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Stormwater Drainage Asset Revaluation

Redland Shire Council

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1. Executive Summary

Connell Wagner was commissioned by Redland Shire Council to undertake a revaluation of the stormwater drainage assets. This report describes the method used to carry out the revaluation and provides a summary of the results.

Assets have been valued on the basis of **fair value** in accordance with the requirements of s45 of the Queensland Local Government Finance Standard 2005, Australian Accounting Standard AASB 116, and the Queensland Audit Office Better Practice Guidelines for Non-Current Assets.

The results of the revaluation are summarised below.

CSID	Asset Sub Class	Number of Assets	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
1034	Manholes	9,206	$29,292,838.02	$366,160.48	$6,446,221.86	$22,846,616.16
1035	Pipes	26,703	$257,123,433.32	$3,214,042.92	$58,413,115.75	$198,710,317.57
1038	Box Culverts	567	$36,085,412.61	$451,067.66	$5,737,467.38	$30,347,945.23
1039	Open Drains*	117	$4,613,453.22	$57,804.79	$882,771.67	$3,730,681.55
1040	Headwalls	2,923	$4,473,022.53	$55,912.78	$826,815.81	$3,646,206.72
1042	Catchpits	15,344	$38,072,381.51	$475,904.77	$8,056,888.67	$30,015,492.85
Total		**54,860**	**$369,660,541.21**	**$4,620,893.39**	**$80,363,281.13**	**$289,297,260.08**

*excludes unlined open drains

The assets that predominantly contribute to and make up 90% of the total replacement value are:

- 375 mm diameter pipes (12%)
- Catch pits with 2400 mm lintel (9%)
- Manholes of 1200 mm and 1050 mm diameter (2% and 4% respectively)
- Box culvert with dimension 3600x2400 mm (2%)
- Other pipes with diameter 300 to 1800mm (3 to 7% and an aggregated value of 52%)

All other assets have values that are less than or equal to 1% of the total replacement value.

Comparison of the June 2007 replacement value with the September 2006 replacement value extracted from the Council's accounting system has shown that the replacement value has increased by 43% from $259 million to $370 million.

The increase has been assessed as being mainly due to the following factors:

- 5% due to general price increases between September 2006 and June 2007
- 3% due to the addition of demolitions and reinstatement costs that were not previously included in unit rates for catch pits and manholes
- 16% due to the addition of demolitions and reinstatement works that were not previously included in the unit rates for pipes
- 13% due to excavation works that were not fully accounted for in the previous unit rates for pipes

Improvements to the asset data and addition of new stormwater assets accounts for the remaining 6% increase in the replacement value.

2. Introduction

Connell Wagner was commissioned by Redland Shire Council to undertake a revaluation of Council's stormwater drainage assets in May 2007.

The purpose of the commission was to prepare a valuation of Council's stormwater drainage assets on the basis of fair value, prepare a report on the methodology used to demonstrate compliance with the appropriate legislation, standards and guidelines, and provide an outcome acceptable to the Queensland Audit Office.

This report has been written to fulfil the above requirements and summarise the results of the revaluation.

Assets have been valued in accordance with s45 of the Queensland Local Government Finance Standard 2005 and Australian Accounting Standard AASB116 (Property, Plant and Equipment).

2.1 Scope of Work

The scope of works for revaluation of Redland Shire Council's stormwater drainage assets included:

- Receiving asset data from Redland Shire Council
- Review of asset information for completeness and adequacy for the purpose of the revaluation
- Develop a valuation approach based on the information available
- Inspection of a selected sample of assets to verify data given in asset registers
- Collate unit rate information and develop a schedule of unit rates applicable to Redland Shire Council
- Review the useful lives for all assets for consistency with current maintenance and replacement practice and/or standard industry values
- Review the residual lives for asset that have reached or exceeded their expected useful life
- Review the residual values for all assets
- Prepare the revaluation spreadsheets
- Document the revaluation process
- Reporting the revaluation results

The scope of works was further extended to include review and verification of the asset valuation data after it had been loaded in to Maximo, RSC's asset management system.

2.2 Extent of Assets

The following asset subclasses have been revalued under this commission:

- Underground pipes
- Stormwater manholes
- Open drains
- Box culverts
- Headwalls
- Gully pits
- Trash racks
- Gross pollutant traps

2.3 Terms and Definitions

The following terms and definitions have been used in this report:

Accumulated Depreciation is the sum total value of the annual depreciation accumulated from the date of creation up to the valuation date.

Depreciable Amount is the portion of value of the asset to be depreciated, calculated as the replacement cost less the asset's residual value.

Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life.

Fair Value is the cost of replacing or reproducing the asset that the agency would reasonably pay based on current market rates.

Remaining Life is the expected remaining useful life of the asset, calculated as the difference between the 'Useful Life' and current age, or assessed from the condition of the asset at the time of inspection.

Replacement Cost is the cost of replacing or reproducing the asset, and has the same definition as '*Fair Value'* in this report.

Residual Value is the value of the asset at the end of its expected life.

Useful life is the period over which the asset is expected to be used.

Written Down Value is the depreciated replacement cost of the asset, calculated as the replacement cost less accumulated depreciation.

3. Methodology

3.1 General Approach

Generally the replacement costs for all assets have been based on current market rates for similar assets, or their modern equivalent. The rates have been derived from different information sources, including:

- Rates and labour costs provided by Redland Shire Council
- Rates obtained from local suppliers
- Contract schedules and price estimates for works recently carried out throughout South East Queensland.

Where rates were not readily available, the rates from *Rawlinsons 2007 edition of the "Australian Construction Handbook"* have been used.

The majority of Redcliffe Shire Council's assets are relatively new compared to their expected life and there has been very little need for replacement of assets over the last few years. For this reason the number of recent Council projects with detailed schedules of actual unit rates was not sufficient to provide a representative network average rate. For some assets external information has been the only available source of information to develop the unit rates.

"Straight-line Depreciation" has been used to calculate the Written Down Value for all assets covered by this report as described in section 3.4 below.

3.2 Valuation Date

The effective date for the unit rates developed for this revaluation is **30 June 2007**.

The asset values and summary tables presented in this report are based on the asset data in Council's asset component register (GIS database) at the valuation date.

3.3 Methodology Overview

The revaluation of Redland Shire Council's stormwater drainage assets was carried out through a series of planned phases.

