be embossed with the word “Sewer”.

Bolt down covers shall be used where required by the Coordinator Design and Traffic, ie below 1 in 20 year flood line.

No step ladders/step irons are to be fitted to access chambers.

Finished surface level of access chambers in private property shall be 50-75 mm higher than surrounding finished surface level.

No backdrop is to be constructed to pre-cast access chamber units without the specific written approval of Council’s Coordinator Design and Traffic.

A precast top slab may be used on cast insitu access chamber walls with the permission of the Manager Design and Asset Services or nominated representative provided that the joint between slab and wall is made perfectly water tight and that an approved lateral restraint detail is used.

4.7 Pressure Testing

Pressure testing for certification purposes shall be undertaken upon practical completion of the development works. The Consultant must provide details of all pressure tests and include them with the engineering certification.

Council is to be notified when the pressure testing is to be undertaken.

The sewer must be pressurised to a minimum air pressure of 30kPa and the pressure held for three minutes. If during this period the pressure in the main falls below 25 kPa the line will be deemed to have failed. The Consultant will decide on the appropriate remedial works to be undertaken and the section will be retested.

5.0 GENERAL

5.1 Live Connections

All works on live sewers shall be undertaken by Council staff at the Developer's expense. This includes the construction of manholes over existing sewers.

5.2 Acceptance "On Maintenance"

The following will be required to be submitted to Council to enable formal acceptance of the works "on maintenance" for a period of twelve (12) months as required by Council.

- Engineering Certification, which shall include the following:
    - As Constructed Drawings
    - Pressure Test Results
    - Compaction Tests on Backfill
    - Grading Analysis of Bedding Material (if requested)
    - Completed pre-on maintenance checklist.
- The provision of a bank guarantee or bond equivalent to not less than 5% of the value of the works (minimum. $1,500) as security for the performance of maintenance obligations. Each item of work must at no cost to the Council:
    - be maintained during its Maintenance Period; and
    - have any latent defects of which the Council gives notice promptly rectified.

Failure to perform the maintenance obligations entitles the Council to call up the whole or any part of a bank guarantee or bond and apply the monies to meet the cost of the Council performing those obligations.

- Copy of receipt of payment of private works account for live connections.
- Copies of written clearances from private property owners affected by the works if applicable.
- Copy of receipt of payment of Permit to Draw Water for Construction Purposes i.e. water used for flushing etc.

CHAPTER 8 - WATER RETICULATION WORKS

1.0 AIM

This guideline has been prepared to serve as a guide to consulting engineers in the preparation of design plans and specifications for water reticulation works undertaken within the boundaries of Redcliffe City Council.

2.0 GENERAL

Water reticulation mains are hereby defined as mains of 100mm to 300mm diameter used to convey water to properties. Designs for larger diameter watermains shall be subject to specific criteria nominated by the Manager Design and Asset Services.

All references to pipe diameters shall refer to the nominal internal diameter of the pipe.

All water reticulation mains shall be designed in accordance with the provisions of the current Water Resources Commission "Design Guidelines for Planning and Design of Urban Water Supply Schemes". Prior to proceeding with detailed design, the Consultant shall seek from the Manager Design and Asset Services his confirmation as to whether a network analysis shall be required as part of the design submission. If an analysis is required the Consulting Engineer will provide relevant design information.

In "special" industrial areas, as designated by the, additional pressure for fire fighting flow purposes must be considered in the hydraulic analysis.

Any new mains to be positioned on State Controlled roads are to be confirmed with Main Roads prior to commencement.

All connections or alterations to Council's water reticulation mains, shall be arranged by Manager Design and Asset Services, at the developer's expense. Formal application including two (2) copies of the relevant plans for Council cost estimates for the works to be undertaken shall be forwarded to the Manager Design and Asset Services. Development works will not be accepted "On Maintenance" or permitted to be occupied until such time as Council cost estimates have been obtained, and paid. The new main shall be laid a maximum of 2.0 metres from Council's existing main and shall be laid in line horizontally and vertically with the existing. Any additional costs incurred during the connection works undertaken by Council due to the new main being on an incorrect alignment shall be at the Developer's expense.

The design of the water reticulation will take into consideration all external demands that are presently acting on the system or are likely to do so in the future.

Council's commercial unit may be contacted to provide "As Constructed" and performance information on existing mains.

Where, as a result of the development, existing mains are located on non-standard alignments or have less than minimum cover, the developer shall bear the cost of relocation, replacement or lowering, subject to the approval of the Manager Design and Asset Services. Pavement widening associated with some developments can place existing mains under the new pavement. In such cases the developer shall bear the cost of its replacement in a material approved by the Manager Design and Asset Services.

Full engineering plans and specifications prepared by a Registered Professional Engineer (Qld) shall be submitted for all water reticulation and associated works for approval by Council. All work shall be supervised by a Registered Professional Engineer (Qld) competent in water reticulation works.

The works shall be undertaken by a nominated Principal Contractor experienced in the construction of Public (Municipal) Works. Council may request evidence of the Principal Contractors competency.

On the completion of the works a certificate shall be submitted to Council from the supervising engineer to the effect that the works have been completed in accordance with the approved plans and specifications. Certification shall include the submission of "as constructed" plans and copies of all relevant test results. **The maintenance period for water reticulation works shall be for a period of 12 months**. The Council shall prior to accepting the works "on maintenance" require the provision of a bank guarantee or bond equivalent to not less than 5% of the value of the works as security for the performance of the maintenance obligations. Each item of works must at no cost to the Council :-

* be maintained during its Maintenance Period ; and
* have any latent defects of which the Council gives notice promptly rectified.

Failure to perform the maintenance obligations entitles the Council to call up the whole or any part of a bank guarantee or bond and apply the monies to meet the cost of the Council performing those obligations.

2.1 Easement

Where required for normal access and maintenance, an easement (minimum width 3.0m) in favour of Council shall be provided by the Developer as follows:-

(i) Within private property
(ii) Council maintained water mains in group title developments

2.2 As Constructed

All "as constructed" requirements shall comply with Chapter 15. of the manual.

2.3 Specification

The specification for water supply reticulation shall conform with the technical requirements of Council Standard Specification for Water Reticulation SS2.

3.0 MATERIALS

3.1 Pipes

All pipes and fittings shall be manufactured by a quality endorsed company with current AS 3902 accreditation, or shall be inspected and tested by the Water Resources Commission.

Only mains of the following nominal diameters shall be used within the City

100mm; 150mm; 225mm; 300mm.

Pipes used for watermains shall conform to the latest revision of the following standards:-

- Pipes shall be uPVC rubber ring jointed thick wall Class 16 conforming to the requirements and tests of AS 2977.1 and the requirements and tests of the Local Authority Services Division of the Queensland Water Resources Commission. The pipes shall be suitable for a maximum working pressure of 1.6 MPa and shall have outside diameters which are the same as ductile iron pressure pipes to AS 2280 of the same nominal diameter.

- Alternatively, rubber ring jointed ductile iron pipes of minimum Class K9 conforming to the requirements and tests of AS 2280 and the requirements and tests of the Local Authority Services Division of the Queensland Water Resources Commission, may be used. Ductile iron pipes shall be cement lined internally with a light thickness cement mortar lining in accordance with AS 1281. Pipes shall be externally coated with two coats of bituminous paint, and shall be polyethylene sleeved with coloured lay flat polyethylene tubing of 0.2mm thickness complying with AS 3680, Polyethylene Sleeving for Ductile Iron Pipes.

3.2 Water Service Conduits

Water service conduits shall be 100mm diameter, however larger diameters may be required for industrial and some commercial developments.

Pipes used for water service conduits shall conform to the latest revision of the following standards:-

- rubber ring jointed RCP minimum Class "1" to AS 1646-1973;
- uPVC pipe minimum Class 12; or
- fibre reinforced cement pipe minimum Class "X"

3.3 Hydrants, Valves and Fittings

Fittings shall conform to AS 2280, latest revision, and shall be cast iron or ductile iron, cement lined, minimum Class K9, and have current approval from the Local Authorities Services Division of the Queensland Water Resources Commission.

The use of 100mm diameter uPVC fittings conforming to AS 2280 will be permitted.

All flanges shall conform to Table "C" of AS 2129. Bolts shall be Grade 316 stainless steel.

Ductile iron fittings shall be polyethylene sleeved to AS 3680 and AS 3681.

22m minimum pressure at the building pad except firefighting which is 12m under fire fighting flow.

Pressure Reducing Valves

> *Where the pressure in mains exceeds 800 kPa Council may require the installation of a pressure reducing valve. Council shall be provided with details of the area affected and the number of lots involved.*

Where such installations are approved by Council, they shall generally be in accordance with Council's **Standard Drawing Nº 59607**.

Sluice valves shall be cast iron bodied conforming to AS 2638 and be Class 14 minimum, and have counter clockwise rotating spindles for closing.

Valves and hydrants shall be fusion bonded epoxy 250 micron thickness or approved equivalent coating and have current approval from the Local Authorities Services Division of the Queensland Water Resources Commission.

Valves shall be resilient seated with a wedge type gate.

Prior to the installation of any valves, hydrants or other fitting the following information shall be provided to Council:-

- Name and address of supplier(s) and manufacturer, if not the same as supplier(s);

- Evidence of Queensland Water Resources Commission Local Authorities Services Division approval of the valves and fittings to be supplied.

Rubber jointing rings shall be of sizes and type to suit the type of pipe used, shall be approved by the Joint Committee, Standard Water Supply and Sewerage Bylaws, and shall comply with the requirements of AS 1477.6 Unplasticized PVC (uPVC) pipes and fittings for pressure applications - Rubber Ring Joints.

3.4 Bedding and Backfill

The standard types of water main construction are detailed on **Standard Drawing No 59602**. It is the responsibility of the Consulting Engineer to determine the actual type of bedding to be constructed after consideration of actual conditions in the trench. Type O construction shall not be used without the prior written approval of the Manager Design and Asset Services

All water mains constructed from non metallic materials shall have a conductive marker tape installed in the back fill. The tape shall be made from polythene, not less than 100mm wide. the tape shall have two stainless steel wires not less than 0.7mm diameter bonded to the polythene tape. The tape shall be coloured green and bear the imprint "Redcliffe Water - High Pressure Water Main Below". The marker tape shall be exposed inside each valve and hydrant box, and shall be continuous between adjacent surface boxes. Joins will not be allowed between adjacent surface boxes.

3.4.1 Approved Bedding

Bedding sand shall be provided to ensure a minimum of 100mm below the pipe to 150mm above. The bedding sand shall be uniform in quality and free from dirt, clay and other foreign matter and shall conform to the following specification:-

A sand coarser than the above or exhibiting similar properties may be approved by the Manager Design and Asset Services.

Reference should be made to "Water Reticulation Code of Australia".

Approved filling shall be placed above the bedding to a minimum height of 150mm above the approved bedding. This shall be a sand or sandy loam material, free from vegetable matter and lumps of clay with more than 70% by weight passing the 2.4 mm sieve. Not more than 30% by weight shall pass the 75 mm sieve.

The material passing the 2.4 mm sieve shall have a miniature abrasion loss not exceeding 15% and the material passing the 425mm sieve shall have a linear shrinkage not exceeding 6%.

Approved filling as specified above shall be used in footpaths and other non trafficable areas.

In roadways and other trafficable areas, refer to "Water Reticulation Code"

3.4.2 Backfilling

Footpaths and Other Non Trafficable Areas

Backfilling shall be carried out using selected material from excavation. The material shall be placed in layers not exceeding 300mm in depth and shall be compacted to a minimum consolidation of 95% Standard Compaction.

New Roads and Other Trafficable Areas

Backfilling above the bedding to the underside of the pavement box shall be a selected material conforming to the following requirements.

The material shall be a gravel or decomposed or broken rock, free from vegetable matter and lumps of clay and shall have the following properties:-

CBR 15

Grading	75 mm 100
2.36 mm	25-70
75 μm	0-30

Miniature Abrasion Loss
(passing 2.36 mm sieve) 0-15

For the portion of material passing the 425 μm sieve

Liquid Limit	0-35
Plasticity Index	0-12

Linear Shrinkage 0-8

The material retained on the 2.36 mm sieve shall consist of sound stone.

The material shall be placed in layers not exceeding 300mm in depth and shall be compacted to a minimum consolidation of 95% Modified Compaction.

Existing Trafficked Roads

Backfilling of trenches within existing roads shall be carried out using approved bedding sand, lean mix concrete and asphalt surface restoration.

-Minimum 450mm lean-mix concrete above approved backfill.

4.0 LOCATION AND ALIGNMENT

4.1 Water Main

Minor horizontal centreline deviations being permissible provided the main remains entirely within the allocation width shown on the above drawings. At the point of connection with Council's existing water main, the new main shall be laid a maximum of 2.0 metres from the existing main and shall be laid in line horizontally and vertically with the existing. Any additional costs incurred during the connection works undertaken by Council due to the new main being on an incorrect alignment shall be at the Developer's expense.

4.2 Water Service Conduits

- Location

  From boundary to boundary when produced square from the kerb; selected so as to minimise the angle of the conduit across the road. Refer to **Standard Drawing No 59605**.

- Conduits shall extend 300mm behind the back of kerb; be laid at a minimum 600mm below top of kerb; be located to avoid conflicts with electrical conduits and pillars; and have a metal plate inscribed "W" placed in the kerb above.

4.3 Hydrants

- Location:-

- opposite RP boundaries.

Spacing:of 80m apart, and to be marked on the road pavement for easy identification by Emergency Service vehicles and maintenance units. Hydrants shall be identified on the road surface by the placement of a blue delineator (raised pavement marker) as detailed in **Standard Drawing No: 59612.** .

Where a hydrant is placed at the end of a water main which will not be extended in the future, eg in culsdesac; the hydrant shall be installed with a hydrant bend located 5 metres from the boundary of the last property serviced, or the nearest truncation point, whichever is the greater. In cases where the main may be extended in the future, a

hydrant tee and deadend shall be used, located as near as practicable (<0.5m) to the development boundary or nearest RP boundary.

4.4 Valves

- **Location:-**

  opposite the first truncation point at a threeway intersection; or opposite the nearest RP boundary.

- **Spacing:-**

  at a maximum spacing of 300 m; and to all tees to the leg of the tee and on one side of the head.

  Valves shall be installed where necessary to isolate sections of the system for maintenance purposes such that maintenance can be carried out causing minimum inconvenience and disturbance to the consumers. Generally the maximum number of houses inconvenienced should be 30.

  All valves shall have the surrounds painted in a yellow paint as detailed **Standard Drawing 59606, 59608, 59610, 59611**.

5.0 COVER

The minimum cover for mains of 100mm and 150mm diameter located in the verge and other non trafficable areas shall be 600mm to the top of the pipe.

The minimum cover for mains of 225mm and 300mm diameter shall be 750mm to the top of the pipe.

The minimum cover for roadways and other trafficable areas shall be 900mm to the top of the pipe.

Where normal cover for mains is unable to be maintained due to the presence of existing services or other restricting factors ductile iron pipe, may be used, subject to the approval of the Manager Design and Asset Services..

Mains shall not be laid under stormwater, sewerage pipes or electricity conduits unless approved by the Manager Design and Asset Services.

6.0 JOINT DEFLECTION

Joint deflections, to manufacturers recommendations, or DICL bends shall be provided at every change of direction of property boundaries.

7.0 SEPARATION

The minimum separation between the water main and other services that cross the mains path is 300mm.

No other services shall share a trench with the water main.

8.0 HYDRANT AND VALVE INSTALLATION

Hydrants and Valves shall be installed in accordance with **Standard Drawing 59611**.

9.0 DEAD ENDS

Dead ends not adjacent to a hydrant shall be provided with a scouring and/or dosing point.

10.0 THRUST BLOCKS

Concrete blocks in accordance with **Standard Drawing No 59604,** shall be placed at all bends, horizontal and vertical tees, angle branches, crosses, dead ends, reducers, or other places where there is an unbalanced hydraulic load.

The concrete used for the blocks shall be Class N25 concrete. The blocks shall be cast at least seven (7) days prior to pressure testing of any section of mains. All concrete must be placed against solid undisturbed ground. Special attention is required where underground power is to be laid on the same side of the road as the watermain to ensure the integrity of the thrust blocks.

For vertical bends with an upward thrust additional concrete shall be placed so that the mass of concrete is greater than the thrust on the filling. Sufficient steel reinforcement shall be included to bind the weight of the block below the pipe centreline to the upper part of the block. These thrust blocks shall be designed to manufacturer's specifications.

11.0 WATER SERVICE CONNECTIONS

Water service connections are not normally required, however shall be installed if required by the approval conditions or if the proposed water service connection point is to be located under proposed concrete footpath / bikeways or driveways. Water service connections shall be installed by the Council at the cost of the developer.

12.0 WATER METERS

Water meters are not normally installed at the time of subdivision, except in the case of Community Title Schemes, where the common meter, usually 100mm diameter is installed by Council at the Developer's expense.

13.0 FLUSHING AND STERILISATION

The main is to be flushed prior to chlorination. After flushing the main shall be charged with water and chlorine in an approved form, to be introduced to the main in such a quantity as to give a residual chlorine content in the mains of 50mg/L capacity of the mains to be treated. This is to be held in the main for a period of 24 hours.

The mains shall be retested for a residual chlorine count of 5mg/L before flushing the chlorinated water out of the mains. If a residual count of 5mg/L is not obtained, then the mains shall be scoured, re-chlorinated and the above procedure repeated.

Before any water main is placed "On Maintenance" the laboratory quality tests results shall be supplied to Council by the Supervising Engineer. These tests should be carried out by a laboratory with National Association of Testing Authorities Australia (NATA) registration. Reports must include standard plate count, total coliform and E-coli; and provide a written recommendation as to the suitability of the newly constructed watermains to be connected to the water distribution system.

Results forwarded to Council for Bacteriological Tests should be within the following ranges:-

1. Total Bacteria Count < 100
2. Coliform Count 0
3. Faecal coliform count or E-coli 0

Results higher than the above limits are unacceptable.

Results to be provided to the Manager Design and Asset Services prior to acceptance "On Maintenance".

14.0 PRESSURE TEST CRITERIA

The mains, including valves, shall be pressure tested to 1200kPa. Once the test pressure is reached, it shall stand without make up water for fifteen (15) minutes. The test shall be considered to have passed if no make-up water is required to maintain pressure.

The pressure test must be certified by the an RPEQ .

The certification is to be supplied with the Engineers Certificate for the completed works.

CHAPTER 9 - LANDSCAPING

For Subdivisional and Site Development Works

1.0 AIM

The aim of this guideline is to provide the requirements of REDCLIFFE CITY COUNCIL for the inspection and certification of Landscaping works which will become part of the City's infrastructure

2.0 GENERAL

The details provided are to be used as a guide only. As each site has individual and unique characteristics in the landscaping design. The work to be considered and submitted as part of the Landscaping plan and specifications consist of details outlined under the Redcliffe Landscape and Streetscape Guidelines.

A copy of these details are available from Manager Design and Asset Services.

Vegetation of cut and fill batters, median areas, footpaths, verges, and other areas within the site. Vegetation includes the initial surface preparation, topsoiling, fertilising, turfing, hydro-seeding, hydro-mulching, and mulching into additional to plants and irrigation systems.

2.1 Landscape Drawings

Fully detailed landscape drawings must be prepared by a suitably qualified Landscape Architect or designer, and submitted to the Manager Design and Asset Services for assessment.

2.2 Planting Areas and Street Trees

Planting areas (or garden beds) on the verge/footpath will only be approved at feature locations or where the design of the site lends itself to a planting area or landscaped area.

High maintenance plants will not be accepted. Plants and colour are to play an essential role in creating character and interest within the Redcliffe landscape. The selection of plants is to reflect the image of Redcliffe City. Details regarding the Landscape Strategy and suitable plant types can be discussed with Redcliffe Council .

A tool which can be utilised to help identify the type of trees and shrubs to use is the Redcliffe City Council " Streetscape and Landscape Guidelines". A copy is available from the Parks and Landscape Planner.

A key issue of plant selection is to consider maintenance.

- **Maintenance**

Maintenance aspects that would need to be considered:

- The provision of long life plants rather than short, as in local climate, plants may go extended periods without watering(especially when water restrictions are in place)

- Species chosen must match the planting space available. Adequate space must be provided to allow root growth to proliferate within the space, and not into adjacent surfaces / structures

Should plants be chosen which may incur root growth then measures shall be implemented during development (ie root guarding) with the approval from the Councils representative.

Other considerations include:

- Minimum watering and pruning

- No interference with existing above and below ground services, signage, street lighting, footpath, kerb and channel structures

- Sub surface drainage from medians, traffic islands and kerb and channel is not affected from discharging along the length of the system

- Trees shedding leaves do not impact on functioning gullies and baskets. Choose plants and trees, which are less inclined to impact on drainage channels, and utilise leafy tress in park areas and away from kerb and channel.

Tree Locations

Planting is recommended to be avoided in the following areas:

- Within 3 metres of:
- Power pole;
- Driveway;
- Invert Crossing;
- Inspection boxes;
- Fire hydrants;
- Water valves
- Within 5 metres from the departure side of a pedestrian crossing;
- Within 6 metres from the departure side of a bus stop;
- Within 7 metres of a street light; If installed to be offset midway between poles.
- Within 10 metres of the departure corner;
- Within 15 metres of the approach side of a pedestrian crossing and from the approach corner
- Within 20 metres from the approach to a bus stop
- Within the vicinity of impeding the visibility of regulatory signs.

Any variances from the details provided are to be approved by the Manager Design and Asset Services or nominated representative prior to implementation.

Tree List

Trees and plants recommended for use within different regions of Redcliffe are available from Manager Design and Asset Services.