The first phase included the project inception meeting, collation and review of information on the assets to be revalued. The key outcome of the first phase was to confirm the scope of works, review the current asset information for completeness and obtain a sound knowledge of the extent of assets to be revalued and the extent of information available.

The second phase was to revalue the assets and audit the data to ensure that quality data was used in the revaluation of individual assets, and a quality outcome that complies with the relevant legislative and accounting standards and meets the requirements of the Queensland Audit Office.

The third phase of the revaluation included consolidating the results from the previous phases into a report, documentation of the valuation methodology, review and comment on the draft report by Council, and finalisation of the report.

Connell Wagner was also engaged to review and verify the valuation data and update the report after the information was uploaded to Maximo. This was carried out to confirm that the information had been correctly transposed and interpreted and also the ensure that any changes to the data up to 30 June 2007 had been reflected in the revaluation.

The methodology used for the revaluation of Redland Shire Council's stormwater assets is summarised by the following diagram.

Phase	Summary of Project Task	Details
Phase 1 Project Initiation	Project Inception	• Inception meeting with Council staff • Agree on timetable for submission of draft and final report • Agree on scope including asset component levels, assessment methodologies and details • Agree on spreadsheets and data collection forms
	Collation and Review of Existing Information	• Obtain electronic data for all assets to be valued including quantity, dimensions, material, construction date, condition, etc. • Review existing asset register, previous valuation reports, financial policies, local unit rates, etc.
Phase 2 Revaluation	Data Review and Condition Assessment	• Inspect above ground assets to assess condition and expected residual lives
	Revise Unit Rates and Develop Cost Models	• Collate historic cost information and local supplier rates to develop unit rate schedules • Review asset register and develop cost models based on "fair value"
	Calculate current and replacement values	• Use existing condition and age based information to update expected and residual lives • Calculate asset replacement and depreciated replacement values • Prepare valuation summary tables and charts
Phase 3 Reporting	Valuation Report	• Prepare draft valuation report • Council to review draft report • Finalise report • Deliver final report

3.4 Depreciation Method

The straight-line depreciation method was used to calculate the depreciation for all assets included within the scope of this report.

The straight-line method assumes that the decline in service potential will occur at a constant rate over the useful life of the asset.

The formulas below illustrate the general method used for calculation of the annual and accumulated depreciation and written down value for each asset.

$$\textit{Depreciable Amount} = \textit{Replacement Cost} - \textit{Residual Value}$$

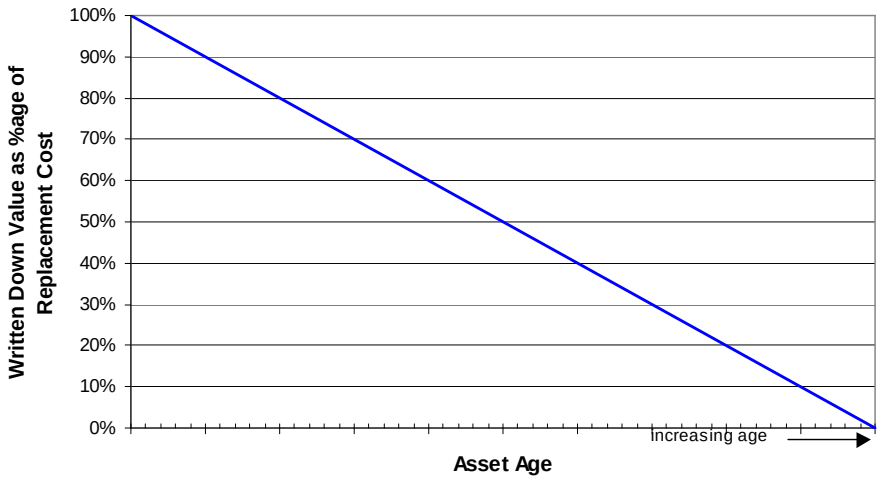
$$\textit{Annual Depreciation} = \frac{\textit{Depreciable Amount}}{\textit{Useful Life}}$$

$$\textit{Accumulated Depreciation} = \textit{Annual Depreciation} \times \textit{Age}$$

$$\textit{Written Down Value} = \textit{Replacement Cost} - \textit{Accumulated Depreciation}$$

The figure below demonstrates the decline in value using the straight line depreciation method with zero residual value.

It was determined that the residual value is zero for all stormwater assets. This is mainly due to the expectation that assets will not be able to provide a service function at the end of their useful life and they are not likely to have a marketable resale value. In the majority of cases stormwater assets are either demolished and disposed off or abandoned.



3.5 Replacement Costs and Unit Rates

Replacement costs and unit rates have been calculated using the prevailing market costs for supply and installation of similar assets or their modern equivalent.

The rates have been derived from the following sources of information:

- Redland Shire Council rates and labour costs where available,
- Rates obtained from local suppliers,
- Contract schedules for works recently carried out throughout the South East Queensland Region
- Analysis of the rates from stormwater project cost estimates from Connell Wagner's record of construction projects in the Brisbane region

Where rates were not readily available, rates from Rawlinsons 2007 edition of the "Australian Construction Handbook" have been used. Rawlinsons is published annually and is an industry-recognised source and an authoritative text for construction costs in Australia. The published rates have been increased by 4% to account for increases in the rates between December 2006, the date of

publication, and 30 June 2007. The 4% increase is based on the latest quarterly update available at the time the revaluation was carried out, being the April 2007 quarterly update.

The unit rate for each asset type has been calculated from first principles. This methodology consists of breaking down each asset into its cost components such as demolition, reinstatement, excavation, construction, delivery and installation. For each component the major construction tasks were identified with their relevant quantities and detailed unit rates. These tasks include activities such as excavation, supply and installation of pre-cast elements, and formwork and concrete works for cast 'in-situ' elements. Quantities have been calculated based on the current standard drawings or actual dimensions provided in the asset database.

Section 4 provides further information on the methodology and assumptions made for each asset category. Appendix A provides details of the cost breakdown for each asset category with additional information on how costs and unit rates were derived. Appendix B includes examples of unit rates provided by Redland Shire Council, rates obtained from local suppliers and a benchmark analysis of contract schedule rates.

On Cost and Overheads

On cost and overheads have been determined by reviewing past projects carried out by the Redland Shire Council and other recent stormwater projects. The following table provides a detailed breakdown of the on-costs used for the unit rate calculation. The detailed calculations for determination of on-costs are provided in Appendix A.