3.0 MATERIALS

3.1 Topsoil

The Contractor shall use topsoil stockpiled on site in compliance with the details covered under Earthworks. Where imported topsoil is required it shall comply with AS4419 and that detailed under Council Specifications. Material shall be:

- of a friable, porous nature;
- free of weeds and weed seeds, bulbs, corms and vegetable matter;
- contain no refuse or materials toxic to plant growth;
- contain no stumps, roots, clay lumps or stones larger than 50mm in size;
- have an organic content of at least 3 per cent by mass;
- have a pH neither less than 5.5 nor more than 7.5;
- have a soluble salt content not exceeding 0.06 per cent by mass

3.2 Turf

The Council wish to reserve the

3.3 Fertiliser

Fertilisers shall be detailed in Landscaping plan, with chemical type, type of application, Application rate, NPK, Wetting agents used, Analysis and purpose described in specification.

3.4 Water

Water to be of a non potable water source. Discussions can be made with Council Officers regarding alternative sources of water supply.

3.5 Mulch

Mulch shall be free from stones, soil, clay, dust, weeds, roots, sticks, rubbish, vermin, insects, pests, fungus, disease and other deleterious material. It shall be free from matter toxic to plant growth.

Redcliffe City Council recommend the use of one of the following mulch types.

- Organic Mulch
- Inorganic Mulch

Redcliffe Council is currently preparing a detailed plan of the intended streetscape. Prior to submission discussion with the Landscape Architect is requested to confirm intended design.

A sample of the nominated product to be provided to the Manager Design and Asset Services or nominated representative if required.

3.6 Sprinkler Systems

Details regarding work carried out under the general heading of irrigation system where shown on the Drawings or specified.

Details to be outlined on the Landscape Plan, and supported with relevant specifications, design of the irrigation system, certification of the design, provision of design warranties, provision of maintenance details, and connection / compliance with current Council water requirements.

Commissioning of the system is dependant on the following details:

- Testing of the system;
- Providing of the operational performance of the system;
- Provision of "As Constructed" Drawings";
- Provision of operating manuals;
- Provision of construction warranties

The design of the irrigation shall be carried out by an experienced person who is qualified as a Certified Irrigation Designer. The water supply component shall be designed by a civil engineer with experience in municipal water supply installations. The design and drawings shall be certified by an RPEQ engineer.

3.7 Bollards

Type and location of bollards to be used in Redcliffe City are to be discussed with Council Officers prior to submission of design details.

Issues to be considered include:

(a) Material type;
(b) Size of the bollard;
(c) Impact effect with vehicles;
(d) Location behind kerb in relation to vehicle movement over kerbs;
(e) Maintenance and replacement issues;
(f) Local area style
(g) Safety

4.0 ON MAINTENANCE INSPECTION

"On Maintenance" inspections of the dedicated open space areas should be carried out generally in accordance with this Section of these Guidelines.

The Consultant is responsible for ensuring that the Council's open space requirements are presented in accordance with the Development Conditions and general category classifications as set out in Section 6.2.2 of these Guidelines.

The "On Maintenance" inspections will generally include, but are not limited to, inspection of the following:-

- Topsoiling and seeding/grassing to prescribed areas
- Low maintenance and constant grades to mowable surfaces
- Minimum 50mm surface variations where defined
- Stormwater outlets, pollution and siltation control devices are completed and operational
- Maximum longitudinal grading of swales etc of 1%
- Removal of debris, rubbish, dead *and dying trees*, and rocks larger than 25mm depending on future open space use
- Removal of all declared noxious and/or recognised environmental weeds
- Provision of designated utility connections (sewer, water and electrical reticulation) including appropriate metering and protective devices.
- Provision for vehicle exclusion
- Restoration planting to assist wildlife corridors and cleared areas
- Adherence to landscape plans, management plans, irrigation plans etc
- Provision of approved playground equipment/recreational facilities
- *Playing fields require level playing surfaces.*
- *"A" grade turf (weed free).*
- *Where parks have frontage to waterways, the treatment of the foreshore should correspond with the outcomes of an impact assessment statement (if appropriate)*
- Provisions of approved irrigation systems (where provided) including appropriate metering and protective devices.

Notwithstanding normal cadastral survey requirements 1.5 metre marker posts shall be located adjacent to each corner peg of dedicated Public Open Space areas that adjoin urban, industrial and rural allotments. The purpose of these marker posts is to reduce fencing errors and to better define Council's maintenance responsibility.

5.0 OFF MAINTENANCE

The inspections will generally include, but are not limited to, inspection of the following:-

- 80% coverage of specified grass to prescribed open space areas *(playing fields 100%)*
- Mowable surfaces are easily maintained
- Declared plants and/or recognised environmental weeds
- Successful establishment of landscaping and tree planting (ie landscape works)
- Stormwater outlets, pollution and siltation control devices are functional
- Overland flow paths and swales etc are low maintenance
- Approved playground equipment/recreational facilities is functional
- Foreshore treatments to waterway frontages are performing in a sustainable way as outlined in an impact assessment statement (if appropriate)
- Irrigation systems (where appropriate) are functional.

CHAPTER 10 - WATERFRONT DEVELOPMENT

1.0 CANALS

All canals, revetment walls and associated facilities required in a canal subdivision shall be designed and constructed in accordance with the Canals Act and in accordance with the canal layouts approved by Council at the time of consideration of the preliminary approval under the Canals Act. Such design and construction shall meet the following minimum requirements:-

(i) The canal access from the adjacent channel shall be constructed to the approved depth and shall include appropriate structures to prevent infilling and siltation, ensuring stability of adjoining properties and improvement.

(ii) The beach profile shall be constructed for long term stability with due consideration to tides, boat wash and wind induced waves. Additional consideration of beach construction shall allow for ease and access to perform maintenance.

(iii) The seaward face of revetments (reinforced or mass concrete wall) shall align with the allotment RP Boundary. Reinforced concrete walls should be designed, with a minimum design life of 40 years. The footing of the wall shall be located minimum 300mm below L.A.T. for the site.

(iv) The location of revetments / walls shall be such to ensure that:-

- The waterway provides a suitable navigation channel
- Provides for reasonable boat storage on pontoons or jetties for each waterfront property.
- Maintains the water quality within the waterway during normal tidal flows.
- Midge populations can be controlled
- Maintains flood conveyance and flood storage requirements during flood flows.

2.0 CONSULTATION

1. Consultation with public authorities is necessarily more comprehensive in the case of waterfront developments. Design proposals shall not be reviewed by Council until all relevant approvals required by public authorities have been obtained. Relevant public authorities include:

   Council shall provide allocated locations for services, but all further approvals are conducted through the relevant authority.

   It is the responsibility of the developer to comply with all State relevant acts and requirements. It shall not be the responsibility of the Council or any acting officers to verify all details are in compliance.

   Some relevant agencies include:

- The Environment Protection Agency
- Queensland Transport
- Department of Natural Resources & Mines

3.0 GENERAL REQUIREMENTS

There are general requirements pertinent to waterfront development which are applied by Council or other public authorities. These requirements include:

- No adverse effect to flood levels in the area.
- No adverse effect to erosion or deposition conditions within the existing environment.
- Revetment walling is to be located with the property boundary.
- Design of canals shall be undertaken to minimise maintenance
- Design shall allow for maintenance access
- Maintenance of water quality
- Requirements of all State government compliance is achieved.

4.0 LAND RECLAMATION

A detailed foundation investigation shall be carried out by a registered Professional Engineer Queensland (RPEQ) practising geotechnical engineer to determine the long term bearing capacity of the site. The investigation shall include the bearing capacity of the in-situ and fill components of the foundation. It shall predict the settlement of the finished surface through time (without structural loading). The foundation investigation shall specify any procedures or provisions to ensure that the foundation performance of the site will be suitable for the proposed types of site development in accordance with AS3798.

During construction of the site fill testing shall be carried out in accordance with the nominated processes in the chapter. All details shall be inspected by the Coordinator Design and Traffic or nominated representative. The Council reserves the right to implement a qualified geotechnical engineer during the construction process to monitor the earthworks operations. All associated costs are to be borne by the Developer.

The design of structural foundations should be carried out by a qualified practising structural engineer to ensure compatibility with the inherent foundation properties of the proposed site.

Provision shall be made for the developer to provide certification that all allotments have met the bearing capacity strength of the original design characteristic for residential construction

5.0 PLANNING CONCEPTS

1. Consideration should be given to design of artificial waterways which are more natural in appearance than conventional rectilinear key type canal developments, exhibit superior mixing and tidal exchange performance and which permit straightforward maintenance.

2. The location of parks and reserves within the development should be judiciously selected. Location of parks and reserves at the head of canals is desirable. Discussion should be carried out with RCC officer.

3. Depths shall constructed and maintained consistent with navigation and other requirements, in order to maximise tidal flushing and mixing by wind action. The development is to ensure that the construction and design provides long term access and usage of the canals without costly dredging maintenance.

   Canal depths shall allow for movement of siltation into and around the canal development and the effect the siltation has on canal batter shapes and pontoon placement.

4. The factors involved in selection of water depth for navigation and mooring areas are as follows:

   - draught of boat
   - underkeel clearance (UKC)
   - allowance for sedimentation.
   - batter slope
   - width of boat (deeper allowance to be made under boat)
   - width and make of pontoon (now and future designs)

5. Water quality within canals must be such that the following are not adversely affected:

   - occasional swimming and wading
   - boating
   - passive recreation
   - visual aesthetic acceptability
   - freedom from excessive plant and algal growth
   - the maintenance of a complete aquatic faunal community.

6.0 PLAN GEOMETRY

Wherever possible, the design of the canal development should incorporate the following factors to promote optimal mixing and exchange:

- Provision of bends and meandering canals, and elimination of poorly flushed pockets and coves;

- Provision of additional tidal prism at the head of canals by creation of a lake or basin;
- Modify any existing entrances if the canal development increases from that of original concept.

- Orientate channel openings to factor principal wind directions.

Canal orientation with prevailing winds, tidal currents and wave action to minimise impact on canal bank.

7.0 WATERWAY DEPTHS

1. Canal centre depths throughout the canal system shall be uniform or graded towards the canal entrance(s).

2. Depths should be sufficient for safe navigation by craft likely to use the waterway. Reference to be made Queensland Transport – Regional Harbour Master

3. A maximum canal depth of 2 metres is preferred, depending on design levels and considerations for profile and craft access requirements.

4. Suitable allowance shall be made for sedimentation and bank stability in establishing the design canal depth.

8.0 WATERWAY (CANAL) WIDTHS

1. Two measurements for canal width can be distinguished:
   - navigation width: width of canal at the navigation depth
   - overall canal width: width of canal between the top of the revetment walls.

2. The navigation widths for Main Canals and Side Canals shall be sufficient for safe navigation by two way boat traffic respectively, taking into account the size of craft likely to use the waterway. Minimum navigation widths shall be used as a guide:
   - Main Canal $5 \times B_{max}$ or 20m whichever is the greater
   - Side Canal $3 \times B_{max}$ or 15m whichever is the greater
   - Where B_{max} is the maximum beam of the craft likely to use the waterway.
   - Where any structures or moored craft encroach into the navigation width, a clear distance of $5 \times B_{max}$ and $3 \times B_{max}$ shall be provided in Main Canals and Side Canals respectively, measured between structures or craft moored on opposite sides of the canals.

3. The navigation width of the entrance channel shall be sufficient for safe navigation by craft likely to use the waterway taking into account the degree of exposure of the entrance, but shall not be less than 25m.

4. The overall width of any canal shall not be less than 50m.

5. The Department of Transport / EPA may require that the overall width of canals be increased above the minimum value where it is considered that such widening is necessary to improve mixing and flushing characteristics.

6. Determination of the navigation and overall canal widths shall take into account bank and bed stability considerations. An allowance for pontoon design and type shall be considered for all tide levels and materials transported

around the canal and settling on the bottom (ie marine clays) and creating problems with pontoon structures.

7. Width of the canal shall allow for revetment wall on either side of the canal and the positioning of the moorings / pontoons at low tide for boats to anchor safely in the water and allow access to occur.

9.0 WATERWAY LENGTH

1. Determination of the design canal length(s) shall take into account the following main factors:

   - flushing and water quality considerations
   - bank and bed stability
   - boat travel times.
   - Disturbance of PASS (Potential Acid Sulphate) material

Discussions to be held with Council regarding disposal locations and process for PASS material prior to implementation.

2. The maximum distance from the host waterbody to the end of the canal(s) shall not exceed 1 kilometre unless studies are undertaken which establish that water quality will be satisfactory. All details are to be provided under the Development Application.

10.0 WATERWAY CROSS SECTIONS

1. The canal cross-section and edge treatment shall be designed in accordance with sound engineering practice by a registered Professional Engineer Queensland (RPEQ) civil engineer, taking into account the type of soil conditions, the likely range of water levels including long term variations, and the applied forces. All details outlining the tide access to pontoons attached to private properties (or potential for)and the need to reduce maintenance dredging. Engineering studies demonstrating the adequacy of the canal cross-sections and edge treatment shall be made available to the Environmental Protection Agency..

2. The canal cross-section design should conform in principle with the design cross-sections shown in table below. however, alternative designs will be considered which suit particular sites and material conditions.

11.0 UNDERWATER BATTERS AT CANALS AND SHORELINES

1. Stormwater outlets into beach type canals are to be submerged in the canal waters. All sections of stormwater pipe submerged or subject to full flow conditions shall be increased by one standard size to allow for long term growth of marine build up or sediment.

2. All pipes shall comply with material required for salt water conditions.

12.0 STORMWATER MANAGEMENT

1. The proponent is required to adequately demonstrate that the proposed method of stormwater management will not adversely affect water quality within the canal development and host waterbody, or lead to problems associated with siltation and erosion.

2. The canal allotment shall be graded to ensure as much runoff as possible is directed to the street where it may be collected and then directed into the canals through properly designed stormwater outlets. The preferred system of stormwater discharge is by means of a "drowned outlet" constructed below beach level, incorporating suitable scour protection.

3. Wherever practical, stormwater outlets shall be located at points of maximal flushing, or directly within the host waterbody.

4. For canals over 150m in length it is preferred that stormwater outlets shall not be located at the heads of dead-end canals. Outlets should be located a distance from the canal ends (ie 25% from the end) to ensure stormwater can move with tidal action, and not present any health concerns with water quality and length of canal.

5. The crown level within the property is to be such that all but the rear 8m of the property falls towards the road, so that where ever possible the need for rear-of-allotment drainage systems are eliminated provided that the beach material is no smaller than 20mm. However where this can not be achieved, runoff towards the canals from the slope behind the revetment wall shall be intercepted prior to flowing over the revetment wall onto the beach, and otherwise directed into the canal waters without causing beach erosion. The preferred method of collection is by means of a kerb and gutter arrangement incorporated into the revetment wall, with flows then directed via pipework into the canal to discharge below anticipated lowest low water level.

6. Suitable allowance for sedimentation near stormwater outlets shall be made in the design of the canal cross-section and/or access made available for future maintenance dredging.

7. Suitable temporary sediment control devices shall be installed during the construction phase to ensure that sedimentation within the canal system is minimised and sedimentation does not occur within the host waterbody.

13.0 FLOOD CONTROL STRUCTURES

1. Flood control structures usually include a system of canals and weirs which are to be approved by the Environmental Protection Agency. Usually detailed designs for flood control structures are commenced only after the overall canals and flood structures have been mathematically and physically modelled and approved by the Environmental Protection Agency and Council. Preliminary plans are usually prepared as part of a "flood study" which involves modelling procedures.

2. Designs must ensure that the proposed works and any raising of the land will not result in any significant increase in flood levels in the area.

14.0 TIDAL INFLUENCES

1. The level of study of tidal hydraulics necessary to adequately demonstrate the impact of the proposed development on tidal hydraulics, and the effects of the tidal hydraulics on the development, is dependent on a number of factors. It is important that the proponent seek early consultation with the Environmental Protection Agency.

2. The proponent shall assess variations in the tidal characteristics of the host estuary at the development site taking into account cyclic and long term changes in: estuary shoaling and scour, entrance stability, hydrologic input, mean sea level, and any engineering works (such as large scale estuary dredging, entrance works, or other canal subdivisions) proposed or approved by the various government authorities. The implications of these changes to the design and functionality of the canal subdivision shall be established and accommodated.

3. The proponent shall establish the tidal levels at the proposed development site. These levels may be based on existing information supplied by the EPA, where available, or measurements undertaken on behalf of the proponent by a suitably qualified surveyor or civil engineer.

4. There is no minimum acceptable tidal range below which canal developments would not be considered. The degree of tidal flushing will however reduce as tidal range decreases, and this effect must be considered in the water exchange and mixing studies required by the EPA and outlined elsewhere in the guidelines.

15.0 WATER QUALITY INFLUENCES

1. Consideration should be given, where practical, to enhancement of water circulation and/or exchange by the following additional means:
   - provision of an additional entrance(s), not necessarily navigable
   - provision of additional tidal prism by creation, for example, of a lake or basin at the head of the canal(s)
   - provision of bends, curves and island features
   - elimination of poorly flushed end canals
   - alignment of the canals in the direction of prevailing winds
   - mechanical assistance.

2. There would appear to be benefit in aligning canals in the direction of prevailing winds if this is possible, in order to maximise mixing and exchange processes.

3. Fetch lengths in the direction of strong winds should be minimised to mitigate the potential adverse impacts of wind-generated waves.

4. The effectiveness of the wind in developing vertical secondary mixing circulation is increased by increasing the width of the water surface in the canals. It follows that broad canals, and lake-type developments, will exhibit enhanced vertical secondary mixing.

16.0 EROSION AND SEDIMENTATION INFLUENCES

1. Canal developments are to be constructed to requirements set out as guidelines by Council.

2. Long canals with sandy shorelines, and aligned with prevailing winds, are likely to experience littoral drift. Generally speaking, the length and alignment of canals should be carefully considered and the potential for littoral drift balanced against the advantages of wind action for promotion of mixing of canal waters.

3. Shoreline structures which extend across the littoral drift zone, eg. some stormwater outlet designs, should be avoided where relatively high littoral drift rates are anticipated, except where special provision has been made to mitigate beach erosion.

4. In assessing the sediment load carried by stormwater outlets from a given catchment area, it is reasonable to adopt the following sediment quantities per hectare of catchment area per year:

   - partially developed urban catchment 5.5 tonnes/ha/yr
   - fully developed urban catchment 1.5 tonnes/ha/yr
   - rural areas 0.3 tonnes/ha/yr

5. Stormwater outlets should be arranged so as not to directly or indirectly cause erosion or local scour. Consideration should be given to construction of the stormwater outlets and their location.

17.0 STRUCTURES

17.1 REVETMENT WALLS

1. Revetment walls are to be designed as retaining walls certified by a practicing registered Structural Engineer (RPEQ) and submitted to Council for approval. This does not apply to non-load bearing concrete edge strips.

2. Filling is to be composed of material not injurious to the health of the neighbourhood and shall comply with Council's requirements for filling in subdivisions.

   Filling to be carried out in accordance with "Compliance Testing" detailed in Chapter 12.

   Fill to be constructed with good engineering and construction practice.

3. Determination of the full construction height, structural adequacy and stability of the wall or edge strip shall take into account an erosion allowance in front of the wall or edge strip.

17.2 JETTIES, PONTOONS AND BOAT RAMPS

DETAILS TO BE PROVIDED IN RELATION TO QUAY LINES AND CANAL PROFILES

1. Where jetties and pontoons are proposed for canals which serve as floodways, the effect of these structures on the hydraulic performance of the canals shall be taken into account in the hydraulic design of the canals.

2. Jetties, pontoons and boat ramps shall be designed in accordance with sound engineering practice by a registered Civil Engineer (RPEQ) to satisfactorily resist all dead loads and applied live loads. Particular consideration shall be given to the effect of flood currents and debris loading on structures proposed to be located within canals which will serve as floodways.

3. Special design requirements due to the height of water levels during flooding shall also be considered, eg. electrical connections and cut-off levels for mooring piles.

4. Account shall be taken of jetty pontoon, ramp, etc design in assessing the required width of the canals.

5. Public boat launching facilities and marina facilities are generally regarded as unsuitable to a residential canal development because of the difficulty of ensuring adequate privacy for residents. Such facilities should only be considered where adequate and comprehensive environmental safeguards can be incorporated in the design of the development.

6. Public boat launching facilities and marina facilities shall be developed in accordance with the Guidelines in Section 86 of the Harbours Act..

7. Where it is proposed to construct public boat launching facilities within a canal development, consideration shall be given to siting of the launching facilities so as to minimise any adverse noise impacts on adjacent development due to the particular hours of use of the facilities.

8. Where it is proposed to construct marina facilities within a canal development, consideration shall be given to siting of the marina and design of the marina so as to maximise tidal exchange between the marina basin and the host waterbody.

   Ideally, marina basins should be located separately from residential canals and close to the entrance of the overall development.

   Canals shall be designed such that commonly available pontoons (3.5 metres wide, dry berth type) shall have a minimum of pontoon and any part of the canal embankment.

17.3 BRIDGES AND STRUCTURES

1. Bridges and structures shall be designed in accordance with the Specification for Structures and Bridge Design. The design life shall be 100 years and the serviceability design flood shall be 1:20 years. The ultimate limit state, that is the capability of the bridge to withstand a flood without collapse, shall be 1:2000 years.

2. Where canals are narrowed at bridge locations, it is likely that complete rock protection of the banks and bed of the canal will be required. Lowering of the canal bed to reduce velocities may also be required.

3. The vertical clearance of any proposed bridge should be checked with the Waterways Authority, and shall not be less than the existing at the Griffith Road bridge.

4. Where a canal entrance cuts pedestrian access along a public foreshore (eg. by removing the intertidal area) then a footbridge should be provided to ensure continuance of public access and amenity.