On-Cost Item	Percentage
Site Establishment (Incl. traffic control)	2.9%
Construction On-Costs	11.0%
Project Management & Administration	3.5%
Design	6.0%
Surveys	4.2%
Total On Costs	**26%**

Discount

A discount factor of 10% has been applied to the unit rates. Discussions with Redland Shire Council have confirmed that this level of discount is a typical discount for works undertaken for the Council in the past years and an appropriate discount factor that would be expected from a contractor working for the Council. The discount factor takes into account such things as competitive tendering processes, contract periods, and cost efficiencies attracted through tendering bulk quantities work.

Escalation and Building Price Index

Escalation of unit rates using the Building Price Index has only been used for the purpose of comparing the 2007 unit rates with the 2004 unit rates or for comparison with other historical rates. This has largely been carried out for benchmarking purposes and to establish whether or not the 2007 unit rates were consistent with previous rates and to assist in determining the reasons for movement in the total asset value. The 2004 revaluation rates were escalated by 23.5% based on the Brisbane Building Price Index obtained from Rawlinsons 2007 edition of the *Australian Construction Handbook.*

Benchmarks

Benchmark ranges have been calculated by analysing tender rates applied for projects constructed over the past few years. Because it was not possible to establish in detail the assumptions underpinning the contract rate calculations, especially the inclusions and exclusions, the range of rates was very broad. In addition these rates applied to projects of different value, locations and local conditions and these factors have an appreciable impact on the range of rates. For this reason the range of rates provided for the benchmarking are indicative only. However, this does not rule out that some unit rates may be outside the provided ranges because of specific conditions that are not factored into the benchmarking exercise.

3.6 Site Inspections/Observations

Site visits were carried out for selected asset types to develop an understanding of the general condition of the assets and to confirm data held in Redland Shire Council's inventory. Inspections were also carried out to test the assumptions made during the revaluation and confirm that the assumptions provided a realistic outcome. The site visits were not intended as a full and comprehensive audit of the entire asset database.

Generally, the data recorded in the asset registers was consistent with the observations made of the assets inspected during the site visits in terms of asset type and dimension. Council is currently in the process of carrying out a complete review of all assets and the information contained in the GIS database to ensure its accuracy and completeness. This is an ongoing process to continuously improve and update data in the asset component register.

Council has also advised that the current class structure identifiers for stormwater infrastructure assets will shortly be retired and replaced with a new set of identifiers. This will incorporate a new series of infrastructure types as categorised by ADAC (Asset Design As Constructed) for stormwater. Redland Shire Council is currently restructuring all sub-surface assets in accordance with the Institute of Public Works Engineering Australia (IPWEA) ADAC Standards.

3.7 Assumptions and Data Confidence

Redlands Shire Council's asset component register is currently being updated to improve the overall quality of the data as part of a two year program. The current city-wide update and review is expected to be completed in 2007/08.

Despite the asset data currently being reviewed and updated, the base data that was required to carry out the revaluation was generally complete. There were no observations made during the site inspections to indicate that the asset database was substantially incomplete or inaccurate to the extent that it would have a material impact on the revaluation results.

The assumptions made in this revaluation are mainly related to asset materials, dimensions and types where such data was missing. For example, many of the manholes did not have a depth and an assumed depth was used.

The assumed data was determined through one of two processes. Firstly, if Council has adopted standard engineering details for the asset, the information was obtained from the current engineering drawings as these would represent Council's current construction standards for any replaced asset. The second approach, for asset attributes with no fixed standard, a rigorous analysis was carried out across all similar assets with current attributes to determine a suitable average dimension or typical asset type. While this approach may result in some variations on an individual asset basis, it is considered that the approach is consistent with industry practice and provides a credible outcome at the network level.

The overall impression of the asset data used to carry out the revaluation, based on the field inspections and interrogation of the asset database, was that the information was of sufficient quality to provide robust revaluation outcome.

3.8 Assessment of Useful Life

The useful life of an asset is defined as the physical life of the asset up to the period when the asset is unable to function within performance standards and/or the cost to retain the asset exceeds the cost to renew or replace the asset.

The useful and remaining lives stated in this report are average values for the purpose of valuation of the assets and are indicative of the lives that could potentially be achieved assuming an appropriate

level of routine maintenance and servicing is carried out. It does not guarantee that an individual asset will survive to or expire on the specified date as the actual replacement date can be influenced by many factors beyond Council's control.

Asset	Redlands Shire Council Useful Life	Typical Industry Range	Revised Useful Life
Concrete Catch Pits	80	70-120	80
Concrete Manholes	80	70-120	80
Concrete Box Culvert	80	70-120	80
Concrete Headwalls	80	70-120	80
Open Drain – Lined	50	70-120	80
Open Drain – Unlined			75
Open Drain – Partially Lined			75
Unplasticised Polyvinyl Chloride (uPVC) Pipe	50	50-100	80
Reinforced Concrete Pipe (RCP)	60	70-100	80
Fibre Reinforce Cement (FRC) Pipe	80	50-100	80

The table above provides an indication of the useful lives currently adopted by Redland Shire Council, the typical industry range and the revised useful lives used in the 30 June 2007 revaluation.

Typical average life spans for concrete elements are between 70 and 120 years. Current industry practice usually prescribes to build concrete elements with a useful life of 100 years. On the other hand, manufacturers and suppliers usually provide a more conservative useful life around 50 years for pipes. We note that 50 years for uPVC and FRC is the minimum design life as defined in Australian Standards AS1254 and AS4139 for the manufacture and supply of pipes and fittings. The average life of an asset is normally well beyond the manufacturers minimum guaranteed life.

Assessment of appropriate useful lives for Redland Shire Council's assets faces two challenges. Firstly the assets are relatively young and do not have a proven performance record to accurately assess their current or predicted performance. The second is that a large portion of Redlands' assets are located in potentially aggressive soils that may reduce the life of the asset, and their situation is therefore different to many other councils represented by the industry average values.

The lives adopted in this revaluation have therefore been based on Connell Wagner's assessment of useful lives for councils that are similarly located in coastal areas. In particular we have taken into consideration the lives used by Redcliffe City Council which were derived from a detailed analysis of condition data and asset performance.

The figure on page 10 below is an example of a profile of structural faults in concrete pipes located within a coastal environment. While the profile indicates a rapid decline in the condition of concrete pipes as they near 100 years of age, intervention is normally expected well before the asset reaches the point that would lead to such an exponential decline in condition. An intervention threshold of 10% to 20% is often adopted, or even less if the infrastructure is of critical importance or if there is a high risk that catastrophic failure will result in consequential damage to other infrastructure or property.

The intervention level of 10% to 20% is consistent with an asset life of around 80 years. This is the live that has been adopted for the majority of Redland Shire Council's assets as stated in the table above.

Whilst the above assessment is based on the performance of assets similar to Redland Shire Councils it is recommended that Council implements a program to capture condition information on its stormwater assets, and further comment on this matter is given in Section 5.

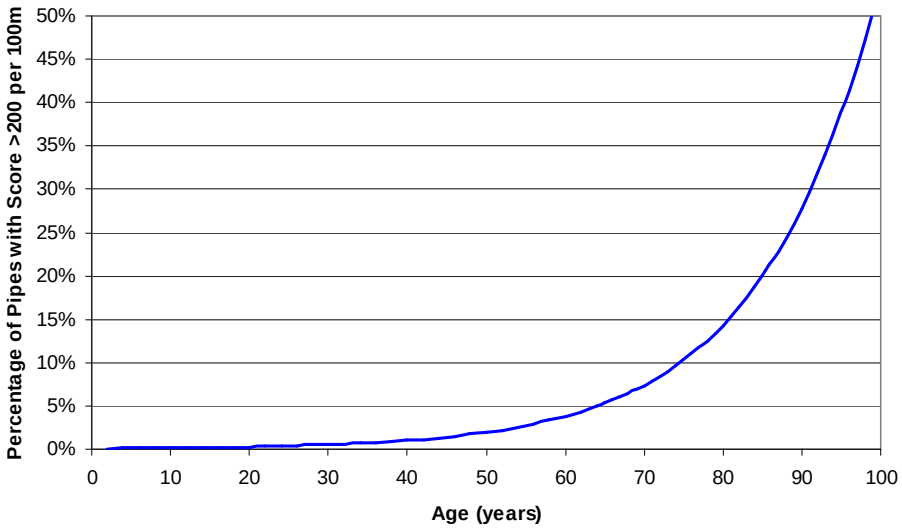


Figure 1 - Performance Curve for Concrete Pipes

3.9 Independence

Connell Wagner has carried out this revaluation externally and independently to Redland Shire Council. However, discussion was carried out with Redland Shire Council staff with respect to the valuation methodology, unit rates, asset lifecycles, and asset replacement strategies to confirm that the valuation outcomes provided a credible result and reflected a consistent approach to Redlands Shire Council's current asset management practices and current asset performance.

Connell Wagner also independently carried out a review of the asset data after it was uploaded into Maximo through interrogation of data report. The script used to generate the report is given in the *Redland Shire Council Valuation Procedures Manual* in Appendix E of this report. The review and verification processes used did not indicate any significant anomalies of a material nature.

3.10 Experience & Qualifications

In accordance with the Queensland Audit Office "Better Practice Guidelines" for Non-Current Assets, the revaluation has been carried out by Connell Wagner's team of experienced and suitably qualified staff.

The following Connell Wagner Team, including brief details of their role and relevant experience, was used for revaluation of Redland Shire Council's assets:

Lloyd Arnott
Role: Project Principal
Lloyd Arnott is the Principal of Connell Wagner's Advisory Team which provides high level strategic planning, project management, business advisory and asset management services to public and private sector clients. Prior to joining Connell Wagner Lloyd had more than 24 years experience in engineering and general management roles in the public sector around Australia.

Lloyd was the Project Principal for this assignment and will oversaw the management of this project to ensure a quality product was delivered.

Joe Giani
Role: Project Leader
Joe is an asset management consultant in the Advisory Services section. His expertise in asset management includes life cycle and operating cost modelling, system analysis, risk analysis, program planning and condition assessment. Joe's expertise is also supported by his background experience in the design, project management and construction management of a wide range of civil and building projects. Joe led the project team and provided the key point of contact. Throughout the project he maintained regular liaison with Redland Shire Council.

Warrick Field
Role: Asset Management Consultant
Warrick has over 18 years local government experience including 11 years specialising in management of infrastructure assets. His skills and experience encompass a comprehensive range of areas within a total asset management framework at both operational and strategic level. His previous experience within local government provides an excellent understanding of asset management principles. His experience includes the role of Asset Manager responsible for managing a $430 million portfolio of road, water, wastewater, and drainage assets and providing assistance and advice on management of other assets such as community and recreational facilities and parks.

His key skills include policy development, development of asset management plans and risk management strategies, implementation of asset and knowledge management systems, developing asset condition and utilisation strategies, asset valuations and development of lifecycle costing and funding models. He also has a good a general background in design, project specification and project management.

4. Commentary and Results

4.1 General Results

The following subsections provide a commentary on the methods used for the revaluation for individual asset categories including the source of data used and any assumptions made. Detailed information on the source data, assumptions and unit rate calculation is also provided in Appendix A and Appendix B. The information contained within these sections is based on the assets in Council's asset component register at 30 June 2007.

The following table summarises the results of the revaluation including the current replacement value, the written down value, accumulated depreciation, annual depreciation and average depreciation rate.

CSID	Asset SubClass	30 June 2007				
		Current Replacement Cost	Average Depreciation Rate	Annual Depreciation	Accumulated Depreciation	Written Down Value
1034	Manholes	$29,292,838	1.25%	$366,160	$6,446,222	$22,846,616
1035	Pipes	$257,123,433	1.25%	$3,214,043	$58,413,116	$198,710,318
1038	Box Culverts	$36,085,413	1.25%	$451,068	$5,737,467	$30,347,945
1039	Open Drains*	$4,613,453	1.25%	$57,805	$882,772	$3,730,682
1040	Headwalls	$4,473,023	1.25%	$55,913	$826,816	$3,646,207
1042	Catchpits	$38,072,382	1.25%	$475,905	$8,056,889	$30,015,493
Total		**$369,660,541**	**1.25%**	**$4,620,893**	**$80,363,281**	**$289,297,260**

* excludes unlined open drains

The current replacement value for the stormwater asset is about $370 million and the current written down value is $289 million. This means that on average the assets have consumed 22% of their useful life. Pipes represent the largest asset category in terms of value with 69% of the written down value, followed by box culverts with 10%, catch pits 10%, manholes 8%, open drains 1% and headwalls with only 1%.