CHAPTER 11 - PUBLIC UTILITIES

1.0 AIM

This chapter is intended to provide supplementary information to expand on some of the elements included under Public Utilities in the submission of details for Operational Works.

1.1 General Requirements

Unless stated otherwise, the Developer is responsible for the design and coordination of the public utility services, including liaison with relevant public utility authorities, supply and installation of all service conduits, including the provision of all services, and/or conduits along the full length of any rear allotment access. The Developer must also meet the cost of any alterations to the public utility mains, existing mains, services or installations required in the connection of the development.

If road widening is required along the frontage of the development, the Developer must relocate the services on the correct alignment within the verge. In some instances, the services may need to be lowered to provide sufficient cover when the footpath is regraded to the design profile.

2.0 STREET LIGHTING

If the road lighting is to be installed on a non Redcliffe City Council road, a submission is to be made with Main Roads. Information regarding delegated roads can be obtained from Redcliffe City Council Office.

The Guidelines have been prepared for the guidance of Developers and their Consultants to ensure Council's requirement for street lighting is achieved.

A copy of design approval letter and layout to be made to Council.

2.1 Objectives

The objectives of Street Lighting is to increase the safety and amenity of pedestrians and to improve traffic operations at intersections and hazardous locations.

The relative significance of these objectives vary between Major Traffic Routes and Minor Streets.

On Major Traffic Routes the lighting is referred to as Route Lighting and is classified in AS1158 as Category A lighting.

On Minor Streets the lighting is classified in AS1158 as Category B lighting.

Council requires that the Developer shall appoint a Principal Consultant to liaise with Council. The Principal Consultant shall be Council's only contact for the design and construction of street lighting.

Street lighting (and electrical reticulation) drawings are to be submitted to Council for approval at the same time the civil works drawings are submitted. This is required to ensure that services do not conflict and comply with these Guidelines, Councils standard drawings and specifications.

2.2 Location of Street lighting Services

The service corridors and alignments must conform to relevant Standard Drawings and in compliance with Energex approval.

2.3 Process

The Developer must appoint a suitably qualified consultant to liaise with Council for the approval of street lighting.

The consultant must be a Registered Professional Engineer in Queensland.

Upon completion of the detailed design a submission is to be made to Energex for approval in accordance with their standards. A copy of the approved design with certification is to be forwarded to the Manager Design and Asset Services or nominated representative with the design submission.

Upon completion of the works, Energex and the Council are to receive a copy of the "As Constructed" drawings so a site audit can be carried out.

Upon successful completion of the audit, Energex shall forward the developer a copy of the Certificate of Approval, of which a copy shall be forwarded to the Manager Design and Asset Services or nominated representative.

2.4 Standards

Unless specified or as directed by Council, the detailed design of street lighting installations must conform to the following standards.

- Australian Standard AS1158 Public Lighting Code
- Guide to Traffic Engineering Practice – Part 12 Roadway Lighting (Austroads publication)
- Energex Lighting and Design Manual (Policies and Standards)

2.5 Alignment:

To achieve a balanced streetscape, it is preferred that lights are installed alternatively on the opposite sides of the street (staggered). Installation of lights on one side of the street only is unacceptable.

The location of the poles should avoid the likely vehicle conflict points, minimise the risk of damage to both poles and vehicles and injury to vehicle occupants, minimise glare complaints, and minimise conflict driveway locations. The following factors should be considered when determining the street alignment:

1. Locating poles on opposite boundaries of "battle axe" allotments is undesirable, due to high potential for vehicle collision.

2. Lighting poles must be located in accordance with Standard Drawings and Energex requirements.

3. Where the verge (footpath) width exceeds 4.75m, the centre of the street lighting pole must be located 0.8m behind the nominal face or 0.98m behind the kerb invert.

4. In subdivisions designed to Council specifications where the 'common trench' arrangements are applicable, lighting poles are permitted to be 0.7m behind the nominal kerb face.

5. For bikeways, the lighting column must be located 1.2m from the edge of the bikeway pavement.

6. The proposed or existing light must be at least 7m clear from any street trees.

7. Ensure safety audit is performed on the design in relation to risk associated with vehicle incidents with the lighting columns.

2.6 Subdivision / Development

1. The lighting design must be cost effective in regard to minimising the annual operating costs and where possible, the installation capital costs. The Developer is responsible for all capital costs associated with the design and installation of the street lighting scheme.

2. Underground services must be provided.

3. Where the new development is adjoins an existing street, the new poles / lights must match the existing types to the maximum practicable extent.

4. The lighting design for the development if a redevelopment must match existing lighting conditions.

5. The design must allow for future planning for the area.

6. Underground electricity supply pillars must be provided at 150m intervals along park frontages for future supply to internal park lighting and other electrical park equipment.

2.7 Decorative Lighting

Decorative lighting will not be accepted for the lighting of public roads and laneways unless it is an Energex approved item.

If the development is an extension of an existing estate already installed with decorative units, then the Developer must continue to matching units, and conform with Energex colouring.

Prior to submission of detailed design to Council, it is requested that discussions be held with Council Officers to confirm if designated lighting poles are allocated to sections of the Town Plan.

2.8 Electricity Supply

(a) General

In this context, 'underground electricity' means the installation of conduits and supply of services such as electrical reticulation, pilot cables, street lighting, traffic signals and public lighting to ttransport facilities, parks, bikeways and telephone booths.

(b) Approval Process

All the design and construction work on the electrical supply assets, must be carried out by the electrical supplier or approved electrical supplier's consultant/contractor. The verification of the underground electricity services will be done in conjunction with the approval of the street lighting layout plans. The Developer or Consultant must produce evidence by the electricity supplier stating whether the design complies with, or varies from the requirements

(c) Subdivisions/Developments

The requirements of subdivisions/developments are as follows:

- New Roads

For new roads, full underground electricity reticulation including service pillars must be provided within the road reserve to all allotments including parkland.

- Existing Roads

Where overhead electricity reticulation exists along the frontage of the development and all the proposed allotments are to take access of the existing road:

- The 11KV may be obtained using an existing overhead connection for a split block category.
- If a battleaxe block is to be constructed then an underground supply is to be provided to the rear block. The new service pole is not to be installed near the corner of the entry point, and must comply with authority recommendations.
- Redundant power poles removed and holes backfilled in consultation with Energex practise.
- All road crossings to comply with Council and Energex construction requirements and specifications.

- Existing Houses/Buildings

Where an existing dwelling/building is to remain within the limits of a development. Then the existing overhead electricity (and telecommunication) service to the building may remain.

- High Voltage Feeders (33KV and Higher)

Details regarding existing and future 33KV services are to be discussed with Energex / Powerlink.

(d) Telstra

Underground telecommunications services must be provided separate to all other services, to all allotments. Where overhead communication lines exist along the development frontage, conditions are to comply with Telstra requirements and specifications.

(e) Gas

If underground gas is to be supplied to the new development, these service conduits must be shown on the engineering plans.

CHAPTER 12 - COMPLIANCE WITH STANDARDS

1.0 AIM

The aim of this guideline is to provide the requirements of REDCLIFFE CITY COUNCIL for the inspection and certification of any works which will become part of the City's infrastructure, ie., Roadworks, Stormwater Drainage, Sewer Reticulation and Water Reticulation Works.

2.0 NEED FOR QUALITY ASSURANCE

The works listed above and other elements of a subdivisional estate and other types of developments will become a part of the City's infrastructure. Responsibility for the on-going maintenance of this infrastructure will lie with the Redcliffe City Council and, thus, the ratepayers of Redcliffe.

Compliance with the requirements of Council needs to be assured through a process of testing, inspection, and certification before work may be accepted Off Maintenance and full responsibility for the works transferred to Council.

It is the aim of Redcliffe City Council that there be provision by the Contractor regarding a Quality Assurance approach by the Consultants in addition to the detailed inspections and checking by Council, which may not occur in all aspects of the development.

3.0 COMPLIANCE PROCEDURES

Developers and their consultants or agents remain at all times responsible to ensure that all works are executed in accordance with principles of sound engineering design and construction and are in accordance with current codes and practice.

It is the responsibility of the developer or his consultant to arrange for all testing, inspections and certifications.

3.1 Testing

The testing requirements as detailed in these guidelines are summarised for ready reference in Appendix 12.0 "Compliance Requirements for Municipal Works". This summary indicates when the test results are to be supplied to Council.

3.2 Certification

The following certificates or certified drawings are generally required to be supplied by the Consulting Registered Professional Engineer engaged to supervise the works:-

1. **"On Maintenance":**
   - Pre-Inspection Checklist - Appendix 9.0
   - Engineering Certification - Appendix 1.0
   - Geotechnical and Structural Certificates (where applicable)
   - As Constructed" Plans
   - Asset Management Register
   - Copies of all relevant test results

NOTE: The following items are also required in addition to the above to enable formal acceptance of the works "On Maintenance":-

- Maintenance Security Deposit (5% of the cost of the works minimum. $1500)
- Payment of any outstanding Private Works and Redcliffe City Council accounts.
- Written clearances to be obtained for works carried out on land under other ownership, upon completion of the works.
- Any other documentation as may be required by Council.
- Payment of any outstanding Fees and Permits

2. "Off Maintenance": Any items as agreed to by Council at the time of formal acceptance of the works "on-maintenance".

   Revised drawings owing to modifications during “On Maintenance”

3.3 Inspections

Council will carry out the following set inspections which will also be attended by the Consultant The Consultant or his representative is expected to undertake all other inspections on drainage, roadworks, earthworks, sewer reticulation and water reticulation works, etc., as are necessary to ensure that the finished product conforms to standards and is "fit for its intended purpose".

Random/Audit inspections shall be undertaken by Council Officers to ensure adequate quality control is being employed.

The notice required for any inspection/meeting to be attended by Council Officers depends on the type of inspection as follows:-

Pre-Start Meeting	3 working days
Pavement Subgrade	24 hours
Sewer Backfill (notify)	24 hours
Stormwater & Water main	24 hours
Preseal Inspection	24 hours

Sewer Pressure Testing	24 hours
Water Mains Pressure Testing	24 hours

On Maintenance	5 working days (and assurance that all documentation is available)
Off Maintenance	10 working days

These lead times should not be an imposition on Consultants if a reasonable level of job control is in place. These lead times may be discussed with Council staff wherever required.

3.4 Community Title Schemes, Attached Housing or Apartment Building Developments etc.

Council will not normally carry out inspections of civil works associated with these types of developments (ie: works which shall remain the property of the owner). The Consultant or his representative is expected to undertake inspections as necessary to ensure the finished product conforms to standards and is "fit for it's intended use".

The Consultant shall supply the necessary certificates, including geotechnical and structural where applicable, to Council to this effect.

4.0 PRE-START MEETING

Prior to construction work commencing, Council's Manager Design and Asset Services or nominated representative shall be extended an invitation to attend the pre-start meeting.

Information regarding details required shall be forwarded to Council prior to the above meeting.

5.0 SUBGRADE INSPECTIONS

5.1 Pavement Thickness

Following acceptance of engineering drawings by Council's Manager Design and Asset Services or nominated representative, the Consultant is to arrange for soil testing and submit a proposed pavement design to Council for approval, in accordance with Chapter 5 Section 2.0 "Flexible Pavement Design" and Council Specification SS7.

The consultant should verify on site that the subgrade tests are representative of that on which the pavement approval (design) is based prior to requesting a box inspection by Council Officers.

The subgrade inspection is limited to a visual and load test, the latter using machinery/plant to be provided by the Developer's Contractor.

5.2 Visual Test

1. To confirm that the pavement excavation depth is in accordance with the approved depth.

2. To ensure that the base of the box is even with correct crown and crossfall, and that the sides are vertical. String lines and tape with necessary personnel are to be provided by the Consulting Registered Professional Engineer.

3. To check that the subgrade material is consistent in type and colours with the tested material on which the design was based and that the subgrade material is uniform throughout the exposed section.

4. To ensure that the base is free from wet spots or any other visually defective areas, e.g., tree stumps and other organic/inorganic matter or visible movement under loaded water truck or equivalent.

5.3 Load Test

Proof loading is normally required to check for any area of the subgrade which might show signs of deflection.

Deflections detected in the subgrade indicating a weakness in the sub-strata will require remedial treatment under the Consulting Registered Professional Engineer's direction.

Details in accordance with RCC Specification SS7.

5.4 Subgrade Compaction Testing

Refer to Council Specification.SS7.

5.5 Remedial Treatments

Subgrades that are deemed to have failed any of the above tests may require remedial treatments. These may include, but are not limited to, the following:-

1. Additional excavation to reach a sound subgrade stratum.

2. Install side and/or mitre drains, if not already required to have been installed.

3. Place free draining crushed rock (e.g., spalls, 75/100mm clean rock, with or without geofabric.

The Consulting Engineer shall provide details of the remedial treatment, and confirmation of its success, with all other pavement test results prior to the preseal inspection.

Any locations which incur substantial design changes from that of the original design submission are to be detailed as cross section details with chainages in the “As Constructed” details.

6.0 PRESEAL INSPECTIONS

These are to ensure that the pavement material has been placed and compacted in accordance with the pavement design, that sufficient depth has been allowed for the placement of the required seal thickness, and to a profile enabling the correct crossfall to be achieved.

The preseal inspection by Council is limited to a visual and load test, the latter using machinery/plant supplied by the Developer's Contractors.

6.1 Pavement Compliance Testing

It is a requirement that the Consulting Registered Professional Engineer arrange for the appropriate compliance testing of the compacted pavement material in accordance with the requirements listed in the RCC Specification SS7..

Compaction and pavement material property test results shall be provided prior to the preseal inspection. Advice of any remedial treatment directed by the Consulting Engineer must be included with any failed test results for any pavement layers or pavement materials.

6.1.1 Material Quality Compliance Tests

One complete set of pavement material quality compliance tests shall be made for each project, unless there is a change in source of supply or additional testing is required by Council's Manager Design and Asset Services or nominated representative and should be provided prior to the pre-seal inspection.

Quality compliance testing shall be carried out by an authorised registered laboratory. A certificate shall be prepared showing results of testing in accordance with each of the tests required under SS7.

6.1.2 Quality Assurance Testing

The date and time of the sampling shall be recorded.

Frequency: 4 day Soaked CBR, fines quality and particle size distribution shall be carried out at the rate of one (1) test per 500m^3 of material of each class for each parameter.

Additional testing of fines quality and tests of Dry Density and of moisture content from material in place in the pavement may be requested by Council's Manager Design and Asset Services or nominated representative at any time. Grading analysis to be submitted in graphical or tabulated form.

6.1.3 Non-Compliance with Material Requirements

The responsibility for maintenance of acceptable material standards rests with the Consulting Engineer and his nominated contractor. Compliance of the pavement materials is to be covered by the Engineers certification for the adequacy of the works.

Materials submitted for approval but not complying in full with the relevant specification requirements may be accepted or rejected at the discretion of the Council.

6.1.4 Pavement Depth Verification

Pavement depths shall be verified by the provision of "as constructed" levels of the subgrade and preseal stage (or top of kerb if installed) at a frequency of **3 levels (RHS, centre and LHS) every 50 metres**. The surveyed information is to be provided in a tabulated format (eletronically) and is to be certified by both the licensed surveyor and consulting engineer.

6.2 Visual Test

Refer to Council Specification SS7.

6.3 Load Test

Refer to Council Specification SS7.

6.4 Pavement Compaction Testing

Refer to Council Specification SS7.

6.5 Remedial Works

Pavements that are deemed to have failed any of the above tests will require remedial treatments. These may include, but are not limited to, the following:-

- excavation of pavement (and subgrade) to remove soft material and replace with suitable material
- tyne up and recompact materials
- adjust moisture content.

The Consulting Engineer shall provide details of remedial treatment, and confirmation of its success, together with any outstanding pavement test results prior to the "On Maintenance" inspection.

7.0 SEWER PRESSURE TEST

All sewers and house drains shall, when laid and jointed, be submitted to a water test or air test as specified in Chapter 7, "Sewerage Reticulation Works" and in accordance with Council Specification SS1.

The Consulting Engineer shall supply copies of all results of tests performed on each manhole length. Lines which do not pass the test will be rejected and the Consulting Engineer shall direct that the necessary rectification works be undertaken, and the line re-tested. **Test results shall be submitted prior to the On-Maintenance inspection**.

Council shall be given twenty-four (24) hours notice as to when the testing is to be undertaken. Council inspectors will undertake an audit inspection of the testing procedure in progress.

Party performing the testing is to be NATA registered in conducting such testing.

Testing for certification purposes should generally be undertaken upon completion of all works. Preliminary testing prior to backfilling shall be at the discretion of the Consultant/Contractor.

If testing not performed, Manager Design and Asset Services or nominated representative to may if so required arrange for testing to be carried out at the cost of the developer

8.0 WATER MAINS PRESSURE TEST

The whole of the mains laid by the contractor shall be hydraulically tested to a pressure of, as detailed in Chapter 8, "Water Reticulation Works" and Council Specification SS2.

The consultant shall provide **test results prior to the "On Maintenance" inspection**.

Council shall be given twenty-four (24) hours notice as to when the test is to be undertaken. Council inspectors will undertake an audit inspection of the test procedure in progress.

If testing not performed, Manager Design and Asset Services or nominated representative to may if so required arrange for testing to be carried out at the cost of the developer

9.0 CONCRETE TESTING

Prior to the "On Maintenance" inspection being carried out, all available concrete test results shall be submitted to Council. Minimum requirement is for seven (7) day tests to be available. All outstanding test results (28 day tests) are to be submitted during the Maintenance Period. Tests should be carried out as set out in Appendix 8.0.

For structural elements such as bridges, retaining walls, cast insitu box culverts, etc., full design strength must be obtained prior to "On Maintenance" as the structures will be expected to be put into service following acceptance of the works.

10.0 ON MAINTENANCE INSPECTION PROCEDURES

The purpose of the "On Maintenance" inspection is to ensure that the development works have been completed in accordance with the approved engineering plans, the conditions of subdivision/site development approval and that the appropriate standards of construction methods and materials have been used. The inspected works are put on trial for the minimum periods as specified by Council. Longer periods may be required for specific items, where problems have been encountered or where non-standard methods or materials have been used.

In accordance with the Council's aim to progress over time toward a Quality Assurance approach to the management of subdivisional and development works,

consultants must complete a checklist to confirm that critical aspects of the work have been inspected and completed to a standard appropriate for acceptance by the Council. The need for a detailed "On Maintenance" inspection by Council will be at the discretion of Council's Coordinator Design and Traffic. In most cases only an "audit" inspection by Council should be necessary.

As well as the pre-inspection checklist, the consultant must furnish a formal Consulting Engineer's Certificate for the works, which shall be in a form similar to that shown in Appendix 1.0 (on the consultant's letterhead).

10.1 Pre-Inspection Checklist

The pre-inspection checklist should be in the form given in Appendix 9.0 advising that all works as per the attached list have been completed and inspected to the satisfaction of the Consulting Engineer. This is to be forwarded to Council prior to the requested On Maintenance inspection date.

The Council inspection will not be carried out if this checklist has not been received from the Consultant. If more than two (2) items on the checklist (items not of a minor nature) are found to be incorrect and the site is not ready, the inspection may be immediately cancelled at the discretion of Council's Manager Design and Asset Services or nominated representative

10.2 Inspection

The need for a detailed inspection shall be at the discretion of Councils Manager Design and Asset Services or nominated representative. In the majority of cases it is intended that an "audit" inspection only should be necessary.

The on-site inspection is to be attended by the Consulting Engineer, the Civil Contractor(s) and the Council Officer(s). Each person will be required to provide their own safety equipment for the inspection of subsurface structures, e.g., helmet, boots. Any need for specialised equipment should be pre-arranged by the Consulting Engineer with the contractor in accordance with the requirements of the Workplace Health and Safety Act.

In particular, the Consulting Engineer's attention is drawn to the requirements of the Workplace Health and Safety Act, where the pipe drainage system and/or sewer reticulation system is to be subjected to a detailed inspection, as directed by the Council inspecting officer, i.e., entry into confined spaces such as gully pits and manholes.

It will be the Principal Contractor's responsibility to ensure the requirements of the Act are satisfied.

10.3 Non-Conforming Inspection

If the development fails to satisfy the requirements of the inspection, other than for minor defects, the Consulting Engineer shall be so advised. When the defects have been remedied, the Consulting Engineer shall arrange another inspection.

10.4 Post Compliance Action

The Consulting Engineer is to forward the following to Council's Manager Design and Asset Services or nominated representative prior to formal acceptance of the works "On Maintenance".

1. Letter confirming satisfactory completion of the On Maintenance inspection and requesting that the maintenance period commence from the date of inspection. A list of items recorded at the On Maintenance inspection for further attention shall be included.

2. Certification by the Consulting Engineer that the works have been completed in accordance with the approved Design and Specifications.

3. All outstanding test data and measurements of asphalt quality (with the exception of 28 day concrete test in specific circumstances and AC core tests).

4. "As Constructed" information is to be submitted in accordance with Council's "As Constructed Requirements for Development and Subdivisional Works."

5. Notification of the contract amount and maintenance security amount (5% of the contract sum), and how it is to be handled, ie., reduction of existing bond, cash payments, or bank guarantee lodged with the Council.

6. Payment of all outstanding monies pertaining to Private Works for live sewer connections, live water connections, and any other works undertaken by Council on the developer's behalf.

7. Payment of any outstanding Fees and Permits ie. Road Opening Permit, Permit to Draw Water.

8. Copies of written clearance for works carried out on land under other ownership if applicable.

9. Any other relevant documentation as may be required by Council.

Formal acceptance of the works On Maintenance will be in the form of a letter from Council's Manager Design and Asset Services or nominated representative to the consulting firm. This shall confirm the On Maintenance date and list the defects requiring rectification during the twelve (12) months maintenance period, and confirm how the maintenance security has been handled.