The following table provides a summary of the current replacement values, total quantities, average unit rates and the equivalent 'typical' asset based on the average unit rate.

Asset Category	June 2007 Replacement Value	Quantity	Unit	Average Unit Rate	Equivalent Asset
Stormwater Pipes	$257,123,433	568,998	m	$452	600FRC
Stormwater Manholes	$29,292,838	9,206	Item	$3,182	MH1050-3
Stormwater Catch Pits	$38,072,382	15,344	Item	$2,481	CP2400
Stormwater Headwalls	$4,473,023	2,923	Item	$1,530	HW750
Stormwater Box Culverts	$36,085,413	12,738	m	$2,833	BC1800x1800
Stormwater Open Drains*	$4,613,453	8,340	m	$553	PL3000-1500

* excludes unlined open drains

The equivalent asset is the size whose unit rate value is closest to the average unit rate and provides an indication on the average size for that asset category based on the replacement value rather than the asset quantity or total length.

The June 2007 replacement value has been compared against the 2006 replacement value extracted from the Council's accounting system to evaluate the movement in value. The data provided was dated September 2006. The table shows that the total replacement value for all stormwater assets has increased by 43% compared to the September 2006 value.

September 2006 Replacement Value	$259,000,000
June 2007 Replacement Value	$369,660,541
Difference	**$110,660,541**
Percentage difference	**43%**

The 43% increase has been assessed as being made up from a 5% general inflationary increase in the unit rates, 6% due to the addition of new assets and database improvements, and the remainder due to the addition of demolition and reinstatement costs not previously accounted for. To explain the remaining difference we have analysed the assets that provide the major contribution to the total replacement value. The following table shows the assets, in order of value, that represent 90% of the total replacement value.

Asset	Unit Rate	Quantity	Total Replacement Value	%	Cum %	Unit Rate Difference %*	Replacement Value Difference#
375FRC	$277	8,341	$44,796,574	12%	12%	48%	$14,528,619
CP2400	$2,525	13,733	$34,676,237	9%	21%	20%	$5,779,373
450FRC	$311	2,888	$24,685,706	7%	28%	43%	$7,422,974
300FRC	$234	8,334	$22,398,655	6%	34%	35%	$5,807,059
600FRC	$436	1,400	$19,150,964	5%	39%	67%	$7,683,321
525FRC	$370	1,658	$18,509,744	5%	44%	60%	$6,941,154
1050RCP	$1,010	487	$17,704,202	5%	49%	13%	$2,036,767
MH1050-2	$2,605	6,328	$16,487,034	4%	54%	-10%	-$1,831,893
750FRC	$593	763	$15,190,640	4%	58%	87%	$7,067,303
675FRC	$522	767	$13,717,103	4%	61%	81%	$6,138,593
1200RCP	$1,234	326	$13,268,948	4%	65%	22%	$2,392,761
900RCP	$802	462	$12,521,672	3%	68%	58%	$4,596,563
1350RCP	$1,452	194	$10,793,398	3%	71%	15%	$1,407,835
1800RCP	$2,556	88	$10,282,789	3%	74%	22%	$1,854,273
1500RCP	$1,873	134	$10,019,538	3%	77%	23%	$1,873,572
825RCP	$687	387	$9,610,269	3%	79%	70%	$3,957,170
1650RCP	$2,225	73	$6,970,576	2%	81%	23%	$1,303,441
BC3600x2400	$5,443	6	$6,777,193	2%	83%	-3%	-$209,604
MH1500-2	$4,320	1,436	$6,203,362	2%	85%	35%	$1,608,279
1950RCP	$3,113	27	$5,589,182	2%	86%	26%	$1,153,323
BC3000x1800	$4,150	7	$3,149,154	1%	87%	0%	$0
BC2400x900	$2,725	42	$2,412,951	1%	88%	-30%	-$1,034,122
FI	$2,145	976	$2,093,139	1%	88%	-1%	-$21,143
MH1200-2	$3,581	479	$1,715,458	0%	89%	17%	$249,255
BC2400x1800	$3,428	16	$1,417,307	0%	89%	-20%	-$354,327
BC1200x600	$1,429	48	$1,408,800	0%	90%	0%	$0
BC2100x2100	$3,453	26	$1,355,031	0%	90%	-20%	-$338,758
BC2400x2400	$3,990	7	$1,261,403	0%	90%	0%	$0
Total							**$80,011,788**

* Unit Rate Difference: Difference between current Unit Rates and indexed rates from the 2004 valuation.
\# Replacement Value Difference: Difference between the replacement values, one based on the current Unit Rates and the other based on the indexed rates from the 2004 valuation.

The remaining increase of 32% has been assessed as being due to the following factors:

- 3% due to increases in the unit rates for catch pits to include demolition and reinstatement costs that were not accounted for in the previous rates
- 16% due to increases in the unit rates for pipes to include demolition and reinstatement costs that were not accounted for in the previous rates
- 13% due to increases in the unit rates pipes due to excavation works not being fully accounted for in the previous rates

4.2 Catch Pits

The GIS database includes 15,344 catch pits that have been mostly built from the 1970s onwards. The following table provides the number of catch pits for each type, their average age and the decade in which they were built.

Type	Quantity	Average Age	Decade Built				
			1960	1970	1980	1990	2000
AP - Anti ponding	593	14.7	4	32	172	230	155
CP - Catch pit	13733	17.4	169	1988	4412	4403	2761
FI - Field inlet	972	12.4	4	33	231	324	380
SP - Special	36	5.3				8	28
ST - Silt trap	10	7.1			2	1	7
Total	**15344**	**16.9**	**177**	**2053**	**4817**	**4966**	**3331**

The most representative type of catch pits are the "CP" or road gully, followed by the field inlets and anti ponding pits. The majority of the pits have been build between the 1980s and 1990s, which is also confirmed by the average asset age of 17 years.

Rates for calculating the replacement values for catch pits were calculated from first principles. The rates include demolition of existing pits, excavation, on-site concrete works, installation activities and reinstatement works as detailed in Appendix A. Allowance for construction on-costs has also been included in the rates.

Unit rates have been calculated for catch pits with 2.4 m lintel and 3.5 m lintel, field inlets and anti ponding pits. Typical pit dimensions have been obtained from Council's standard drawings. Where no information regarding the type of catch pits was available, the CP2400 type has been assigned to the asset.