11.0 MAINTENANCE PERIOD

During this period, responsibility and liability for the maintenance and rectification of defects of materials and works, lies with the developer and/or his consultant, not the Council (unless the work may be directly related to Council activities).

AC core tests and 28 day concrete cylinder tests not available at the On Maintenance inspection must be supplied prior to on maintenance period for all structural concrete.

12.0 OFF MAINTENANCE INSPECTION

The purpose of the "Off Maintenance" inspection is to ensure that the constructed works have performed satisfactorily during the maintenance period and that omissions, defects, and damage have been rectified. If this has been achieved, then

the Consulting Engineer and Developer may be relieved of any further responsibility regarding future maintenance of the works and the works are accepted by Council.

The Consulting Engineer shall remain liable for all works in so far as the certificates attested to by the Consultant. Council shall retain the right to call upon the Consulting Engineer to rectify any works which have been found not to comply with the certificates received by Council.

12.1 Inspection

An inspection, when requested by the Consulting Engineer, will generally be undertaken within the next ten (10) working days at a mutually agreed time. All areas inspected at the On Maintenance stage will be liable to be re-inspected with special emphasis placed on any unsatisfactory points noted during the On Maintenance inspection and any points that have been brought to Council's attention during the defects period.

Any matters outstanding at the time of this inspection constitute an uncompleted works situation such that the constructed works cannot be accepted by Council.

Any matters made subject to review are to be evaluated and course of action implemented.

12.2 Non-Compliance Inspection

All unsatisfactory work is to be rectified prior to the consultant arranging a second inspection.

12.3 Post Compliance Action

The Consulting Engineer shall forward a letter and "Final Contract Drawings" to Council's Manager Design and Asset Services or nominated representative requesting:-

- That the development be taken Off Maintenance;
- That the maintenance security and any other bond monies be released.

Formal acceptance Off Maintenance will be by a letter to the Manager of the consulting firm confirming that the relevant works have been accepted by Council. The letter will also indicate that the maintenance security deposit is to be released (unless specified to the contrary by the consultant). At this time the relevant works formally become a Council asset.

APPENDIX 1.0 - CONSULTING ENGINEER'S CERTIFICATE

R.C.C. File:
Date:

CONSULTING ENGINEER'S CERTIFICATE

Construction of Roadworks, Stormwater Drainage, Sewer Reticulation, Water Reticulation and Associated Works.

at

.....

for

.....

I, ... of

.....

Consulting Engineers, being duly authorised in this behalf, do certify that the earthworks, roadworks, stormwater drainage, sewer reticulation, water reticulation and associated works for the above Development, have been completed in accordance with the approved drawings, designs, schedules and specifications, the conditions of approval for the Development incorporating any approved amendments, and within specified tolerances or, where not specified, within generally accepted tolerance, also in accordance with relevant certificates, sound engineering principles and practices and that the works are fit for the purpose for which they are intended.

And I make this certificate conscientiously believing that I/We have appropriate procedures for inspection and testing in place to assure the quality of the works and conscientiously believing these procedures have been followed during the construction of the works.

.....

Designation .....

Certified this .....day of..... 19

EXAMPLE ONLY

APPENDIX 2.0 - EARTHWORKS

As outlined below and in accordance with Council Specification SS4.

2.1 EARTHWORKS - GUIDELINES FOR MINIMUM RELATIVE COMPACTION

		Minimum standard compaction percentage	
ITEM	PROJECT	MINIMUM DRY DENSITY RATIO (Cohesive Soils) (see Note 1)	MINIMUM DENSITY INDEX (Cohesionless Soils) (See Note 2)
1.	Residential Lot fill (3)	95	65
2.	Commercial, Fills to support minor loadings. (4)	98	70
3.	Road embankments a) >0.3m below pavement subgrade b) <0.3m below pavement subgrade (5)	95 100	65 80

SOURCE: ADAPTED FROM TABLE 5.1 - AS 3798-1990

NOTES:

1. All dry density ratios relate to AS 1289.E4.1 or AS 1289.E7.1 and standard compaction energy input (see AS 1289.E1.1 and As 1289.E1.2).

2. Density index as a means for control of achieved relative compaction may be difficult to use and interpret. Local correlations with other methods may exist and can be used where these are well established.

3. Development on this fill will be restricted to single and some double storey free standing houses with floor slab average loadings not exceeding 20 kPa, and strip or pad footings not exceeding bearing pressures of 100 kPa. Residential developments other than these are considered as commercial. A minimum dry density ratio of 98% or higher may need to be considered if collapse on saturation, excessive settlement, or dispersive soils are likely to occur.

4. Commercial developments are likely to impose loads on fills which will have a more severe effect than those free standing houses, even where contact pressures are limited to those stated. The engineer must assess the load carrying capacity and associated deformations associated with proposed filling to satisfy himself / herself the fill can perform its required function. Where highly loaded fills are proposed, the minimum relative compaction may need to be increased.

5. Where road pavements will be required to carry significant volume of heavy vehicles, the minimum compaction criteria for the upper levels of the fill may need to be reviewed.

2.2 Earthworks - Guidelines to Frequency of Field Density Test

SCOPE OF EARTHWORKS	MINIMUM FREQUENCY OF TESTS (See Note 2)
Large scale operations (e.g. subdivisions, large industrial lots, road embankments)	Greatest of: (a) 1 test per 500 m^3 distributed reasonably evenly throughout full depth and area; or (b) 1 test per layer per material type per 2500 m^2; or (c) 1 test per 200 mm thickness per material type per 2500 m^2; or (d) 1 test per lot
Small scale operations (e.g. residential lots)	Greatest of: (a) 1 test per 200 m^3 distributed evenly through full depth and area; or (b) 1 test per layer (3) per 1000 m^2; or (c) 1 test per 200 mm thickness (3) per 1000 m^2; or (d) 1 test per lot
Concentrated operations (e.g. filling gullies, farm dams, etc.)	Greatest of: (a) 1 test per 100 m^3 distributed reasonably evenly throughout full depth and area; or (b) 1 test per layer (3) per 500 m^2; or (c) 1 test per 200 mm thickness (3) per 500 m^2
Confined operations filling behind structures (4)	1 test per 2 layers per 50 m^2, i.e. test every second layer once per 50 m^2

SOURCE: ADAPTED FROM TABLE 8.1 AS 3798-1990

NOTES:

1. These guidelines refer to the determination of relative compaction using a direct method. However, where an indirect method is used, e.g. Perth sand penetrometer (AS 1289.F3.3), some interpretation of the guidelines may be required.

2. Tests in visually doubtful areas, and retests of failed areas should be carried out and are additional to the testing recommended in this table.

3. Where a geotechnical testing authority has been engaged at level 2 or level 3, it may be acceptable to test more than one layer per site visit by excavating to the test level.

4. Implies hand operated or small equipment.

5. All test locations are to be shown on a sketch plan, accompanying the test results.

APPENDIX 3.0 - PAVEMENT DESIGN & CONSTRUCTION

3.1 determination of subgrade strength

The design parameter for the subgrade is the California Bearing Ratio (CBR).

A design CBR is to be determined for each identifiable unit defined on the basis of topographic, geological and drainage conditions at the site. It must be related to the soaked condition in the subgrade at a compaction of 100% standard.

In determining the design CBR, account must also be taken of the variations of the subgrade strength with depth below subgrade level. The critical layer of material should be established to ensure each layer has adequate cover.

Laboratory Determination of CBR

When the subgrade CBR is particularly sensitive to changes in moisture content, adequate testing of the CBR over a range of M.C.'s and densities should be provided and CBR interpolated at the design M.C. and density conditions.

The four day soaked CBR at a compaction of 100% standard is to be the standard test. Tests are to be carried out in a NATA registered laboratory.

These test results together with the pavement design are to be submitted to Council's Development Engineer prior to the request for a subgrade (box) inspection.

Frequency of Sampling

The frequency of sampling for determining of laboratory CBR is to be in accordance with Appendix 3.7.

3.2 Pavement construction

Each pavement course should not be commenced until the previous course, ie., subgrade, subbase, base, or existing pavement, has been inspected and approved and certified by the consultant with respect to compaction, finished levels and texture of finish. Compaction tests of each layer are required and consultants must ensure that all tests are satisfactory before proceeding to the next layer. All test results should be provided to the inspecting Council Officer prior to asphalt surfacing. Layer thickness should not exceed 150 mm compacted thickness.

Subgrade preparation

Subgrade is to be trimmed to an even surface free from loose material and graded to be free-draining. Unsuitable material such as organic material is to be removed.

Subgrade affected by rainfall after final trimming shall not be accepted until appropriate drying out treatment has been affected.

Unbound Pavement Course Placement

Unbound pavement course material is to be placed only on underlying layers maintained at the correct moisture content. Prepared subgrades and preceding layers of base course shall be moistened immediately prior to spreading the next course.

Pavement material should be maintained at the specified moisture content prior to and during spreading. The leading edges of the pavement material are to be kept moist. Minimum compacted layer thickness shall be 100 millimetres. Maximum compacted layer thickness shall be 150 millimetres.

3.3 Asphalt Surfacing

Refer to Appendix 4.0.

3.4 Compaction Testing

Determination of the compaction performance of the subgrade and pavement gravel materials - laboratory reference density, field density, optimum moisture content, field moisture content - shall be carried out in accordance with AS1289 Methods of Testing Soils for Engineering Purposes, in particular the E series tests. The laboratory reference density shall be

- Subgrade 100% Standard Maximum Dry Density (MDD)
- Pavement 95% Modified Maximum Dry Density (MMDD)

FREQUENCY: FIELD DENSITY TESTS ARE TO BE AS GIVEN IN APPENDIX 3.6. ALL TEST RESULTS ARE REQUIRED TO BE SUBMITTED TO THE COUNCIL PRIOR TO SEALING.

The testing frequencies stated are based on a 'not one to fail' basis. Failure of material quality tests will generally require removal of the material or further 'in-situ' testing. Failure of compaction tests will require:

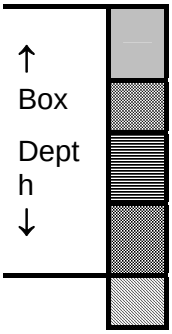
(a) Re-testing of the same depth and location if the failure is minor, e.g. localised single failure by 1% - 3%;

(b) Removal of, or reworking of material, if the failure is significant or widespread.

Subgrade and base courses shall be compacted to the densities specified in Appendix 3.5.

Any failed test results on any layer together with the remedial treatment undertaken at the consultants direction must be submitted with other test results prior to the preseal inspection.

3.5 Schematic Representation of Pavement Material Course



		Minimum Compaction
	AC SURFACING	
	Base Course (Type 2.1, CBR 80)	(102% MDD)
	Upper Sub-base Course (Type 2.3, CBR 45)	(102% MDD)
	Lower Sub-base Course (Type 2.5, CBR 15)	(102% MDD)
	NATURAL SUBGRADE	(100% MDD)

MDD = Standard Maximum Dry Density

BOXED PAVEMENT DETAIL

3.6 COMPACTION TESTING FREQUENCY

Refer to RCC Specification SS5.

3.7 Testing Frequency For Subgrade Cbr Determination

TYPE A and B ROADS And Roads < 120 m	TYPE C,D,E,F, ROADS and Roads > 120 m
Sample at 2 Sites;	Sample at 1 site every 60 to 100m

NOTES:

1. The sampling is to be randomly located within each homogenous length of the proposed roadway.

2. Sampling should be undertaken on sections of significantly different subgrade strength with each section being of sufficient length to accommodate economical construction.

3. * Design CBR = Least estimated insitu CBR (for less than five results)
   * Design CBR = 10th percentile of all estimated insitu CBR's (for more than four results)

4. The samples are to be taken generally in the position of the outer wheel path on both sides of the proposed road. The sampling should confirm homogenous material over the unit length concerned.

5. Sketch plan of location of tests to be submitted with the test results for pavement design approval.

3.8 Summary Of Tests For Material Quality Compliance

Testing for quality compliance with the requirements shall be carried out in accordance with the applicable RCC Specification SS5 and Main Roads test procedures:

3.9 Allowable Tolerances For Pavement Construction

	SUBGRADE	UNBOUND PAVEMENT COURSES
Tolerance on pavement depth (on level calculated as top of kerb level less indicated height of kerb less approved pavement thickness)	-0mm +50mm	-5mm +5mm
Tolerance on 3m straight edge	-12mm +12mm	-5mm +5mm
Tolerance on crossfall (mean slopes)	-0.40% +0.40%	-0.2% +0.2%
Tolerance on longitudinal grade (measured over 25m)	-0.15% +0.15%	-0.10% +0.10%

APPENDIX 4.0 - ASPHALT & ASPHALT SURFACING

4.1 Testing Requirements

Refer to RCC Specification SS8.

4.2 Material Quality

Refer to Council Specification SS8.

4.3 Finished Levels

Refer to Council Specification SS8.

4.4 Asphalt Thickness

Refer to Council Specification SS8.

Prior to On Maintenance the consulting engineer shall provide evidence that the required amount of asphaltic concrete has been used on the project with copies of weighbridge dockets or similar documentation.

Refer to Council Specification SS8.

4.5 Acceptance/Rejection Criteria - Compaction

Refer to Council Specification SS8.

APPENDIX 5.0 - STORMWATER DRAINAGE WORKS

5.1 Bedding Material

Refer to Council Specification SS5.

5.2 Backfill Requirements

Backfilling on Roadways

Refer to Council Specification SS8.

Backfilling on Private Property and Other Non Trafficable Areas

Refer to Council Specification SS8..

Compaction testing shall be carried out in each alternate layer of backfill with one test every 100 metres maximum or part thereof. One test in five is to be located adjacent to a manhole or gully.

Test results are to be submitted prior to or at the "On Maintenance" inspection. A sketch plan showing the location of the tests is to be submitted with the results.

APPENDIX 6.0 - SEWER RETICULATION WORKS

6.1 Bedding Material

Refer to Council Specification SS1.

6.2 Backfill Requirements

Roadways and Other Trafficable Areas

Refer to Council Specification SS1.

Compaction testing shall be carried out in each alternate layer of backfill with one test every 40 metres maximum or part thereof.

Test results are to be submitted prior to or at the subgrade (box) inspection. A sketch plan showing the location of the tests is to be submitted with the results.

Private Property and Other Non Trafficable Areas

Refer to Council Specification SS1.

Compaction testing shall be carried out in each alternate layer of backfill with one test every 100 metres maximum or part thereof. One test in five is to be located adjacent to a manhole.

Test results are to be submitted prior to or at the On Maintenance inspection. A sketch plan showing the location of the tests is to be submitted with the results.

6.3 Pressure Test Results

Tabulated test results certified by the consultant are to be submitted prior to or at the 'On Maintenance' inspection.

APPENDIX 7.0 - WATER RETICULATION WORKS

7.1 Bedding Material

Bedding sand shall conform to the grading specified in Council Specification SS2.

7.2 Backfill Requirements

Roads and Other Trafficable Areas

Refer to Council Specification SS2.

Compaction testing, shall be carried out in each alternate layer of backfill with one test every 40 metres or part thereof.

Tests results are to be submitted prior to or at the subgrade (box) inspection. A sketch plan showing the location of the tests is to be submitted with the results.

Footpaths and Other Non-Trafficable Areas

Refer to Council Specification SS2

Compaction testing shall only be required for trenches in excess of 600 mm depth at the frequency as specified for sewer reticulation works.

7.3 Water Quality Test

Following chlorination and flushing of the mains, water quality testing shall be undertaken on all new mains by an authorised registered laboratory. This testing shall include a Chemical and Bacterialogical Analysis of the samples taken.

Satisfactory test results shall be submitted to Council prior to connection to the distribution system.

Samples shall be taken at various locations for testing at the rate of 1 test per 500 metres of new main or part thereof. Test results shall detailed in a lot sheet with test results correlating to section of main tested. These results are to be submitted at the “On Maintenance” inspection, for Practical Completion to be awarded in writing.

7.4 Pressure Test

The consultant shall submit certification and results identifying that the pipework has been satisfactorily pressure tested in accordance with Council's requirements at the time of the "On Maintenance" inspection.

Testing shall be carried out in accordance with the requirements outlined in Appendix 3.

APPENDIX 8.0 - CONCRETE TESTING

CONCRETE CYLINDER TESTS

Inspection and Certification

ITEM	TARGET STRENGTH (28 DAYS)	FREQUENCY	SUBMIT TO COUNCIL	WHEN REQUIRED
Kerb and Channel	25MPa	1 per 300 m	YES	On or Off Mtce(3)
Vehicular Crossings	25 MPa	1 per crossing	NO	On or Off Mtce(2)
Bikeways	25 MPa	1 per 300 m	YES	On or Off Mtce(2)
Footpaths	25 MPa	1 per 300 m	YES	On or Off Mtce(2)
Concrete channels	25 MPa	1 per 150 m	YES	On Mtce(3)
Structures(5)	Per design	as directed	YES	On Mtce(4)
Manholes/Gully-Pits(6)	Per design	as directed	YES	On Mtce(4)

NOTES:

1. Test according to AS 1012 (pts 1-14) "Method of Testing Portland Cement Concrete"
2. Tests may be submitted after On Maintenance only if bonded
3. Minimum Requirement is for the 7-day tests to be provided at On Maintenance
4. 28-day test required
5. Bridges, retaining walls, cast insitu box culverts, etc.
6. Major structures other than standard manholes and gully-pits.

APPENDIX 9.0 - COMPLIANCE WITH STANDARDS

COMPLIANCE WITH STANDARDS

PRE-ON MAINTENANCE INSPECTION CHECKLIST OF WORKS

DEVELOPMENT .....

R.C.C. FILE NO.....

ITEM	WORK PASSED (Yes/No/N.A.)	COMMENT
ROOFWATER DRAINAGE SYSTEM The works have been finally inspected and:		
a) Roofwater drainage system is constructed to plan		
b) Roofwater pits have been constructed to a satisfactory standard, ie., - benching - correct cover, embossed RWD - location relative to lot boundaries - 50-75 mm proud of finished surface level		
c) Pipework has been visually inspected and is satisfactory, ie., - alignment and grade - free of debris and siltation - sanded end connector, for uPVC pipework - no visual sign of trench subsidence		
d) Outlets (especially to kerb and channel) are satisfactory		
e) Lots not provided with roofwater drainage system can be drained to kerb and channel		
f) "As Constructed" details recorded		
STORMWATER DRAINAGE SYSTEM The works have been finally inspected and:		
a) Pipe layout is as per plan or approved amendments with respect to pipe size, levels and location		
b) Pipework has been visually inspected and is satisfactory, ie., - alignment and grade - free of debris and siltation - pipe joints satisfactory - lifting plug holes sealed - no visible sign of trench subsidence		

ITEM	WORK PASSED (Yes/No/N.A.)	COMMENT
c) Gully pits and manholes have been constructed to the correct standards, ie., - correct type of grate or cover - backstones - side entry slots - benching - pipe connections are not constructed to the corner of two walls such that the pipe capacity is reduced - grates are satisfactorily seated (frames - - grates are hinged and operational for maintenance -Gully baskets are installed and operational - Details regarding maintenance inspection records - weepholes provided to bedding material		
d) All density tests of backfill are available and satisfactory		
e) PSD's have been submitted or are available for bedding material		
f) Outlet/inlet structures are satisfactorily constructed and are free from scour or siltation		
g) All manhole and gully pit pipe connections are mortared flush with the walls and no pipe reinforcement is exposed		
h) Open Cut Channels have been finally inspected and are satisfactory, ie., - cut to design profiles - lining of channel is to the required thickness and reinforcement, with appropriate weepholes		
i) Overland flow the works have been finally inspected and appropriate flowpaths are provided and clear of obstruction		
j) Outlets and Outfalls have been constructed to control discharge flow in accordance with the plans		
k) Subsoil drainage discharges to gullies or other approved point of discharge		

ITEM	WORK PASSED (Yes/No/N.A.)	COMMENT
EARTHWORKS The works have been finally inspected and:		
a) Toe of batters not on Council road reserve except as approved		
b) Retaining walls clear of road reserve except as approved		
e) Batter slopes stabilised against erosion		
f) Interim drainage constructed in accordance with drawings		
g) All areas distributed by the works have been grass seeded and fertilised		
ROAD PAVEMENTS The works have been finally inspected and:		
a) Plan layout and geometry of road system is in accordance with the drawings		
b) Finished levels at crown and channel are at design levels		
c) Crossfalls are to the approved plan		
d) AC is satisfactory with regard to finish and thickness		
e) Joints in the seal (especially where various development stages apply) are flush		
SEGMENT PAVERS The works have been finally inspected and:		
a) All pavers have been correctly laid to pattern, within allowable tolerance, compacted, and the joints filled.		
b) Bedding sand for pavers drains to sub-soil drainage.		
c) Pavers adjacent to CKC, edge restraints etc. have been cut and laid per the guidelines.		

ITEM	WORK PASSED (Yes/No/N.A.)	COMMENT
SEWER RETICULATION The works have been finally inspected and:		
a) Pipe layout is as per the plan or approved amendments with respect to pipe size, levels and location		
b) Pipework has been visually inspected and is satisfactory, ie., - pipework flush with internal walls of manhole - alignment and grade - flexible joints - line flushed and clean - no visible sign of trench subsidence		
c) Manholes have been constructed to the correct standards, ie., - benching, - curvature - ponding- - concrete work - no honey combing - no weeps, etc - covers - correct type - imprint - depth of cover surround - depth of top slab - location - relative to lot boundaries - 50-75 mm proud of finished surface level All density tests of backfill are available and satisfactory		
e) Grading Results for bedding material have been submitted or are available		
f) Pressure test results have been submitted and are satisfactory		

ITEM	WORK PASSED (Yes/No/N.A.)	COMMENT
WATER RETICULATION The works have been finally inspected and:		
a) Pipe layout and service fixtures (valves and hydrants) is as per the plan or approved amendments with respect to pipe size and location		
b) Pipework has been pressure tested in accordance with Council's requirements and test results are available and satisfactory		
e) Valves and hydrants have been inspected and are satisfactory, ie., - Valve markers in place and clearly visible.		
f) Grading Results for bedding material have been submitted or are available		
g) Water quality tests carried and and satisfactory		

ITEM	WORK PASSED (Yes/No/N.A.)	COMMENT
CONCRETE KERB AND CHANNEL AND MEDIANS The works have been finally inspected and:		
a) The correct type has been used at all locations (including medians) in accordance with standards		
b) Ponding of stormwater does not occur		
c) Transitions and connections to existing construction are smooth and to a satisfactory standard of workmanship		
d) Service markers have been placed to kerb face		
e) Lip and back of kerb are flush with the roadway and footpath respectively		
f) All channelisation works and medians have been satisfactorily completed		
g) Infill treatment of medians has been inspected and found satisfactory. Any landscaping has been completed to standard		
h) Backing Strips have been provided to median kerbs where required		
i) Side drains have been provided under medians		
FOOTPATHS The works have been finally inspected and:		
a) Profiles are as per plan		
b) Footpath has been topsoiled to Council guidelines		
c) Footpaths have been grassed and fertilised or turfed to Council's guidelines		
d) All service fixtures (such as valves etc.) are flush with the surrounding footpath		
e) Concrete footpaths have been constructed to Council's drawings		
f) Pram ramps constructed as required		
PATHWAYS, DRIVEWAYS AND BIKEWAYS The works have been finally inspected and:		
a) Location and width are as per the plan		
b) Kerb ramps and crossings are constructed		
c) Safety rails and signs, linemarking have been installed		

ITEM	WORK PASSED (Yes/No/N.A.)	COMMENT
SAFETY::		
a) Traffic Management Plan implemented		
b) Site signage satisfactory		
c) Safety Plan and devices used on site		
ENVIRONMENTAL		
a) Work carried out in conjunction with Environmental Management Plan		
b) Erosion and Sediment Control devices used on site effectively		
c) Effective maintenance and maintenance records kept on site.		
d) Stormwater Management Plan in place		
e) Gully baskets are maintained		
LANDSCAPING		
a) Landscaping to Landscaping Plan		
b) Plants are satisfactory		
c) Mulching satisfactory		
d) Sprinkling system established and operation(if required). Maintenance information submitted		
e) Bollard type to approved type and setback in compliance with Council requirements		
WATERWAYS:		
FOOTPATHS The works have been finally inspected and:		
a) Profiles are as per plan		
b) Footpath has been topsoiled to Council guidelines		
c) Footpaths have been grassed and fertilised or turfed to Council's guidelines		
d) All service fixtures (such as valves etc.) are flush with the surrounding footpath		
e) Concrete footpaths have been constructed to Council's drawings		
f) Pram ramps constructed as required		
PATHWAYS, DRIVEWAYS AND BIKEWAYS The works have been finally inspected and:		
a) Location and width are as per the plan		
b) Kerb ramps and crossings are constructed		
c) Safety rails and signs, linemarking have been installed		

ITEM	WORK PASSED (Yes/No/N.A.)	COMMENT
OTHER		
a) Street name signs, traffic signs and pavement marking have been installed		
b) Works have not resulted in problems on neighbouring properties. Clearance letters as may be applicable have been submitted or are available		
c) All boundaries of Subdivision/Development have been inspected to ensure works as constructed will not affect adjoining properties		
d) All necessary testing to ensure the quality of the work has been carried out and results are available and have been provided to Council		
e) Engineer's Certificate of completion is available and has been provided to Council		
f) Private works accounts for live sewer and water connections etc, have been paid		
g) "As Constructed" details are available and have been provided to Council including pavement depth details.		
h) All allotment boundaries, easements etc, have been pegged		
i) Any outstanding fees and charges have been paid, ie., Design Review, Works Inspection, Road Opening Permit, Permit to draw water		
NOTE: Construction is within stated tolerances or otherwise within normally accepted engineering standard tolerances. CONSULTANT'S SIGNATURE:_____NAME:_____ __ NAME OF CONSULTANCY:_____ DATE:_____/____/_____		

APPENDIX 10.0 - COMPLIANCE REQUIREMENTS FOR PUBLIC (MUNICIPAL) WORKS

COMPLIANCE REQUIREMENTS FOR PUBLIC (MUNICIPAL) WORKS

TESTS AND CERTIFICATES	PROVIDE PRIOR TO	COMMENTS
Earthworks		
- Density Tests	On Maintenance	
- Retaining walls and Batters, Structural and Geotechnical Certification	On Maintenance	Consultant responsible for submission of all relevant test results.
Roadworks		
- Subgrade CBR/OMC	Pavement Construction	
- Pavement Design	Pavement Construction	
- Subgrade, Field Density	Subgrade Inspection	
- Pavement		
- Field Density		
- CBR's/PSD	Preseal Inspection	
- Material Quality		Consultant responsible for submission of all relevant test results.
- As Constructed Levels	On Maintenance	
- AC Surfacing	On Maintenance	
- Marshall Tests	On Maintenance	
- Delivery Dockets	Off Maintenance	
- Compaction Tests		
Stormwater Drainage		
- Trench and backfill compaction	Inspection	Consultant responsible for submission of all relevant test results.
- under road	Subgrade Inspection	
- other	On Maintenance	
-PSD's for bedding material	On Maintenance	
Sewerage Reticulation		
- Trench and backfill compaction	Inspection	
- under road		Consultant responsible for submission of all relevant test results.
- other	Subgrade Inspection	
- PSD's for bedding material	On Maintenance	
- Pressure test results	On Maintenance	
	On Maintenance	
Water Reticulation		
- trench and backfill compaction	Inspection	Consultant responsible for submission of all relevant test results.
- under road	Subgrade Inspection	
- other (if applicable)	On Maintenance	
- Pressure test results	On Maintenance	
- Water quality test results	On Maintenance	
Concrete Tests		
- CKC	See Chapter 9.0	
- Footpaths		
- Bikeways	See Appendix 8.0	
- Crossings		
- Other		

Other - Pre-Inspection Certificate/Checklist - Engineers Certificate - As Constructed - Bonding Arrangement - Private Works Accounts - Clearance letters if applicable - Outstanding fees and charges - Request for works to go On Maintenance - As Constructed pavement depth details.	 On Maintenance On Maintenance On Maintenance On Maintenance On Maintenance On Maintenance On Maintenance	 Required before inspection will proceed Consultant to advise Consultant to formally request list of outstanding items, works to be rectified to be included
Maintenance Period - Rectify all defects - AC Core Tests - Concrete Tests - Provide any additional "As Constructed" details as may be required by Council - Submit any other outstanding test results or certificates	 Off Maintenance Off Maintenance Off Maintenance	
Off Maintenance - Request to take works off maintenance - All works rectified - " Final Drawings" - Maintenance security bond	 Off Maintenance Off Maintenance Post Off Maintenance	 Consultant to formally request Consultant to formally request release of maintenance security bond

CHAPTER 13 – CONCRETE

PART A - SPECIFICATION FOR CONCRETE

NOTE: THIS SPECIFICATION IS SUBJECT TO REVIEW IN ACCORDANCE WITH COUNCIL SPECIFICATIONS. TO REMAIN IN THE SHORT TERM.

1.0 GENERAL

The work specified herein shall include the furnishing, placing, compacting and finishing of all Portland cement concrete in ordinary reinforced concrete, and mass concrete, to the lines, levels and dimensions shown in the drawings, or where not shown, as directed by the Superintendent.

2.0 MATERIALS

Unless otherwise stated all concrete shall be composed of portland cement, fine aggregate, course aggregate, additives if approved, and water, proportioned and mixed as specified herein. All such materials shall conform with the requirements of this specification.

2.1 Portland Cement

All cement used shall be Type GP Portland Cement of approved brand and Australian manufacture unless otherwise stated and shall comply with the Australian Standard AS 3972 in all respects.

2.2 Water

Water shall be free from matter harmful to concrete and reinforcing. Where water is not free from colour or taste, a sample shall be submitted to the Supervising Engineer for analysis.

2.3 Fine Aggregate

Fine aggregate shall consist of natural sand, or a combination of natural and manufactured sand containing not less that 50 per cent natural sands. Particles shall be clean, hard and durable, It shall conform to the Australian Standard 2758.1, "Aggregates and Rock for Engineering Purposes, Part 1 Concrete Aggregates".

2.4 Coarse Aggregate

Coarse aggregate shall consist of clean, durable, uncrushed gravel, crushed gravel, crushed stone, or combinations thereof, free from coatings of clay or dirt, organic and other deleterious matter. It shall conform to the Australian Standard AS 2758.1, "Aggregate and Rock for Engineering Purposes, Part 1, Concrete Aggregates".

2.5 Aggregate Crushing Value

The aggregate crushing value shall not exceed the following when tested in accordance with Main Roads Test No. Q204A - Aggregate Crushing Test.

Concrete for wearing surfaces - 30 percent

Concrete other than wearing surfaces - 45 percent

The Contractor shall submit for approval for each concrete class 50 kg of coarse aggregate and 25 kg of fine aggregate. At the Contractor's own expense samples shall be delivered to the Supervising Engineer. Testing will be carried out at the Principal's expense. No material shall be used until approved in writing by the Supervising Engineer.

3.0 STORAGE

Cement shall be stored above ground level in dry, weatherproof sheds well protected from dampness acquired from contact with floors or walls. Bags shall be stacked so as to permit access for tallying, inspection and identification of each consignment.

If bulk cement is stored, only watertight silos shall be used for the purpose.

As far as practicable, cement shall be used in order of receipt. If the Contractor proposes to use cement which has been stored for two months or more on works the Supervising Engineer may require a re-test of the cement at the Contractor's expense before it is used in the work. Cement showing lumps which cannot be broken to the original fineness by finger pressure will be rejected irrespective of age, and replaced at the Contractor's expense.

Aggregates shall be stored on site in such a manner that they will not segregate, become contaminated by foreign matter, or intermixed, nor shall water be permitted to drain into them. Aggregates shall not be stored in direct contact with the ground. Generally storage areas shall be surfaced with concrete slabs.

4.0 ADMIXTURES

Admixtures in concrete shall be used only with the written approval of the Supervising Engineer. Calcium chloride shall not be used as an admixture in reinforced or prestressed concrete. No admixtures shall be used for steam cured concrete.

Where air entrainment is allowed, the air content shall be within the range 3 to 5 percent except where otherwise specified. The contractor shall have a suitable air content gauging device on the job so that the air content of the freshly mixed concrete may be accurately determined. Admixture metering shall be by means of an approved and well maintained dispenser.

5.0 CLASSES OF CONCRETE

Concrete shall be specified in accordance with AS 1379-1991 "The Specification and Manufacture of Concrete". Concrete shall be specified:

- as either:

  - normal class, or
  - special class; and

- by strength grade.

5.1 Standard Strength Grades

The standard strength grades are compressive strength grades and their corresponding characteristic compressive strengths shall be given in Table 1. It is permissible to specify strength grades other than the standard grades, in which case the concrete shall be special class and Clause 5.3 shall then apply.

The specified 28 day strength for the various classes of concrete is shown in Table 1.

TABLE 1
Standard Strength Grades

Standard Grade	Characteristic Compressive Strength at 28 days (f'c) Mpa
20	20
25	25
32	32
40	40
50	50

5.2 Normal Class Concrete

Normal class concrete shall be a standard strength grade specified only by:

- The standard strength grade, designated as one of N20, N25, N32, N40 or N50;
- The slump at the point of acceptance, selected as one of 40, 60, 80 or 100mm;
- The maximum nominal size of aggregate, selected as one of 10, 14 or 20mm;
- The intended method of placement;
- Whether or not project assessment is required;
- Additional parameters as set out in Clause 1.5.3.3 of AS 1379-1991.
- Composition as set out in Clause 1.5.3.4 of AS 1379-1991.

5.3 Special Class Concrete

Concrete other than normal class concrete shall be specified as special class and, if applicable, by strength grade in accordance with Clause 1.5.4 of AS 1379-1991.

6.0 CONCRETE MIX DESIGN AND ACCEPTANCE

6.1 General

The Contractor shall be solely responsible for the design and production of concrete to comply with the specifications. The terms used in Clause 6 are defined as follows:

Lot:	An identifiable quantity of concrete from which the samples are drawn and to which the decisions refer. A lot shall be 15 cubic metres or less of concrete of the same class produced and placed in an essentially uniform and continuous manner.
Sample:	A portion of fresh concrete drawn from a lot in accordance with AS 1012 from which cylinders are made.
Specimen:	A single cylinder (150mm dia x 300mm) made from a sample.
Batch:	One load or charge of a mixing plant.
Standard:	A statistical measure of the variation from a mean of a measurable property.
Deviations(s):	In this specification the property is "compressive strength".
Mean:	The arithmetic average of the strength achieved by a number of specimens.
Target Strength:	The 28 day compressive strength selected for the design of the concrete mix as provided in Clause 6.2.
Specified Strength: (L)	The specified strength in Clause 5.0 for a class of concrete.

At least 6 weeks prior to concreting on the site, the Contractor shall submit for approval, details of the concrete mix he proposes to use for each particular class of concrete. The following information shall be forwarded to the Supervising Engineer:

(i) Mix designation mark
(ii) Class of concrete
(iii) Proportion by weight of individual ingredients
(iv) Admixtures and quantity of admixtures incorporated (if approved)
(v) Slump
(vi) Target strength

6.2 Target Strength

To determine a target strength, the standard deviation likely to be achieved shall be estimated from previous experience with work of a similar nature and target strength shall not be less than calculated as below:

$T = L + 1.64\ s$

The estimated standard deviation shall not be less than 3.8 Mpa nor greater than 6.2 Mpa. The Contractor shall nominate a target strength which must be consistent with the degree of control provided but which shall in no case be less than the minimum specified above.

The Contractor shall state the proposed degree of control when submitting details of the proposed mix design. If during the course of the job this degree of control is not maintained, as evidenced by either the batching and mixing methods employed or by the strength of test cylinders taken on the work, a new mix design shall be prepared and tested at the Contractor's expense

6.3 Preliminary Mix Slump

When tested as specified in Clause 8.0 the measured slump of the preliminary mix shall be within the range of values specified in the table shown in 8.4.

6.4 Preliminary Mixes

Except as provided hereunder, the Contractor shall make preliminary mixes of Class N32 concrete and stronger using the approved materials. The mixes shall be made under field conditions in the presence of the Supervising Engineer or his representative, using the proposed degree of control. The slump shall be recorded and 9 specimens cast from each preliminary mix and delivered to the Supervising Engineer.

If concrete is supplied by an approved supplier of ready mixed concrete, the Supervising Engineer may accept in lieu of test results from preliminary mixes, the strengths of specimens cast from identical mixes produced previously by that supplier. The information relating to the mix shall nevertheless be supplied.

No concrete shall be placed until the preliminary mixes have been made, tested and approved in writing by the Supervising Engineer. Upon request of the Contractor, the Supervising Engineer may give provisional approval of the mix if the 7 day strengths are not less than 0.8 of the specified 28 day strength. Notwithstanding any approval given, the concrete shall meet the specified strength at 28 days. No approval will be given for the use of N32 or N40 concrete until satisfactory 28 day results have been received. Once approved, the mix shall not be altered without the written approval of the Supervising Engineer.

If the standard of control during production varies from that assumed when selecting the target strength, the Supervising Engineer may withdraw approval of the mix pending redesign of the mix or the establishment of improved quality control.

7.0 CONSISTENCY

The consistency and workability of concrete shall be such that it can be handled and transported without segregation and can be placed, worked and compacted into all corners, angles and narrow sections of forms and around reinforcement. The consistency of the concrete shall be checked by use of a slump cone in accordance with Australian Standard AS 1012.

The slump at the time of placing shall not deviate from the slump of the approved preliminary mix by more than ± 15mm.

8.0 TEST SPECIMENS

8.1 Sampling and Testing

The concrete shall be sampled and tested in accordance with the provisions of Australian Standards AS 1012, "Methods of Testing Concrete", except as provided herein. Every sample shall be taken from a separate batch of concrete selected at random during placing. Not more than one specimen shall be cast from each sample. All specimens shall be numbered as they are made. Samples shall be taken at a rate not less than the following:

All Concrete For testing at 28 days, 2 samples from each 15 cubic metre lot or part thereof cast.

Where the Contractor requests the early removal of forms, additional samples shall be taken as determined by the Supervising Engineer.

Concrete cylinders shall be capped in accordance with AS 1012.9-1986.

Specimens cast to determine the strength of the concrete in prestressed concrete units shall be cured under conditions identical with those of the concrete they represent. Other specimens shall be cured according to the methods of Australian Standard AS 1012, except that they shall be stored at the site of the work in moist conditions, sheltered from the sun and winds and protected from extremes of temperature. The 28 day cylinder strength of any lot of concrete shall be determined by the mean crushing strength of two specimens.

8.2 Rejection

Failure of the 28 day cylinder strengths (as determined in Clause 8.1) to comply with specified strengths (as specified in Clause 5.0) will render the lot of concrete represented by the samples liable to rejection, demolition or strengthening at the discretion of the Supervising Engineer and at the Contractor's expense. Alternatively, the Supervising Engineer may give consideration to the acceptance of the whole or part of such concrete subject to a corrective action which provides a suitable solution to the current and future problems.

8.3 Cost of Testing

All specimens shall be manufactured by the Contractor and delivered to the Supervising Engineer on the site for testing. The specimens shall be marked for identification purposes according to the system directed by the Supervising Engineer.

The cost of manufacture of the specimens shall be borne by the Contractor and the cost shall be deemed to be included in the unit rate for concrete.

8.4 Slump Tests

Slump measurements shall be carried out as described in AS 1012.3 and the measured slump shall be within the range of values specified in the table shown below.

The Contractor shall provide all materials and facilities including the conical form and the above Australian Standard for conducting the tests and shall maintain duplicate records of the slump test results.

Original copies shall be forwarded to the Supervising Engineer.

Type of Construction	Measured Slump (mm)	
	Min	Max
Plain Concrete		
• Footings, caissons and substructure walls	50	80
• Tunnel lining	50	100
Kerb and channel:		
• machine finished	12	40
• hand finished	25	40
Reinforced Concrete		
• Slabs	50	80
• Beams and walls	50	100
• Footings	50	100
• Columns	50	100
• Pumped concrete	70	120
• Thins walls	80	100
• Tremie concrete	120	200

9.0 On-Site Batching and Mixing

9.1 Batching

All aggregates for concrete shall be proportioned by weight unless otherwise specified. The mechanism of delivery of material to the weigh-hopper shall be such that there is the least reasonable time lag between the closing of the material hopper and the entry of the material into the weigh-hopper.

Cement for classes of concrete with a specified strength exceeding Grade N32 shall be batched by weight and shall be weighed separately from the aggregates.

Cement for other classes shall be batched by weight or by bag. If batched by weight, the cement shall be weighed separately. If batched by bag, a minimum of 1 in 20 bags used shall be weighed. Batches involving the use of fractional bags will not be permitted. Water and admixtures may be batched by weight or volume. If batched by volume water shall be measured in vessels clearly calibrated in litres.

All weighing equipment used in batching the materials shall be in accordance with the requirements set out in Australian Standard AS 1379-1991, "The Specification and

Manufacture of Concrete". The accuracy of the weighing machine shall be periodically checked.

The quantity of water and aggregate added to the mix shall be adjusted to allow for the water content of the aggregates. The Contractor shall keep on the site and at the works an approved device for determining the water content of the fine aggregate and must stockpile the material in such a way and for a sufficient time to allow the moisture content to become stable and uniform.

9.2 Mixing

Concrete shall be mixed in a batch mixer of approved type and capacity with the drum rotating at the speed recommended by the manufacturer. The capacity of the mixer shall be such that one or more whole bags of cement can be used per batch of concrete. The mixer shall be set up level and the volume of mixed concrete in a batch shall not exceed the rated capacity of the mixer.

When concrete is placed at a rate of 15 or more cubic metres per day, a spare mixer shall be kept on the site unless otherwise determined by the Supervising Engineer. All mixers shall be equipped with adequate water storage and a device for accurately measuring and automatically controlling the amount of water used in each batch. The batch shall be charged into the mixer so that some water will enter in advance of any aggregate. Materials shall be so placed in the hopper that at least two-thirds of the sand and gravel comprising each batch will enter the drum before the cement. Mixing shall continue until the concrete is thoroughly mixed. The minimum mixing time after all materials, including water, have entered the mixer shall be 2 minutes for drum type mixers. For pan and other type mixers the minimum time shall be as directed by the Supervising Engineer after conducting tests.

Upon cessation of mixing for any period exceeding 45 minutes, the mixer shall be cleaned thoroughly. Upon resumption of mixing, the first batch of concrete materials charged into the mixer shall contain sufficient excess sand, cement and water to coat the inside surface of the drum without diminishing the required mortar content of the mix. The entire contents of a batch shall be discharged from the mixer before any materials are placed therein for the succeeding batch.

Hand mixing will be permitted only in the case of emergency and then only with the approval of the Supervising Engineer. Where permitted, the quantity of hand mixed concrete shall be limited to that required to complete a member or reach a construction joint.

Hand mixing shall be carried out on a watertight platform and the batch shall be turned a minimum of 3 times dry and 3 times wet.

9.3 Placing Time

Site mixed concrete shall be placed and compacted within 45 minutes of charging the mixer for concrete temperatures up to 30°C and within 30 minutes of charging the mixer for concrete temperatures exceeding 30°C.

10.0 READY MIXED CONCRETE

Only those manufacturers approved by the Supervising Engineer shall supply ready mixed concrete and the Supervising Engineer at his/her sole discretion may withdraw approval from any supplier.