The average excavation depth has been calculated as the difference between the surface level and the invert level where information was available in the GIS database. For the calculation of the average depth, only valid data was considered. We have assumed the data is valid when both [SURFLEVEL] and [ILEVEL] are available and the calculated depth value was between 0.6 m and 2 m. Depths would not ordinarily exceed 2 m for catchpits due to the difficulty with cleaning and maintaining them.

From the GIS database the following average dimensions have been calculated.

Type	Length mm	Width mm	Lintel mm	Depth Mm
All Pits	784	597	2400	1250
AP	707	468		1120
CP	806	620	2399	1260
FI	798	624		1190

The resulting average depth is 1.25 m which is consistent with the depth in the standard drawings.

It was assumed that catch pits have a useful life of 80 years. This is consistent with the typical value used throughout the industry. It is also assumed that there would be no residual value in the catch pits as they would simply be scrapped at the time of replacement.

The following table provides a summary of the unit rates for catch pits by pit type.

Type	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
				Min	Max	
Catch Pits 2400	$2,525	$2,096	20%	$1,529	$3,956	CP2400
Catch Pits 3600	$2,876	$2,096	37%	$1,529	$3,956	CP3600
Field Inlet	$2,145	$2,167	-1%	$1,970	$2,983	FI
Anti Ponding	$1,920	$1,878	2%	$1,549	$1,995	AP

The current unit rate valuation shows an increase of the unit price for catch pits compared to the rates from the indexed 2004 rates. The reason for this increase is the inclusion of demolition and reinstatement works that were not included in the previous valuation. On average, demolition and reinstatement works represent 21% of the unit rate for the pits. The current rates are also consistent with the typical benchmark rates.

Field inlet and anti ponding current unit rates are consistent with the indexed 2004 values and also are within the typical benchmark range although they include allowances for demolition and reinstatement works.

The table below summarises the unit rates and total replacement value for each catchpit type.

Type	Quantity	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
CP - Catch pit	13733	$34,676,237	$433,453	$7,510,817	$27,165,420
FI - Field inlet	972	$2,084,561	$26,057	$324,321	$1,760,240
AP - Anti ponding	593	$1,138,453	$14,231	$209,266	$929,187
SP - Special	36	$145,106	$1,814	$9,975	$135,130
ST - Silt trap	10	$28,025	$350	$2,510	$25,515
Grand Total	**15344**	**$38,072,382**	**$475,905**	**$8,056,889**	**$30,015,493**

The current replacement value for catchpit assets is about $38 million and the largest value is represented by the catchpits (CP), followed by field inlets (FI) and anti-ponding pits (AP). The other catch pit types have a less material contribution to the total asset value.

The data supplied by Redland Shire Council included gross pollutant traps within the catchpit asset category. An asset category identifier for these asset types does not exist in the current data structure. Therefore unit rate codes for gross polluted traps (GPT) or manholes (MH, SP) have been assigned to these special pits as they are better characterised by the corresponding rates. These unit rates are detailed in the next section.

The detailed unit rate calculation and assumptions are provided in Appendix A.

4.3 Manholes

The GIS database includes 9,207 manholes that have been mostly built between the 1980s and 2000s. The following table provides a summary of the number of manholes for each type, their average age and the decade in which they were built.

Type	Quantity	Average Age	Decade Built				
			1960	1970	1980	1990	2000
EL	122	12.3	1	7	17	50	47
GPT	33	4.8				4	29
MH	2768	13.9	43	330	510	702	1183
SILT TRAP 2000 EL1900	1	6.0					1
SP	74	19.3	10	13	12	13	26
STANDARD	2	57.5			1	1	
STANDARD MANHOLE	7	21.0			5	2	
STD	21	8.3		1			20
(blank)	6178	20.2	55	1027	2519	2422	155
Total	**9206**		**109**	**1378**	**3064**	**3194**	**1461**

The current asset database contains 6,178 manhole records with no manhole type assigned. Additionally, 1706 assets have no recorded diameter, representing 18.5% of all manhole assets. The following table provides the most representative manhole dimensions that add to 98% of the total number of manholes for which the dimension was provided.

Length/diameter	No	%	Cum %
1050	5593	74.6%	74.6%
1500	1451	19.3%	93.9%
1200	172	2.3%	96.2%
1350	83	1.1%	97.3%
1800	46	0.6%	97.9%

The most representative manhole dimension given in the asset database is 1050 mm diameter followed by 1500 mm and 1200 mm.

Rates for calculating the replacement values for manholes were calculated from first principles including demolition, excavation, on-site concrete works, installation activities and reinstatement works as detailed in Appendix A. Allowance for construction on-costs has also been included in the rates.

Unit rates have been calculated for circular manholes with 1050, 1200, 1500, 1800 and 2100 mm diameters and depths of 2, 3, 4 and 5 m. Unit rates for elongated manholes with size 2400x1500mm for depths 2 to 5 m and some special manholes have also been derived. Unit rates for gross pollutant traps of various dimensions were also derived based on typical dimensions as detailed on Council's standard drawings.

The average manhole depths calculated from the GIS database are the followings:

Type	Depth
(blank)	2.0
EL	2.1
GPT	3.0
MH	1.8
SILT TRAP 2000 EL1900	1.2
SP	2.1
STANDARD	1.7
STANDARD MANHOLE	2.8
STD	2.0
Grand Total	1.8

Where the information for each asset was not fully available, a default asset type of "MH", diameter or 1050mm and depth of 2.0m was assumed. This is reflects the typical asset types a shown above and is consistent with the opinion given by RSC engineering staff.

The data supplied by Redland Shire Council included gross pollutant traps (GPT's) within the catchpit and manhole asset categories. An asset category identifier for these asset types does not exist in the current data structure. Redland Shire Council supplied a sample data set of 63 GPT's. Under the new ADAC process it is envisaged that GPT's will be a stand alone feature class.

It was assumed that manholes have a useful life of 80 years. This is consistent with the typical value used throughout the industry. It is also assumed that the residual value of the manholes is zero.

The following table provides a summary of the unit rates and benchmark comparative rates for manholes.

Type	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
				Min	Max	
1050 - 2.0m	$2,605	$2,890	-10%	$1,990	$4,792	MH1050-2
1050 - 3.0m	$3,361	$3,531	-5%	$3,034	$5,213	MH1050-3
1050 - 4.0m	$4,119	$4,315	-5%	$4,278	$6,930	MH1050-4
1050 - 5.0m	$4,879	$5,270	-7%	$5,195	$8,282	MH1050-5
1200 - 2.0m	$3,581	$3,050	17%	$2,470	$4,400	MH1200-2
1200 - 3.0m	$4,660	$3,727	25%	$3,358	$5,748	MH1200-3
1200 - 4.0m	$5,741	$4,553	26%	$4,733	$7,642	MH1200-4
1200 - 5.0m	$6,824	$5,564	23%	$5,737	$9,120	MH1200-5
1500 - 2.0m	$4,320	$3,211	35%	$2,918	$5,209	MH1500-2
1500 - 3.0m	$5,595	$3,917	43%	$3,957	$6,784	MH1500-3
1500 - 4.0m	$6,872	$4,742	45%	$5,596	$9,033	MH1500-4
1500 - 5.0m	$8,152	$5,830	40%	$6,776	$10,765	MH1500-5
1800 - 2.0m	$5,448			$3,682	$6,497	MH1800-2
1800 - 3.0m	$7,044			$4,956	$8,420	MH1800-3
1800 - 4.0m	$8,643			$7,048	$11,263	MH1800-4
1800 - 5.0m	$10,245			$8,507	$13,394	MH1800-5
2100 - 2.0m	$6,813			$4,818	$8,130	MH2100-2
2100 - 3.0m	$8,771			$6,254	$10,296	MH2100-3
2100 - 4.0m	$10,731			$8,652	$13,543	MH2100-4

Type	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
				Min	Max	
2100 - 5.0m	$12,695			$10,300	$15,948	MH2100-5
2400x1500 - 2.0m	$6,459	$8,346	-23%			MH2400x1500-2
2400x1500 - 3.0m	$8,335	$8,346	0%			MH2400x1500-3
2400x1500 - 4.0m	$10,214	$8,346	22%			MH2400x1500-4
2400x1500 - 5.0m	$12,096	$8,346	45%			MH2400x1500-5
SP - 2400x2200 - 3.0m	$12,070	$7,511	61%			SP2400x2200-3
SP - 2500x1200 - 3.0m	$9,561	$7,511	27%			SP2500x1200-3
SP - 4500x1200 - 3.0m	$13,818	$8,961	54%			SP4500x1200-3
SP 3000x2400 - 3.0m	$11,436	$12,717	-10%			SP3000x2400-3
GPT 1050x1050 - 2.0m	$6,365	$3,526	81%			GPT1050-2
GPT 1050x1050 - 3.0m	$7,569					GPT1050-3
GPT 1200x1200 - 2.0m	$6,626					GPT1200-2
GPT 1200x1200 - 3.0m	$8,327					GPT1200-3
GPT 1500x1500 - 2.0m	$7,493	$3,526	113%			GPT1500-2
GPT 2000x2000 - 2.0m	$9,030	$3,526	156%			GPT2000-2
GPT 2000x2000 - 4.0m	$13,464					GPT2000-4
GPT 3000x1500 - 2.0m	$9,817					GPT3000x1500-2
GPT 3650x1950 - 2.0m	$11,692					GPT3650x1950-2

Except for 1050 mm diameter manholes where the unit rates are within 10% of the indexed 2004 rates, there has been a significant increase of the rates for the larger manholes due to the addition of demolition and reinstatement costs. The difference in rates increases with the increase in depth. This is due to additional demolition, excavation and concrete works that substantially increase with depth, which may not have been fully considered in the previous valuation. For example from 1050 to 1200 mm diameter the volume of excavation increases by 37% and the volume of concrete by 81%. The available benchmarks illustrate that the current rates are consistent with typical market rates.

The significant increase in the GTP rates is due to the 2004 unit rates being based on an equivalent manhole rate and no specific rates being developed for GTP's that took into account their specific details and dimensions.

The current replacement value of manhole assets is about $29 million as summarised below. The detailed unit rate calculation and assumptions are provided in Appendix A.

Type	Total	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
EL	122	$839,556	$10,494	$125,589	$713,967
GPT	33	$199,229	$2,490	$11,561	$187,669
MH	2768	$8,822,075	$110,276	$1,492,929	$7,329,146
SILT TRAP 2000					
EL1900	1	$9,030	$113	$673	$8,358
SP	74	$433,891	$5,424	$102,977	$330,914
STANDARD	2	$5,211	$65	$966	$4,245
STANDARD MANHOLE	7	$25,049	$313	$6,517	$18,532
STD	21	$79,106	$989	$7,592	$71,514
(blank)	6178	$18,879,690	$235,996	$4,697,419	$14,182,271
Grand Total	**9206**	**$29,292,838**	**$366,160**	**$6,446,221**	**$22,846,616**

4.4 Pipes

The GIS database includes about 569 km of pipes. The following table provides the total length in meter of the existing pipes grouped by material type and diameter. The table is sorted by the most representative diameter.

Dia	Material			RCP	FRC	uPVC	AC	FRC 2	CL 2	FRCP	CL 3	DICL	RCBC	RCP 2
	Length	%	Cum%	548559	13039	6098	674	239	130	127	89	25	13	7
	568998			96%	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%
375	161604	28%	28%	152502	7656	812	327	149	113	22	23			
300	95913	17%	45%	94129	1004	594	159			21				7
450	79347	14%	59%	76673	2143	365	11		17	73	65			
525	50068	9%	68%	48723	1029	136	74	89				17		
600	43910	8%	76%	43100	657	113	29			11				
675	26289	5%	80%	26128	121	5	35							
750	25633	5%	85%	25533	84		16							
1050	17532	3%	88%	17532										
900	15607	3%	91%	15431		169						7		
825	13986	2%	93%	13955	31									
1200	10752	2%	95%	10635		117								
1350	7432	1%	96%	7330		102								
1500	5349	1%	97%	5345	4									
1800	4023	1%	98%	4023										
1650	3132	1%	99%	3132										
150	2785	0%	99%	723	103	1945	14							
225	2395	0%	99%	1453	208	725	9							
1950	1796	0%	100%	1796										
100	1170	0%	100%	168		1002								
2100	249	0%	100%	249										
250	15	0%	100%			15								
-	13	0%	100%										13	

The RCP pipes represents 96% of the total length of stormwater pipes and the most common diameter is 375 mm (28%) followed by 300 mm diameter (17%), 450 mm (14%) and 525 mm (9%).