The production, delivery and testing of the ready mixed concrete shall be carried out in accordance with the requirements of Australian Standard AS 1379-1991, "The Specification and Manufacture of Concrete", except as specified otherwise hereunder. The slump of the concrete immediately prior to placing shall comply with Clause 8.4 of this specification.

Ready mixed concrete shall be placed and compacted within 1 hour 15 minutes of charging the mixer for concrete temperatures up to 30°C and within 30 minutes of charging the mixer for concrete temperatures exceeding 30°C.

The quantity of concrete delivered in any one truck and the timing of delivery shall be such that the placing operation is continuous.

11.0 HOT WEATHER CONCRETING

Where the ambient temperature is likely to exceed 30°C, the Contractor shall take all practical precautions to maintain the concrete at a temperature not exceeding 30°C at the time of placing to prevent shrinkage, settlement and presetting cracks. These precautions shall include any or all of the following:
Placing the concrete at a time of day when the concrete temperature is likely to be below 30°C;

- Shading aggregate stockpiles;
- The addition of crushed ice in lieu of mixing water;
- Insulating or burying pipe lines;
- Painting water tanks white;
- Cooling formwork by damping with water sprays;
- Shading of work areas;
- Erection of wind breaks;
- Reducing the time for placing and finishing;
- Application of an evaporation retardant such as aliphatic alcohol.

No concrete with a temperature higher than 30°C shall be placed without the prior approval of the Supervising Engineer and it shall be conditional of such approval that all reasonable precautions be taken to reduce the concrete temperature and that the concrete be placed and finished without defects.

12.0 COLD WEATHER CONCRETING

No concrete shall be placed when the shade temperature is likely to be less than 5°C during or within 2 hours of placement.

13.0 FALSEWORK AND FORMWORK

13.1 Falsework

Unless otherwise provided, detailed drawings for false work will be supplied to the Supervising Engineer before any false work is erected, but the provision of such drawings shall in no case relieve the Contractor of responsibility for the satisfactory performance of the false work.

False work which cannot be founded on a satisfactory footing shall be supported on piling which shall be spaced, driven and removed in a manner approved by the Supervising Engineer. Subject to approval by the Supervising Engineer, false work may be supported on constructed portions of the substructure provided the structure is not overstressed or rendered unstable. Allowance shall be made for a deflection during the placement.

Structural strengthening rendered necessary by false work loads shall be effected at the Contractor's expense. False work shall be released only at the time and in the order and manner approved by the Supervising Engineer.

False work shall also comply with any requirements set out in the Special Provisions.

13.2 Formwork

All forms shall be built mortar tight and of sufficient rigidity to prevent distortion by the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained so as to prevent warping and the opening of joints due to shrinkage of the timber. The forms shall be substantial and unyielding and shall be so designed and set that the finished concrete will conform to the proper dimensions and contours within the tolerances specified in Clause 19.0. The design of the forms shall take into account the effect of vibration of the concrete as it is placed.

When forms are re-used, their original shape, strength, rigidity, mortar tightness and surface smoothness shall be maintained at all times. Material previously used in formwork must be cleaned off and oiled before re-use. Warped timber shall not be used.

Forms which are unsatisfactory in any respect shall not be re-used.

The Supervising Engineer's approval of the formwork shall be obtained before placing any concrete and a program must be agreed to, to permit him/her arrange inspection and measurement.

All timber shall be free from knotholes, loose knots, cracks, splits, warps and other defects, which would affect the strength of the structure or the appearance of exposed surfaces.

For narrow walls and columns where the bottom of the form is otherwise inaccessible, openings shall be provided so that they may be cleaned before placing the concrete, and for purposes of compaction and inspection.

All forms shall be treated with the lightest practical coating of release agent before the reinforcement is placed. Release agent shall on no account be placed on reinforcement or construction joints.

All forms shall be set and maintained to the line and level designated. Forms shall remain in place for periods which shall be determined as specified in Clause 16.0. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the work shall not proceed until the defects have been corrected.

Metal form ties shall be of an approved type and, if cast in, shall be constructed so as to permit their removal to a depth of at least 32mm from the face without injury to the concrete. Ordinary wire ties shall not be used. Cavities left when the end fitting of ties are removed shall be as small as possible and shall be subsequently filled with cement mortar and the surface left sound, smooth and uniform in colour.

Form ties shall be located in a uniform and symmetrical pattern relative to the finished structure.

13.3 Formwork for Exposed Surfaces

Plastic coated plywood, waterproof plywood, timber forms lined with tempered hardboard, or good fitting unwarped metal formwork free from dents shall be used on exposed surfaces unless otherwise specified in the Special Provisions or the drawings. Forms with damaged surfaces shall not be used for exposed surfaces.

Joins between form sheeting shall be vertical or horizontal unless otherwise specified in the Special Provisions or the drawings.

13.4 Formwork for Hidden Surfaces

Standard metal forms or undressed timber may be used for surfaces that will not be exposed in the finished structure. All timber shall be shot edged or tongue and grooved.

14.0 PLACING AND COMPACTING

Except as provided in Clause 14.1, all concrete shall be placed in the dry and no concrete shall be placed until the formwork, falsework, and reinforcing materials have been inspected and approved by the Supervising Engineer.

Concrete shall be placed in an essentially continuous manner between approved construction joints so as to avoid placement against concrete which has taken an initial set.

Any troughs and chutes used as aids in placing concrete shall be arranged and used in a manner that does not cause segregation. The use of water to facilitate the movement of concrete along troughs or chutes is expressly prohibited, but all troughs and chutes shall be kept clean and free of coating of hardened concrete by flushing thoroughly with water which shall be discharged well clear of concrete in place.

Troughs and chutes shall discharge into vertical downpipes at least 600mm in length. where steep slopes are required, the chutes shall be equipped with baffles or be in short lengths that reverse the direction of movement so that the concrete slides without segregation and on no account rolls.

Pneumatic placers and concrete pumps shall be used only if authorised by the Supervising Engineer. Such equipment shall be arranged so that freshly placed concrete is not damaged by vibration. The delivery end of the pipe shall terminate in a fitting of approved design which shall prevent segregation of the concrete. After the completion of any concreting operations the equipment shall be thoroughly cleaned.

Concrete shall not be dropped from a height, or in such a manner as will cause segregation or loss of material. When placing operations involve dropping the concrete more than 1.5 metres, it shall be deposited through a sheet metal or other approved tremie, in such a way that the concrete at any point with the intention of moving it along the forms with vibration or tamping rods will not be permitted.

After the initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the ends of reinforcing bars which project.

14.1 Placing Concrete Under Water

If conditions are such that cofferdams or cylinders can be sealed only by placing concrete under water, the work shall only be carried out under the immediate supervision of the Supervising Engineer and as specified hereunder.

The quantity of cement in the concrete shall be increased by 10 percent above the minimum cement quantity for the approved mix.

Concrete shall not be placed in running water and cofferdam or cylinders shall be sufficiently tight to maintain still water at the location of placement. Any pumping must cease and the water level must be constant when placement commences. The concrete shall be placed carefully in a compact mass in its final position by a tremie, a closed bottom-dump bucket or by other approved means. Concrete seals on the bottom of cylinders or caissons, shall be placed in one continuous operation, the concrete shall not be disturbed after being deposited and the placing shall be regulated so as to continually maintain an approximately horizontal surface. No tamping or vibration will be allowed.

When a tremie is used, it shall consist of a watertight tube fitting with a valve or other device so that at no time shall concrete in the tube come in contact with water when it is being filled. The means of supporting the tremie shall be such as to permit free movement of the discharge end and to permit its being lowered rapidly when necessary to choke off or retard the flow of concrete. No water shall enter the tremie tube. The discharge end shall be completely submerged in concrete at all times and the tremie tube shall always be filled to a height to overcome the head of water.

When concrete is placed with a bottom-dump bucket, the bucket shall be lowered gradually and carefully until it rests upon the prepared foundation or upon concrete already placed. It shall then be raised slowly during the discharge travel so as to maintain as far as is practicable still water at the point of discharge and to avoid agitating the mixture. The concrete placed shall not be disturbed.

Cofferdams or cylinders shall not be dewatered until at least 48 hours after the completion of placing the concrete seal. After dewatering, the top of the concrete shall have all liatance and weak concrete removed and be thoroughly scabbled and cleaned before subsequent placement of concrete.

14.2 Use of Spalls

Spalls (plums) of solid approved rock not exceeding 13 kg in weight may be used in mass concrete if approved by the Supervising Engineer. The spalls shall not be placed closer together nor nearer the face of the forms than 150 millimetres. Spalls shall be surface wetted before placing. They shall be well bedded by hand and the concrete vibrated in place around them.

14.3 Compaction of Concrete in the Forms

Concrete shall be thoroughly compacted during and immediately after depositing. Concrete other than no-fines concrete shall be compacted with high frequency internal vibrators in the manner described below. Hand compaction in lieu of mechanical vibration will be allowed only on works designated as minor concreting operations or as emergency measure when approved by the Supervising Engineer.

The vibration shall be internal except as provided below (form vibrators).

- Vibrators shall be of an approved type, capable of transmitting vibration to the concrete at frequencies of not less than 8000 impulses per minute at such an intensity as to visibly effect a 25mm slump concrete at a radius of 300 millimetres.

- Vibrators for Grades of concrete N32 and stronger shall be capable of transmitting vibration to the concrete at frequencies of not less than 12000 impulses per minute at such an intensity as to visibly effect a zero slump concrete at a radius of 300 millimetres.

- The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms. The minimum number of vibrators to be provided will depend on the rate of placing concrete but in no case shall there be less than 1 vibrator for each 4 cubic metres of concrete or part thereof placed per hour, with a minimum of 2 vibrators.

- A vibrator shall be inserted into the concrete at successive positions not more than 450 millimetres apart and vibration shall continue at each position until air bubbles cease to emerge. It shall then be withdrawn slowly.

- Vibrators shall be inserted so as to thoroughly compact the concrete around the reinforcement and embedded fixtures and into the corners and angles of the forms.

- Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete.

- Where more than one layer is being placed in a continuous operation the vibrator shall be inserted through the layer into the layer below. The concrete in the lower layer shall be fresh enough to permit this to be done without difficulty.

- Vibration shall not be applied directly, or through the reinforcement, to sections or layers of concrete which have hardened to the degree that the concrete ceases to be plastic under vibration.

- The provisions of Clause 14.3 shall apply to precast members except that if approved by the Supervising Engineer, the manufacturer's method of vibration may be used. For thin web sections, internal vibration shall be used in conjunction with external mould vibration.

Except when authorised by the Supervising Engineer and in thin web sections concrete shall be placed in horizontal layers not more than 300 millimetres thick. Each layer shall be placed and compacted before the preceding layer has taken its initial set, unless an approved construction joint has been provided.

Immediately following the placing of concrete, all accumulations of mortar splashed upon reinforcement steel and the surfaces of the forms shall be removed.

15.0 CONSTRUCTION JOINTS

Construction joints shall be constructed only where shown on the drawings or specified hereunder unless otherwise approved by the Supervising Engineer. If not detailed in the drawings or specified below, or in the case of an emergency, construction joints shall be placed as directed by the Supervising Engineer.

Construction joints shown in the drawings are mandatory unless specifically exempted by the Supervising Engineer.

At horizontal construction joints, dressed timber strips approximately 25 millimetres square shall be placed inside the forms for all exposed faces and the surface of the lower layer of concrete shall be stopped slightly above the lower edge of the strips so as to give the joints a straight line. Timber strips shall be removed before placing the succeeding layer of concrete. Before placing fresh concrete all laitance shall be removed, the surface wire brushed or pneumatically tooled to expose the surface of the aggregate without undercutting, all loose aggregate removed and the surface washed clean and allowed to dry before the fresh concrete is placed. Immediately before placing fresh concrete the forms shall be drawn tightly against the concrete already in place.

The quantity of cement in the concrete places in contact with the construction joint shall be increased by 10 percent and the quantity of sand increased by 3 percent above the approved mix proportions.

The placing of concrete shall be carried out continuously from joint to joint. The face edges of all joints which are exposed to view shall be carefully finished true to line and elevation.

16.0 REMOVAL OF FORMS, FALSEWORK AND CENTRING

Unless otherwise specified herein or by direction in writing by the Supervising Engineer, forms shall not be removed from the concrete until the following times have elapsed from the placing of the concrete.

Centring under beams and arches:

- Bridge main falsework - On attainment of 70 percent of the specified 28 day cylinder strength, but not less than 7 days.

Other non-prestressed members	-	7 days
Underside of slabs less than 1.8m span	-	3 days
Underside of slabs 1.8m span and over	-	7 days
Walls -	-	24 hours
Columns (depending on slenderness)	-	1 to 2 days
Side of beams and all other parts-	-	24 hours

If field operations are controlled by cylinder tests, the removal of forms and supports may be begun when the strength reaches 70 percent of the specified 28 day strength.

Forms shall be removed with care without hammering and wedging and so as not to injure the concrete or disturb the remaining supports. Forms shall be gradually and uniformly lowered in such a manner as to avoid injurious stress in any part of the structure.

No load which may cause damage to the work shall be placed on or against any concrete. Loading placed on or against any concrete shall be subject to approval by the Supervising Engineer and any requirements specified elsewhere in the Contract Documents. Notwithstanding any such approval, the Contractor shall repair as directed by the Supervising Engineer at the Contractor's expense, any damage caused by his operations.

Generally, the only curing compound which will be approved is a paraffin wax emulsion in water. The compound shall be applied at the rate recommended by the manufacturer. Where the curing of slabs are effected by means of curing compounds, they shall be sprayed with the compound as soon as possible after finishing and before plastic cracking occurs and shall then be immediately covered with an approved building paper. Should the building paper be lifted by wind or other action, the area uncovered shall be re-sprayed and the paper replaced.

If, in the opinion of the Supervising Engineer curing was not applied efficiently, he/she may order the cutting of cores for the testing of the concrete insitu, irrespective of whether test cylinders had been taken previously and irrespective of the test results on such cylinders and the cost of same shall be paid for as set out in the General Conditions of Contract.

Should it become necessary to carry out repairs or add render to surfaces to which curing compound has been applied such surfaces shall be scabbled back at least 25mm.

Curing by means other than with a curing compound will be approved only under special circumstances.

CHAPTER 14 - BONDING

1.0 INTRODUCTION

These Guidelines provide Council's minimum requirements for bonding of Developments Obligations. They shall be read in conjunction with Council's other policies and by laws.

"Bonding" is the submission of a financial security to Council by the developer, and is used in the following circumstances:-

(a) To cover incomplete development obligations in order to obtain the early release of Survey Plans.

(b) To cover all development construction works during the maintenance period.

NOTE Development obligations refer to all conditions of approval relative to the development permit. This includes, but is not limited to, Civil Works, Park improvements, provision of 'As Constructed' information, test certificates, revegetation, sediment and erosion control

2.0 PERFORMANCE BOND

2.1 General

Council may require a bond to be submitted (ie earthworks, sediment erosion) prior to the commencement of works. The amount of the bond will depend on the type of development works being carried out.

2.2 Uncompleted Work Bonds

Council may, at the request of the development proponent, agree to release the Plans of Subdivision prior to completion of development obligations. The pre-requisites for making such a request as well as the documentation and security requirements associated with sealing of those survey plans are outlined in the Moreton Bay Regional Council general policy entitled “Approval of Plans of Subdivision Prior to Completion of Subdivision Works”.

2.3 Maintenance Bond

It is the developer's responsibility to maintain all development works which are to be handed over to Council (including open space areas), for a minimum period of twelve (12) months or as otherwise advised by Council. This period shall commence from the formal acceptance of the development 'On Maintenance'.

Council requires the developer to submit a Maintenance Bond to Council to ensure the above works are maintained during this period.

The Maintenance Bond shall be:

- 5% of the agreed value of the development obligations
- $1500.00 - whichever is the greater amount

2.4 Formal Agreement

The developer shall enter into a written agreement with Council prior to the formal acceptance of works 'on maintenance'.

The agreement serves a number of purposes, one of which is to ensure that the developer is clear in relation to their obligations and the course of action Council can take if these obligations are not fulfilled.

CHAPTER 15 –AS CONSTRUCTED

1.0 GENERAL REQUIREMENTS

Council requires that Consultants certify the "as constructed" information is accurate and records that the completed works are generally in accordance with the tolerances required by Council.

In keeping with the above aim, the Consultant shall complete the "Consulting Engineer's Certificate and "As Constructed" certification form.

2.0 AS CONSTRUCTED CRITERIA

As constructed" information prepared by the Consultant for submission to Council should meet the following minimum criteria:-

- Be endorsed by a Licensed Surveyor with an appropriate Q.A. Standard
- All "as constructed" information shall be submitted to Council prior to any formal acceptance of the Works "on maintenance"
- The submission of "as constructed" information is required in the format as specified in Council's current standard electronic format for As Constructed data"
- Approved street names and correct lot numbers shall be shown on all "as constructed" information
- All significant variations from approved Engineering Drawings (including tolerances outside those specified or set out below) shall be approved by Council prior to or during construction and such changes recorded on the "as constructed" information
- Any amendments required by Council to the submitted "as constructed" information shall be made and resubmitted by the Consultant and approved by Council prior to formal acceptance of the Works "off maintenance"
- Where uncompleted works are bonded for survey plan sealing purposes, preliminary "as constructed" prints of sewerage shall be submitted to Council.

2.1 SURVEY CONTROL

The survey is to be connected to at least two coordinated, Council permanent survey marks. Full details of the control traverse, of all existing, new and Council permanent survey marks, is to be supplied. A suitable control point at or near the centroid of the subject area is to be made the AMG origin. The survey is to be on AMG meridian and is NOT to be scaled to AMG coordinates. A Level run, established and check levels, is also required to be performed and supplied over all Control and Traverse marks to AHD using the permanent survey mark with the highest height order as the origin.

2.2 SURVEY REQUIREMENTS

Real Property connections are NOT required. The survey is to be provided electronically in Civil CAD format using Redcliffe City Council point coding with associated hardcopy plots, generally on A1. Preferably, reduced in Civil CAD to direct point codes to their respective layers and automatically set point symbols and line types. Otherwise ASCII, DXF or DWG files would be sufficient.

2.3 Insurance

Before any work commences, the Council requires evidence that the survey firm has Workers Compensation Insurance, together with Public Liability Insurance cover, to the value of $10M. Notification is also required that the survey firm has assumed the role of Principal Contractor within the meaning of that term, in and for the purposes of the Workplace Health and Safety Act, for the purposes of the survey.

2.4 Features (with associated RCC Survey coding)

Location, type and size of all features are required to be surveyed. However, the RCC coding system may not cater for unique or uncommon features. In this instance, new codes (with respect to the available code numbers) should be assigned and noted. Features and terrain should be defined by stringing paying particular attention to maintaining continuity in ALL linework (ie. No gaps).

The following details Redcliffe City Councils more specific location methods. Refer attached code listing.

Survey (RCC001-RCC049)
Point Features
- Permanent Survey Marks (RCC001)
- RCC Brass Markers (RCC002)

Comments
There is a substantial listing of survey marks available, along with marks of a cadastral nature.

Foreshore (RCC056-RCC070)
Point Features
- Pontoon (RCC056)
- Pylon (RCC057)
- Beacon (RCC059)

Line Features
- Edges of sand, beach, seawalls, boat ramps, jetties and wharfs.

Comments

Steps (RCC080-RCC087)
Line Features
- Concrete, brick, wooden and unspecified steps.

Comments
- There is no need to pick up every step, just the edge of all platforms and four corners of each step incline.

Natural Surface / Contours (RCC100-RCC103)
Point Features

Adequate Level's to accurately contour (RCC100)

Line Features

Stringing of changes of grade - Natural Surface breaklines (RCC101)
(this allows on screen stringed lines without being plotted)
Top/Bottom of Banks (RCC102-RCC103)

Comments

This area of the code list caters for natural surface features only.

Concrete in Public Land (RCC120-RCC125)

Line Features

Driveways (RCC120-RCC122)
Car Tracks (RCC123-RCC125)

Comments

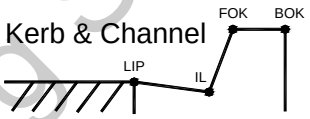
This layer generally relates to all hard stand areas, particularly driveways, but includes all concrete areas (other than paths) in public land.

Roads (RCC130-RCC160)

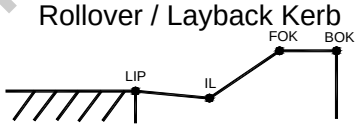
Line Features

Flush Kerb
Back of Kerb (RCC155)
Lip of Kerb (RCC156)

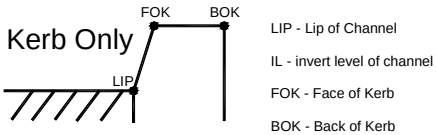
Kerb and Channel
Back of Kerb (RCC146)
Top / Face of Kerb (RCC145)
IL of Kerb (RCC144)
Lip of Kerb (RCC143)



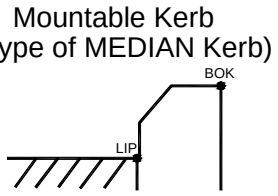
Rollover / LayBack Kerb
Back of Kerb (RCC154)
Top / Face of Kerb (RCC153)
IL of Kerb (RCC152)
Lip of Kerb (RCC151)



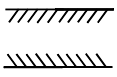
Kerb Only
Back of Kerb (RCC160)
Top / Face of Kerb (RCC159)
IL of Kerb (RCC158)
Lip of Kerb (RCC157)



Median Kerb
Back of Kerb (RCC150)
Top / Face of Kerb (RCC149)
IL of Kerb (RCC148)
Lip of Kerb (RCC147)



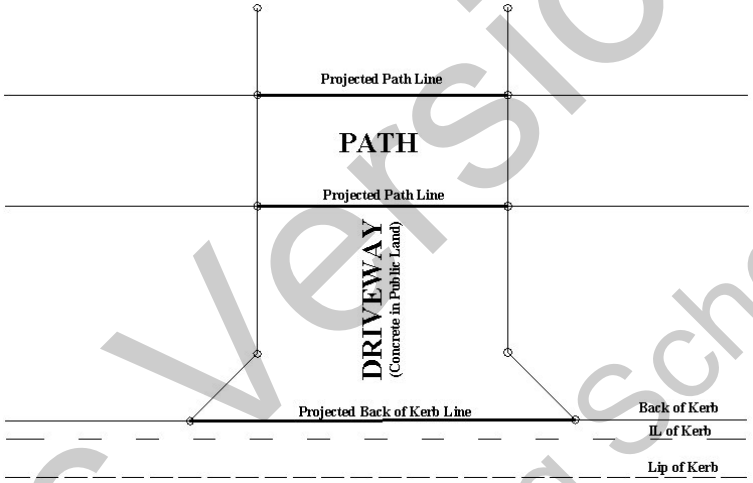
Crown of bitumen (RCC136)
Edge of Bitumen (Hatch left)(RCC138)
Edge of Bitumen (Hatch right)(RCC137)
Hatching is drawn in direction of travel
(eg. Direction from left to right)
Direction of stringing →
Hatch right
Hatch left



Spot level on changes of grade of pavement (RCC142)

Comments

At present the GIS system caters for the Back of Kerb and the Lip of Kerb. However, the IL of kerb is also required for design and aesthetic purposes. RCC's definition of MEDIAN KERB is any type of kerb within the road carriageway and MOUNTABLE KERB is ALWAYS portrayed as a MEDIAN KERB. It should be noted that driveways are to be located under concrete in public land codes and the road Back and Lip is to be strung across the driveway as to keep continuity in the road linework as per the following diagram. Also, curves are required, generally by three point arcs, where curved lines exist. Eg. Traffic islands, road intersections etc.



Paths (RCC170-RCC178)
Line Features
Footpaths – Width < 1.5
Bikepaths – Width > 1.5
Comments
Paths are made of concrete, bitumen or pavers, all of which are catered for in the coding system. Council's GIS divides paths into the above two categories, Footpaths and Bikepaths, by measure of width. Paths are to be connected across driveways, similar to roads. That is, the continuity of the path linework is to be kept across driveways. Similarly, this goes for pram ramps etc. where there is wheel chair access to the road carraigeway.

Signs (RCC190-RCC198)
Point Features
Advertising (RCC190)
Street (RCC191)
Traffic (RCC192-RCC193)
Speed (RCC194)
Parking (RCC196)
By-Law (RCC197)
Bus Stop (RCC198)

Comments

Generalising the extensive range of signs produces the above short list. The centre of the sign post is to be located.

Road Furniture (RCC220-RCC231)

Point Features

Guide Posts (RCC222)
Bike Rack (RCC220)
Traffic Lights (RCC229-RCC231)
Rubbish Bin (RCC226)
Post Box (RCC225)

Line Features

Guard Rails (RCC221)
Seat within road reserve (RCC227)
Table within road reserve (RCC228)

Comments

General furniture within road reserves. It should be noted that bins, seats, tables etc., also occur in the Parks Furniture Layer. Council requires these separated by locality, ie. Features within road reserves are under the Road Furniture layer whilst features within parks come under the Park Furniture Layer.

Drainage (RCC250-RCC499)

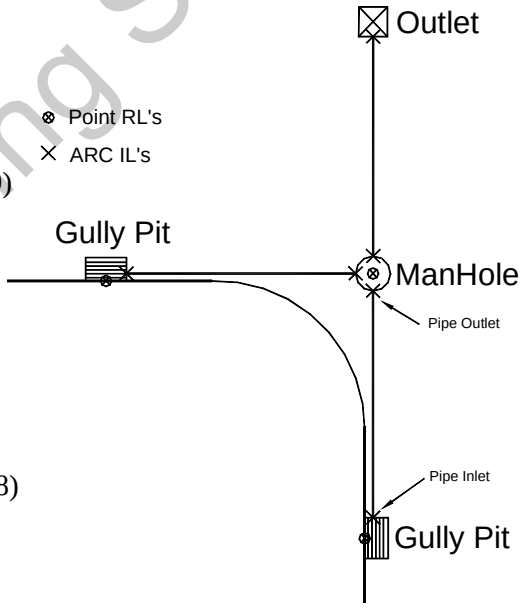
Point Features

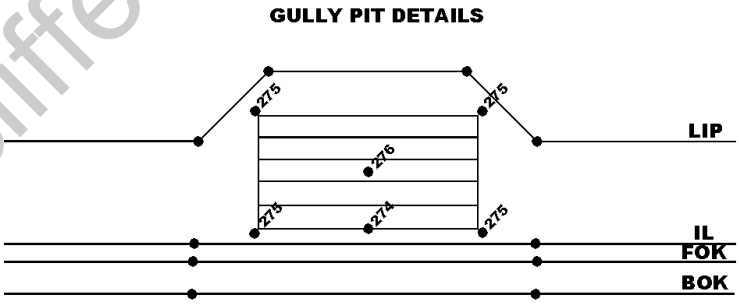
Gully Pits (CL and back of grate RCC274)
Manholes (Centre of MH Lid RCC265)
IL of Inlets of Pipes (RCC310 – RCC399)
IL of Outlets of Pipes (RCC310 – RCC399)
Gross Pollutant Traps (RCC277)
Trash Racks (RCC279)
Tidal Valves (RCC278)

Line Features (defined by stringing points)

RCP's by stringing inlets and outlets
RCBC's by stringing inlets and outlets
Open Drains, concrete lined and

earth drains by stringing (RCC269-273)
Headwalls / Wingwalls by stringing (RCC267-268)
Comments





While the GIS uses the CL and back of gully grates, the four corners of the concrete surrounding the grate is also required for aesthetic and design purposes. Also, it is pertinent to note that the centre of the manhole lid is required, not the centre of the manhole structure. Where possible, IL's are required as in the above diagram. However, this may be impractical, and as such the invert level of the gully pit, manhole or other drainage structure would be sufficient. Open drains are to be strung from the high point to the low point as the associated line type shows the direction of flow.

Water (RCC520-RCC532)

Point Features

Fire Hydrant's (RCC520)
Pillar Fire Hydrant's (RCC527)
Service Valves (RCC521)
Reducer Valves (RCC530)
Flow meter Manholes (RCC529)
Top of Water Main - Bends, T pieces etc… (RCC523)
Water Meter (RCC528)
Irrigation Control Pits (RCC531)
Stop Cocks (RCC532)

Line Features

Watermain / diameter
Conduit

Comments

Generally, survey of underground features should be performed before backfilling of trenches. Although this is not always possible, trenches are usually evident especially in bitumen. Water meter boxes fall into two categories, water meters and irrigation control pits, therefore they must be lifted to ascertain its type. Stop Cocks refer to the smaller irrigation valves which generally have a small square lid with a W.

Sewerage (RCC550-RCC565)

Point Features

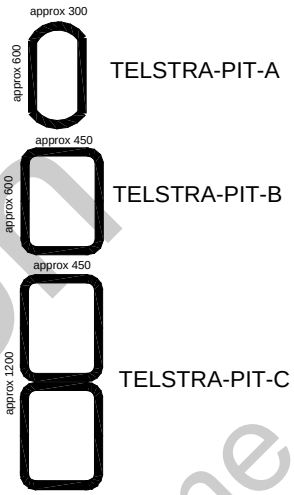
Manholes (Centre Top of SMH lid RCC550)
IL of inlet (RCC552)
IL of outlet (RCC553)
IL of Sewer MH (RCC557)
End of Line (RCC558)
End of Overflow (RCC559)
Junction (RCC560)
Manhole End of Line (RCC561)
Overflow Manhole (RCC562)
Rising Main Junction (RCC564)
Pumpstation (RCC563)
Valve Pits (RCC565)

Line Features

Outline of Sewer Pump Station
Pipes by stringing manhole to manhole
Overflows

Comments

As in drainage, IL's of inlets and outlets may be too difficult to determine, therefore the IL of the centre of the manhole structure in the channel of the concrete flow path would be sufficient.



Telstra (RCC580-RCC590)

Point Features

Telstra-pit-A (RCC581)
Telstra-pit-B (RCC582)
Telstra-pit-C (RCC583)
Telstra-pit-D (old type) (RCC580)
Telstra-pit-unknown (eg. Under pavers etc.)
Sputnick (D.A. Terminal) (RCC586)

Line Features

Telephone Box (RCC589)
Stringing of point features

Comments

There are about 9 different type of Telstra pits, however they pretty much fall into the above categories. If in doubt as to which type the pit is then all corners of the pit should be located. A sputnick or D.A. Terminal is a cylindrical pillar about 1.2 metres high.

Power (RCC610-RCC625)

Point features

Pole – unclassified (RCC610)
Power Pole (RCC611) – has no street light, carries power lines
Light Poles (RCC612) – has a street light, carries power lines
Streetlight (RCC613) – has a streetlight, no power lines
Streetlight (Double) (RCC614) – has a double streetlight,no power lines
Substation (RCC615)
Transformer Poles (RCC616) – Power poles with transformers
Stay Poles (RCC622)
Stay Wires (RCC621)
Electricity Boxes/Power Pits (RCC619) – flush or protruding
Decorative Light (RCC623) – Ornamental type lights
Solar Light (RCC624) – with solar panel

Line Features

Stringing between poles
Large electricity boxes/power Pits
Switchboards
Large Transformers

Comments

The centre of the pole is to be located generally by measuring the distance to perpendicular to the pole and bearing to the centre of the pole.

Vegetation (RCC700-RCC727)

Point Features

Significant trees >= 0.1 diameter (RCC700-RCC720)
Line Features
Edges of trees, gardens, canopies etc… (RCC721-RCC727)
Comments

The centre of the main trunk is required for point features. Trees falling within garden beds etc. do not need locating, unless they are > 0.3m in diameter. Otherwise all trees, no matter what diameter, are to be located.

Bus Shelters (RCC740)

Line Feature

Bus Shelter (RCC740)

Comments

Any type of Bus Shelter. Note that Bus Stops are also distinguished by line marking and Bus Stop signs.

Land Uses (RCC780-RCC792)

Line Features

Land use

Comments

Used for schools, Police, Ambulance etc.

Fences (RCC800-RCC818)

Line features

Fencelines with contourable RL's. (RCC800-RCC812)

Retaining Walls (RCC813-RCC816)

Comments

As fence lines are breaklines, accurate levels are required.

Linemarking (RCC830-RCC863)

Line features

LM40 - '40' on road
LMAB - Airport Block Area
LMADL - Airport Dashed Line
LMAN - Airport Number
LMARN - Airport Runway Number
LMASL - Airport Solid Line
LMAW - Airport Word
LMB - Single Broken White Line
LMBK - Bike Path (symbol of bicycle)
LMBN - Bus Stop Name
LMBS - Bus Stop Line Markings
LMC - Chevron Pattern
LMCL - Continuity Line, (front edge only)
LMD - Double White Lines
LMDA - Directional Arrow
LMDBL - Double Broken White Lines
LMGW - Giveway Line
LMIL - Intersection Turn Line
LMML - Merge Lane
LMNA - Name on the Roadway eg. STOP, XING etc…
LMNP - 'No Parking' on Road
LMNX - 'X' on road
LMPA - 'AHEAD' on road
LMPB - Parking Bays, front in
LMPC - Pedestrian crossing lines, usually at traffic lights
LMPL - Kerbside Parking Bays
LMPN - 'PED' on road
LMS - Single Solid White Line

LMSB - Speed Bump
LMSLBR - Solid left broken right white line
LMSP - Stop Line (front edge)
LMSRBL - Solid right broken left white line
LMZC - Zebra crossing
LMZZ - Zig Zag line before Zebra Crossing

Comments

There are no line types for line marking, the layer name gives the description. The centreline of every line is to be located. This means the actual location of every piece of line marking. For example, for a single broken white line every end point of every dashed line is to be located. Also outlines of symbols such as a bicycle on paths, text or numbers on the road, outlines of turning arrows, disable symbols in car parks etc. are to be located by this method.

Park Furniture (RCC870-RCC902)

Point Features

Drink Fountains (RCC877-RCC878)
Bins (RCC881-RCC886)
Outdoor Shower (RCC880)
Shade sail pole (RCC901)
Shade sail stay pole (RCC902)

Line Feature

Fish filleting table (RCC879)
BBQ's (RCC870-RCC875)
Bike Rack (RCC876)
Seats (RCC897-RCC900)
Playground Equipment (RCC887-RCC896)

Comments

All assets in parks are to be located. The planimetric shape of the playground equipment is to be depicted by the survey. Bin, seat, table etc., codes are also available in the Road Furniture Layer. Council requires these separated by locality, ie. Items within road reserves are under the Road Furniture layer whilst items within parks come under the Park Furniture Layer.

Structures (RCC920-RCC973)

Point Features

Flag Pole (RCC923)

Line Features

Toilet Block (RCC950)
Pools (RCC952-RCC953)
Houses (RCC954-RCC961)
Sheds (RCC965-968)
Floor Levels (RCC972-RCC973)
Grandstand (RCC920)
Shelter (RCC922)
Courts (RCC925)
Fields (RCC928-RCC931)
Skate Facilities (RCC927)

Comments

All structures whether in parks or not.

GAS

Point Feature

Gas Valve (RCC981)

Gas Manhole (RCC982)

Line Features

Gas Pipe (RCC980)

Comments

At present there is no existing information on the GIS about gas pipelines. However, it is envisaged to be in the near future. Consequently all Gas features are to be located.

General Comments

This document is a working document and will be refined continuously as various interpretations can be explained in more detail. If there are any queries or suggestions contact Ces Greenwood, Coordinator Survey and Land Information, Redcliffe City Council as they would be much appreciated.

RCC's GIS DATA STRUCTURE - PERMANENT SURVEY MARKS POINT

REG_PSM_NO	REGISTERED PSM NUMBER
RCC_NO	RCC NUMBER (Usually on Brass Markers & Bolt's in Concrete)
EASTING	AMG Easting
NORTHING	AMG Northing
HORDER	Horizontal Order
HCLASS	Horizontal Class
RL	AHD Orthometric Height (from spirit levelling)
RLORDER	Ortho RL Order
RLCLASS	Ortho RL Class
ORTHOHT_ORIGIN	Origin of Orthometric Height
RL-GPS	GPS AHD Height
GPSORDER	GPS Height Order
GPSCLASS	GPS Height Class
MARK_TYPE	Bolt in Concrete
	Brass Marker (Used by RCC)
	D.D.M. Deep Driven Mark
	Mini Mark (Used by Private Surveyors)
	Spike
	Standard Plaque
PLOTNO	Registered Number otherwise RCC Number
SHEET	Sheet Number in PSM Book
PLOTMK	1 – Registered PSM with coordinates
	2 – Registered PSM without coordinates
	3 – Non-Registered Mark with coordinates
	4 – Non-Registered Mark without coordinates
CONDITION	Buried
	Damaged
	Destroyed
	Disturbed
	Good
	Not Found
Unstable	

FORESHORE ARC

DXF-LAYER	BOTTOM OF BEACH	FSBB
	TOP OF BEACH	FSTB
	EDGE OF SAND	FSES
	BOTTOM OF CONCRETE SEAWALL	FSBCS
	TOP OF CONCRETE SEAWALL	FSTCS
	BOT OF ARMOURSTONE SEAWALL	FSBAS
	TOP OF ARMOURSTONE SEAWALL	FSTAS
	EDGE OF SEAWALL	FSES
	HIGH WATER MARK	FSHWM
	EDGE OF BOAT RAMP	FSEBR
	EDGE OF WHARF	FSEW
	PONTOON	FSPON
	PYLONS	FSPYL
	JETTY	FSJET
	BEACON	FSBEAC

POLY

FORESHORE_TYPE	ARMOUR ROCK CANAL WALL	
	ARMOUR ROCK GROYNE	
	ARMOUR ROCK HARBOUR	
	ARMOUR ROCK SEAWALL	
	BEACH	
	BEACH CANAL	- Beaches in Canals
	BOAT RAMP PUBLIC	
	BOAT RAMP CANAL PRIVATE	
	BOAT RAMP HARBOUR FERRY	
	BOAT RAMP HARBOUR PRIVATE	
	BOAT RAMP PRIVATE	
	BREAKWATER	
	BRIDGE (HORNIBROOK)	
	BRIDGE (HOUGHTON)	
	CONCRETE DRAIN OUTLET	
	CONCRETE RUBBLE SEAWALL	
	CONCRETE SEAWALL	
	CONCRETE SEAWALL STEPPED	
	DENSE MANGROVE	
	HAYS INLET	
	ISOLATED MANGROVE	
	JETTY HARBOUR PRIVATE	
	JETTY HARBOUR PUBLIC	
	JETTY PRIVATE	
	JETTY REDCLIFFE	
	JETTY WOODY POINT	
	MANGROVE	
	MARINA MBBC	
	MARINA NEW PORT DEVELOPMENT	
	MUD FLAT	
	NATURAL BANK	
	PONTOON CANAL PRIVATE	
	PONTOON HARBOUR	
	RED CLIFFS	
	SALT PAN	
	SHIP WRECK	
	SUBMERGED ROCK	

STEPS

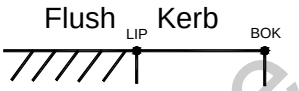
ARC

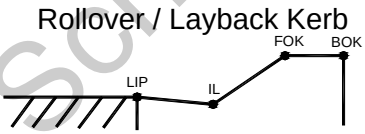
DXF-LAYER	BOTTOM OF STEP (UNDEFINED)	STPUB
	TOP OF STEP (UNDEFINED)	STPUT
	BOTTOM OF CONCRETE STEP	STPCB
	TOP OF CONCRETE STEP	STPCT
	BOTTOM OF BRICK STEP	STPBB
	TOP OF BRICK STEP	STPBT
	BOTTOM OF WOODEN STEP	STPWB
	TOP OF WOODEN STEP	STPWT

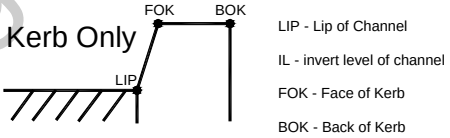
CONCRETE IN PUBLIC LAND ARC

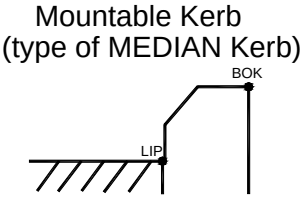
DXF-LAYER **EXISTING -> DWAY, CONCRETE, CONCRETEADD**
FUTURE -> CPLED EDGE OF DRIVEWAY
CPLCD CENTRELINE OF DRIVEWAY
CPLSD SPOT ON DRIVEWAY
CPLEC EDGE OF CAR TRACK
CPLCC CENTRE OF CAR TRACK
CPLCT CAR TRACK

ROADS (Back of Kerb)
ARC









EDGE-TYPE
RDPRVKC - Private Kerb & Channel
RDPRVKO - Private Kerb Only
RDPRVMK - Private Median Kerb
RDPRVRK - Private Rollover Kerb
RDPRVSP - Private Sealed Pavement
RDRCCFK - RCC Flush Kerb
RDRCCKC - RCC Kerb & Channel
RDRCCKO - RCC Kerb Only
RDRCCMK - RCC Median Kerb
RDRCCRK - RCC Rollover Kerb
RDRCCSA - RCC Sealed Pavement @ Aerodrome
RDRCCSP - RCC Sealed Pavement
RDRCCUP - RCC Unsealed Pavement
RDRCCVT - RCC Vehicle Track

KERB_HT
0 - Flush Kerb
50
75
100
150
200
300

ACCURACY Horizontal Accuracy 1-5

ROADS (Lip of Channel)
ARC

DXF-LAYER
RDSKO_LIP - Lip of Kerb Only
RDSFK_LIP - Lip of Flush Kerb
RDSKC_LIP - Lip of Kerb & Channel
RDSMK_LIP - Lip of Median Kerb
RDSRK_LIP - Lip of Rollover Kerb

ACCURACY Horizontal Accuracy 1-5

PATHS
POLYGON

PATH-TYPE	B&FP	- Width > 1.5
	FP	- Width < 1.5
	STAIRS	
SURV-ACC	Horizontal Accuracy	
PATY-TYPE-ID (PATH-TYPE-ID)	Numeric ID	
GIS-ID	F + Numeric ID	

SIGNS
POINTS

SIGN-TYPE	**AD-SIGN**	
	DOUBLE-SIGNPOST	
	HAZARD SIGN	
	KEEP LEFT SIGN	
	SIGN-POST	
	STREET SIGN	
	STREET SIGN + NO THROUGH ROAD	
SURFACE_LEVEL	AHD height	
GIS_ID		
GIS_NO	AM unique identifier	
SURV_ACC	Horizontal Accuracy	
GIS_NO2	)ID's for	
GIS_NO3	)multiple	
GIS_NO4	) signs	
GIS_NO5	) on	
GIS_NO6	) one	
GIS_NO7	) post	

ROAD FURNITURE
POINT

DXF LAYER	**GUARD RAIL**	**RDFGR**
	GUIDE POST	RDFGP
	PARKING METER	RDFPM
	POST BOX	RDFPB
	RUBBISH BIN	RDFRB
	TRAFFIC CONTROL BOX	RDFTCB
	TRAFFIC LIGHTS	RDFTL
	TRAFFIC LIGHT CAMERA	RDFTLC

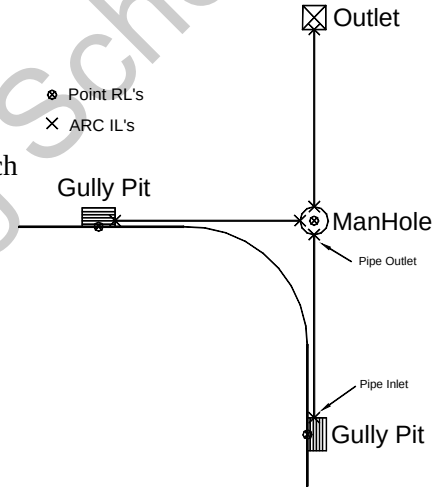
ARC

DXF-LAYER	**BIKE RACK**	**RDFBR**
	MONUMENT	RDFMN
	SEAT (ROAD)	RDFST
	TABLE (ROAD)	RDFTB

DRAINAGE

POINT

DXF-LAYER	BRIDGE	- Road Bridges
	CULVERT	- Vehicle/Bike/Foot crossings over drains with no **RCP or RCBC**
	DGEGP	- Centre, back of Gully Pit
	DGEIL	- Inlet of RCP/RCBC
	DGEILD	- Intersection of lined open drains
	DGEINT	- Intersection of RCP/RCBC (mainly for AM)
	DGEIUD	- Intersection of unlined open drains
	DGEJB	- Junction Box (usually buried and not accessible)
	DGEMH	- Centre of Manhole Lid
	DGEOL	- Outlet of RCP/RCBC/Drain
	DGESLD	- Start of lined drain
	DGESUD	- Start of unlined drain
	DGETR	- Trash rack (centre)
	DGETV	- Tidal Valve (centre)
	DGEGPT	- Gross Pollutant Trap (centre)
	DGEWEIR	- Weir (centre)
DXF-ELEVATION	AHD height	
GIS-ID	Concatenated catchment, outfall, branch & reach	
CATCHMENT	04X etc. (Overland flow path)	
OUTFALL	A0 etc. (end of drainage network)	
BRANCH	0101 etc. (branch from mainline)	
REACH	01 etc. (branch from branch, ie sub branches)	
SURV-ACC	Horizontal Accuracy 1-5	
COMMENTS	General Comments	
ASSET-ID	5 digit numeric UNIQUE IDENTIFIER (for consolidation with AM)	



ARC

DGETYPE	BRIDGE	- Graphical representation of bridges (rectangles)
	DGECL	- Chamber lines (used only for continuity, ignore)
	DGEHW	- Head Wall (from photography)
	DGEOL	- Open lined drain
	DGEOU	- Open unlined drain
	DGERCBC	- Reinforced concrete box culvert
	DGERCP	- Reinforced concrete pipe
	DGEWEIR	- Graphical representation of Weir
	DRAIN	- Drains after outlets (ignore)
	POND_LINE	- Creeks etc. (Humpybong ck)
GIS-ID1	equivalent to upstream Point GIS-ID	
SURV-ACC	**Horizontal Accuracy 1-5**	
COMMENTS	General comments	
DRAIN-SIZE	RCP/RCBC size OL/OU drain width	

INLET-ACC	Vertical Accuracy	1-5	1 – Levelled 2 – Trigonometric height 3 – Aerial Photo height of kerb minus pit depth (not common) 4 – Design Plan 5 – As Constructed Plan

IL-INLET	AHD RL of inlet
IL-OUTLET	AHD RL of outlet
OUTLET-ACC	Vertical Accuracy 1-5 same as INLET-ACC
ASSET-ID	**5 digit number corresponding to the upstream POINTS ASSET-ID**
LINE-ID	Number of downstream pipe (as can have >1 pipes)
ARC-ID	Concatenate ASSET-ID and LINE-ID for UNIQUE IDENTIFIER

WATER

POINT

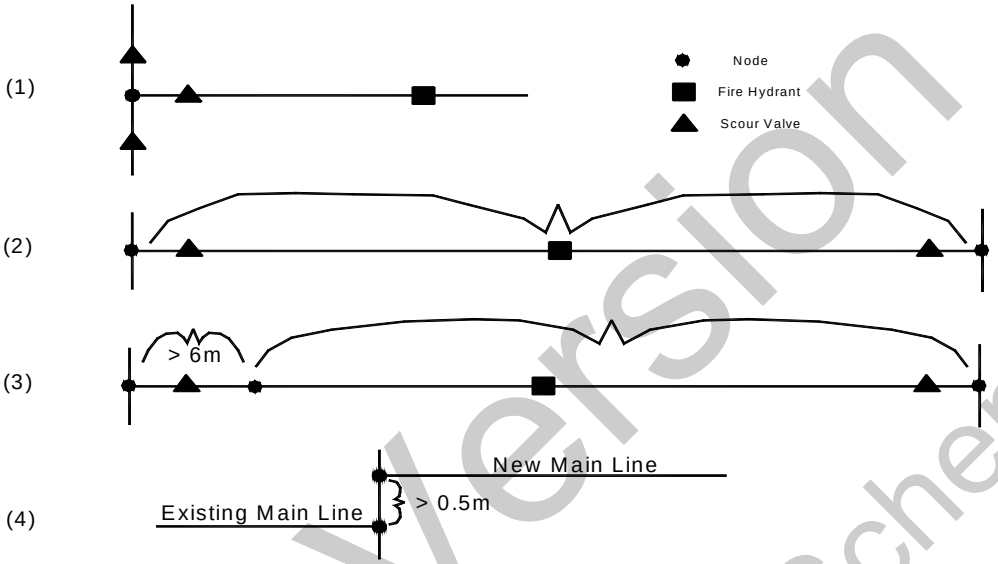
VALVE-TYPE	WATPH - Pillar Hydrant
WATFH	- Fire Hydrant
	WATMH - Flow Meter Manhole/Pit
	WATRE - Reducer Valve
	WATSV - Stop Valve
	WATICP - Irrigation Control Pit (mostly any other pit other than WM)
	WATBS - Beach Shower
	WATWM - Water Meter
	WATSC - Stop Cock (small square pit generally with W)
VALVE-LEVEL	AHD RL
WATERID	4 Digit numeric IDENTIFIER (corresponds to ARCID) (not unique since all points along arc have same ARCID)
SURV-ACC	Horizontal Accuracy 1-5

ARC

PIPE-SIZE	WATCONDUIT - Large conduit
	WATRM-10 - Water Reticulation Main < 100mm diameter
	WATRM80 - Water Reticulation 80mm
	WATRM100 - Water Reticulation 100mm
	WATRM150 - Water Reticulation 150mm
	WATRM200 - Water Reticulation 200mm
	WATRM225 - Water Reticulation 225mm
	WATRM250 - Water Reticulation 250mm
	WATRM300 - Water Reticulation 300mm
	WATRM300+ - Water Reticulation >300mm
ARCID	4 Digit numeric UNIQUE IDENTIFIER

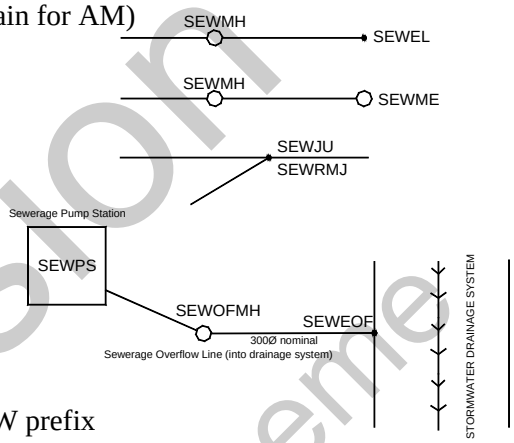
NOTES

1. Water mains intersect on nodes NOT points
2. New mains keep old ARCID if the WHOLE line is replaced
3. New mains get assigned a new number if only part of the line is replaced AND the remainder section is > 6m (ie length of pipe).
4. New junctions on mainline only get assigned a new number if > 0.5m from existing junction.



SEWERAGE

NODE



DXF-LAYER SEWDUMH - Dummy Manhole (on rising main for AM)
SEWEL- End of line (pipe)
SEWEOF - End of overflow
SEWJU - Gravity main junction of pipes
SEWME - Manhole at end of line
SEWMH - Manhole
SEWOFMH - Overflow Manhole
SEWPS - Pumpstation
SEWRMJ - Rising main junction of pipes
SEWVP - Valve Pit (rare)

ASSET-ID 5 digit numeric IDENTIFIER
MH-LID-LEVEL AHD RL
SEWER-TYPE SAME as DXF-LAYER without the SEW prefix
SURV-ACC Horizontal Accuracy 1-5
PSTN_Z_NO Pump Station Number
MGISNO Concatenate SEWER-TYPE,PSTN_Z_NO and ASSET-ID for UNIQUE IDENTIFIER
COMMENTS General Comments

ARC

TYPE-SIZE PUMPSTN_STRU - Pump Station structure
RISING-MAIN - Sewer Rising Main
SEWGM100 - Gravity main dia. 100
SEWGM110 - Gravity main dia. 110
SEWGM150 - Gravity main dia. 150
SEWGM225 - Gravity main dia. 225
SEWGM300 - Gravity main dia. 300
SEWGM375 - Gravity main dia. 375
SEWGM450 - Gravity main dia. 450
SEWGM525 - Gravity main dia. 525
SEWGM750 - Gravity main dia. 750
SEWOF - Sewer overflow
SEWOF300 - Sewer overflow dia. 300
SEWPS - Sewer Pump Stn
SEWRM50 - Sewer Rising Main dia. 50
SEWRM65 - Sewer Rising Main dia. 65
SEWVP - Sewer Valve Pit

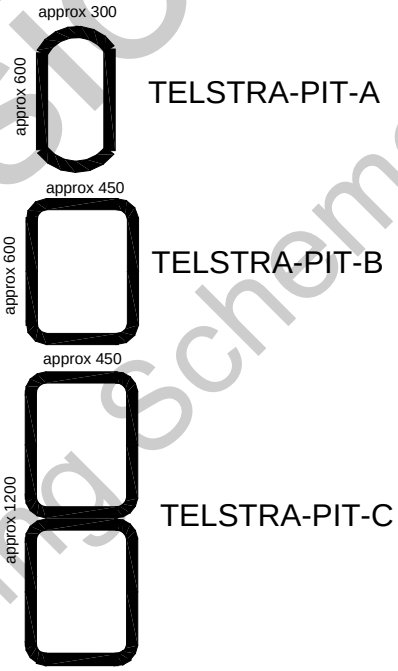
ASSET-ID_NO 5 digit numeric IDENTIFIER
ASSET_GIS_NO Upstream NODE MGISNO
US_TYPE Upstream NODE SEWER-TYPE
US_ID Upstream NODE MGISNO
US_SL Upstream Surface Level AHD
US_IL Upstream Invert Level AHD
AM_DIA Asset Management diameter
AM_LENGTH Asset Management length
= GIS length – 1.2m if MH-MH
= GIS length – 0.6m if EL – MH
(ie –0.6m for pipe length at MH's)

DS_SL	Downstream Surface Level AHD
DS_IL	Downstream Invert Level AHD
DS_TYPE	Downstream NODE SEWER-TYPE
DS_ID	Downstream NODE MGISNO
AM_FLOW	G (gravity main) or R (rising main)

TELSTRA

POINT

DXF-LAYER	POST-BOX (this item will go to road furniture)
	TELECOM-COLUMN
	TELECOM-PIT-1
	TELECOM-PIT-2
	TELECOM-PIT-3
	TELECOM-PIT-4
	TELECOM-PIT-5
	TELECOM-PIT-6
	TELECOM-PIT-7
	TELECOM-PIT-8
	TELECOM-PIT-A
	TELECOM-PIT-B
	TELECOM-PIT-C
	TELECOM-PIT-D
	TELECOM-PIT-LARGE
	TELECOM-PIT-UNKNOWN
DXF-ELEVATION	AHD Height
ACCURACY	Horizontal Accuracy
RCC-CODE	POST-BOX
	TELSTRA-COLUMN
	TELSTRA-PIT-A
	TELSTRA-PIT-B
	TELSTRA-PIT-C
	TELSTRA-PIT-D
	TELSTRA-PIT-UNKNOWN



ARC

DXF-LAYER **PHONE BOX**

POWER

POINT

DXF-LAYER	**POWUPOLE**	**- Unclassified Pole**
	POWDLIGHT	- Decorative Light
	POWEBOX	- Electricity Box/Power Pit
	POWIDENTI-LIGHT	- ???
	POWLPOLE	- Light Pole
	POWPOLE	- Power Pole
	POWSLIGHT	- Streetlight (No O/H wire)
	POWSLIGHTD	- Double Streetlight
	POWTPOLE	- Transformer Pole
	POWSLPOLE	- Solar Light Pole
	POWSS	- Sub Station
DXF-ELEVATION	AHD Height	

ACCURACY	Horizontal Accuracy
ARC	
DXF-LAYER	ELECTRICITY-TRANSFORMER SWITCHBOARD
VEGETATION	
POINT	
DXF-LAYER	**TREE00 - Tree no diameter** TREE01 - Tree 0.1m diameter TREE02 - Tree 0.2m diameter TREE03 - Tree 0.3m diameter TREE04 - Tree 0.4m diameter TREE05 - Tree 0.5m diameter TREE06 - Tree 0.6m diameter TREE07 - Tree 0.7m diameter TREE08 - Tree 0.8m diameter TREE09 - Tree 0.9m diameter TREE10 - Tree 1.0m diameter TREE11 - Tree 1.1m diameter TREE12 - Tree 1.2m diameter TREE13 - Tree 1.3m diameter TREE14 - Tree 1.4m diameter TREE15 - Tree 1.5m diameter TREE16 - Tree 1.6m diameter TREE17 - Tree 1.7m diameter TREE18 - Tree 1.8m diameter TREE19 - Tree 1.9m diameter TREE20 - Tree 2.0m diameter
ARC	
DXF-LAYER	EDGE-OF-SALT-MARSH GARDEN MANGROVES MUDFLAT TREE
BUS STOPS	
ARC	**BUS-SHELTER** **LMBS (Line Marking Bus Shelter)**
DXF-LAYER	
POINT	
BUS_STOP_TYPE	BSD - New Bus Shelter
BSN	- NEW Shelter + Bus Stop Sign BSO - OLD Shelter + Bus Stop Sign BSS - Seat + Bus Stop Sign BST - Bus Stop Sign Only
GIS_ID	Numeric ID

GIS_NO	BS001 – BS036
SURV_ACC	Horizontal Accuracy 1-5

FENCES
FEN93_97
ARC

DXF-LAYER	FENCE COR UNCLASSIFIED	FENUCNR
	FENCE LINE UNCLASSIFIED	FENUFL
	INTERSECTION OF FENCES	FENINT
	CH'W FENCE/GI.P&RAIL	FENCHW
	WOODEN PAILING FENCE	FENWP
	POST & WIRE FENCE	FENPW
	BRICK FENCE	FENBR
	CONCRETE FENCE	FENCONC
	ARC.MESH FEN./GI.POST&RAI	FENAM
	STAR PICKET FENCE	FENSP
	BRUSH	FENBR
	WD. POST & RAIL FENCE	FENWD
	DILAPIDATED FENCE	FENDIL
	TOP CONC. RET. WALL	FENTCR
	TOP BRICK RET. WALL	FENTBR
	TOP ROCK RET WALL	FENTRR
	BOT. OF RET WALL	FENBR
	GATE	FENGATE
	LOG BARRIER FENCE	FENLOG

LINE MARKING

ARC

DXF-LAYER	LM40	- '40' on road
	LMAB	- Airport Block Area
	LMADL	- Airport Dashed Line
	LMAN	- Airport Number
	LMARN	- Airport Runway Number
	LMASL	- Airport Solid Line
	LMAW	- Airport Word
	LMB	- Single Broken White Line
	LMBK	- Bike Path (symbol of bicycle)
	LMBN	- Bus Stop Name
	LMBS	- Bus Stop Line Markings
	LMC	- Chevron Pattern
	LMCL	- Continuity Line, (front edge only)
	LMD	- Double White Lines
	LMDA	- Directional Arrow
	LMDBL	- Double Broken White Lines
	LMGW	- Giveway Line
	LMIL	- Intersection Turn Line
	LMML	- Merge Lane
	LMNA	- Name on the Roadway eg. STOP, XING etc…
	LMNP	- 'No Parking' on Road
	LMNX	- 'X' on road

	LMPA	- 'AHEAD' on road
	LMPB	- Parking Bays, front in
	LMPC	- Pedestrian crossing lines, usually at traffic lights
	LMPL	- Kerbside Parking Bays
LMPN	- 'PED' on road	
LMS	- Single Solid White Line	
LMSB	- Speed Bump	
	LMSLBR	- Solid left broken right white line
	LMSP	- Stop Line (front edge)
	LMSRBL	- Solid right broken left white line
	LMZC	- Zebra crossing
	LMZZ	- Zig Zag line before Zebra Crossing

DXF-COLOR
DXF-THICKNESS
DXF-TYPE
DXF-ELEVATION
DXF-HANDLE
DXF-CURVE

PARK FURNITURE

POINT

DXF-LAYER	PFBEC	BBQ ELECTRIC (COVERED)
	PFBEU	BBQ ELECTRIC (UNCOVERED)
	PFBGC	BBQ GAS (COVERED)
	PFBGU	BBQ GAS (UNCOVERED)
	PFBWC	BBQ WOOD (COVERED)
	PFBWU	BBQ WOOD (UNCOVERED)
	PFBR	BIKE RACK PARK
	PFDFD	DRINK FOUNTAIN DISABLED
	PFDFS	DRINK FOUNTAIN STANDARD
	PFFS	FISH FILLETING TABLE
	PFOS	OUTDOOR SHOWER
	PFB	PARK BIN 90L
	PFBC	PARK BIN (CIG BUTTS)
	PFBE	PARK BIN ENCLOSURE
	PFBI	PARK BIN INDUSTRIAL
	PFBW	PARK BIN WHEELIE
	PFPEAQ	PLAY EQUIP AQUATIC
	PFPECL	PLAY EQUIP CLIMBING
	PFPECU	PLAY EQUIP COMBINED UNIT
	PFPESE	PLAY EQUIP SEE SAW
	PFPESL	PLAY EQUIP SLIDE
	PFPESF	PLAY EQUIP SOFTFALL
	PFPESW	PLAY EQUIP SWING
	PFPEOT	PLAY EQUIP OTHER
	PFPERO	PLAY EQUIP ROCKER
	PFPEEE	PLAY EQUIP EXERCISE EQUIP
	PFBS	SEAT PARK BENCH
	PFTSD	SEAT PICNIC TABLE DISABLED
	PFTSS	SEAT PICNIC TABLE STD
	PFPF	SEAT PLATFORM
	PFSSS	SHADE SAIL STAY POLE

	PFSSP	SHADE SAIL POLE

BUILDING

BUILD93_97
POLYGON

BUILDIND_ID	**- Building ID (B001 – B168)**
BUILDING_CATEGO	**- Building Category**
AM - Amenities	
HA - Hall	
OF - Office	
OT - Other	
PS - Sewer Pump Station	
RF - Residential Flat	
RH - Residential House	
ST - Storage	
TB - Toilet Block	
WO - Workshop	
MAP_REF	**- Map Reference on Building Map**
ACCURACY	**- Horizontal Accuracy 1-5**
	1 - < 50mm
	2 - < 150mm
	3 - < 1m
	4 - < 5m
	5 - < 30m

BUILD_AIR
POLYGON

LESSE	- Lessee
BUSINESS_OCCUPI	- Business Occupier

BUILD_RCC
POLYGON

BUILDING_ID	- Building ID (B001 – B186)
BUILDING_CATEGO	- Building Category (AS ABOVE)
BUILDING_TYPE	- Full Description
LOCATION	- Road Frontage or Park Name
MAP_REF	- Map Reference on Building Map
PARK_ID	- Park ID (PK9999)
ACCURACY	- Horizontal Accuracy 1-5

STRUCTURES

POINT

DXF-LAYER	STRUGS	GRANDSTAND
	STRUMT	MONUMENT
	STRUSG	SHELTER
	STRUFG	FLAG POLE
	STRUST	PARK STAGE
	STRUBB	COURT
	STRUAA	EXERCISE SITE
	STRUSK	SKATE FACILITY
	STRUR	SPORTS FIELD RUGBY
	STRUS	SPORTS FIELD SOCCER
	STRUC	SPORTS FIELD CRICKET
	STRUS	SPORTS FIELD SOFTBALL
	STRUAG	ARTIFICIAL GRASS
	STRUVP	VIEWER PLATFORM

	STRUTB	TOILET BLOCK
	STRUCH	CLUBHOUSE
	STRUASP	ABOVE GROUND SWIMMING POOL
	STRUISP	IN GROUND SWIMMING POOL
	STRUUB	UNCLASSIFIED BUILDING
	STRUWH	WOOD HOUSE
	STRUBH	BRICK HOUSE
	STRUSH	STUCCO HOUSE
	STRUCH	CONCRETE HOUSE
	STRUWUF	WOODEN UNITS/FLATS
	STRUBUF	BRICK UNITS/FLATS
	STRUCUF	CONCRETE UNITS/FLATS
	STRUCP	CARPORT
	STRUCB	COMMERCIAL BUILDING
	STRUG	GARAGE
	STRUWS	WOOD SHED
	STRUBS	BRICK SHED
	STRUCS	CONCRETE SHED
	STRUMS	METAL SHED
	STRUSH	SHOP
	STRUST	STABLE
	STRUVA	VERANDA OR AWNING
	STRUFLB	BOTTOM FLOOR LEVEL
	STRUFLT	TOP FLOOR LEVEL

GAS

POINT

DXF-LAYER	GASP	GAS PIPE
	GASV	GAS VALVE
	GASMH	GAS MH

MARINE

POINT

DXF-LAYER	PYLONS
	BEACON
ARC	PONTOON
	JETTY
	BREAKWATER