The following table shows the average age of the stormwater pipes for each material type and diameter.

Diam	RCP	FRC	uPVC	AC	FRC 2	CL 2	FRCP	CL 3	DICL	RCBC	RCP 2
100	9.3		7.9								
150	11.1	6.4	8.2	27.0							
225	11.2	8.2	6.7	20.0							
250			2.0								
300	22.9	5.9	4.4	26.2			25.0				7.0
375	13.8	5.1	5.6	22.1	7.1	7.0	25.0	7.0			
450	16.5	4.6	4.4	25.0		7.0	25.0	7.0			
525	16.1	5.6	5.6	29.0	7.0				3.0		
600	16.8	5.5	6.0	29.0			25.0				
675	17.5	3.3	4.0	21.0							
750	16.3	4.4		21.0							
825	17.1	7.0									
900	18.3		9.0						26.0		
1050	18.1										
1200	16.4		9.0								
1350	18.8		9.0								
1500	18.6	16.0									
1650	21.7										
1800	18.2										
1950	22.0										
2100	15.8										
-										1.0	

FRC and uPVC pipes have been used more recently than RCP pipes and are typically less than 20 years old. The oldest RCP pipes are around 40 to 50 years old.

Unit rates have been calculated for typical diameters currently used that range from 100 to 2100mm and for three material types (uPVC, FRC and RCP). We have also considered the replacement material for the existing pipes according to Redland Shire Council standards that will be uPVC for diameter less then 250mm, FRC for diameter between 300 and 750mm and RCP for diameters larger then 825. The Unit rates include demolition, trench excavation in accordance with the dimensions in the standard drawings, the supply and installation of the pipe and the reinstatement works. Allowance for construction on-costs has been included in the rates.

It was assumed that all pipes have a useful life of 80 years. This is consistent with the typical value used throughout the industry. It is also assumed that the residual value of all the pipe type is zero.

The following table provides a summary of the unit rates and benchmark costs for pipes.

Dia	Material	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
					Min	Max	
100	**uPVC**	$127	$73	75%	$77	$270	100uPVC
150	**uPVC**	$147	$109	35%	$99	$321	150uPVC
225	**uPVC**	$200	$144	39%	$116	$440	225uPVC
250	**uPVC**	$225			$141	$443	250uPVC
300	**FRC**	$234	$173	35%	$114	$261	300FRC
375	**FRC**	$277	$188	48%	$149	$305	375FRC
450	**FRC**	$311	$217	43%	$145	$375	450FRC
525	**FRC**	$370	$231	60%	$176	$474	525FRC
600	**FRC**	$436	$261	67%	$209	$573	600FRC

Dia	Material	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
					Min	Max	
675	**FRC**	$522	$289	81%	$207	$700	675FRC
750	**FRC**	$593	$317	87%	$311	$835	750FRC
825	**RCP**	$687	$405	70%	$259	$644	825RCP
900	**RCP**	$802	$506	58%	$300	$806	900RCP
1050	**RCP**	$1,010	$895	13%	$383	$1,052	1050RCP
1200	**RCP**	$1,234	$1,011	22%	$389	$1,320	1200RCP
1350	**RCP**	$1,452	$1,265	15%	$693	$1,860	1350RCP
1500	**RCP**	$1,873	$1,518	23%	$1,019	$1,962	1500RCP
1650	**RCP**	$2,225	$1,807	23%	$1,919	$2,319	1650RCP
1800	**RCP**	$2,556	$2,096	22%	$982	$2,709	1800RCP
1950	**RCP**	$3,113	$2,479	26%	$2,726	$3,438	1950RCP
2100	**RCP**	$3,469	$2,854	22%	$3,189	$3,793	2100RCP

The table shows substantial differences between the current rate and the indexed 2004 valuation rate, especially as far as the uPVC and FRC are concerned. The RCP rates are generally within 25% of the indexed 2004 rates. However, the current unit rates are generally within the typical benchmark ranges.

The average unit rate increase compared to the indexed 2004 rates is 43%, excluding the increase in the rates due to general inflationary increases in the pipe supply and laying costs which have already been accounted for when comparing the rates by indexing the 2004 rates. The additional 43% increase it is mainly due to:

- 23% average increase in the unit rate for pipes due to demolition and reinstatement works that were not included in the previous rates
- 20% increase in the unit rates for pipes due to excavation works that were not fully accounted for in the previous rates

The table below provides the total value for the Pipes broken down for each Unit Rate Code.

Type	Length	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
375RCP	152,502	$42,273,502	$528,419	$7,677,910	$34,595,591
450RCP	76,673	$23,853,843	$298,173	$5,423,557	$18,430,285
300RCP	94,129	$21,981,833	$274,773	$6,354,380	$15,627,453
600RCP	43,100	$18,797,678	$234,971	$4,281,198	$14,516,480
525RCP	48,723	$18,012,561	$225,157	$4,005,297	$14,007,264
1050RCP	17,532	$17,704,202	$221,303	$4,367,709	$13,336,493
750RCP	25,533	$15,131,396	$189,142	$3,321,698	$11,809,698
675RCP	26,128	$13,633,157	$170,414	$3,139,546	$10,493,610
1200RCP	10,635	$13,124,683	$164,059	$2,851,811	$10,272,872
900RCP	15,431	$12,380,211	$154,753	$2,997,142	$9,383,069
1350RCP	7,330	$10,645,457	$133,068	$2,580,658	$8,064,799
1800RCP	4,023	$10,282,789	$128,535	$2,560,510	$7,722,280
1500RCP	5,345	$10,012,045	$125,151	$2,428,520	$7,583,525
825RCP	13,955	$9,589,092	$119,864	$2,189,020	$7,400,072
1650RCP	3,132	$6,970,576	$87,132	$1,953,348	$5,017,228
1950RCP	1,796	$5,589,182	$69,865	$1,541,173	$4,048,009
375FRC	7,656	$2,122,116	$26,526	$135,974	$1,986,142
2100RCP	249	$862,854	$10,786	$199,472	$663,383
450FRC	2,143	$666,615	$8,333	$39,211	$627,405
525FRC	1,029	$380,341	$4,754	$26,016	$354,324
225RCP	1,453	$291,185	$3,640	$46,529	$244,656
600FRC	657	$286,557	$3,582	$18,823	$267,734
150uPVC	1,945	$285,824	$3,573	$27,827	$257,996
300FRC	1,004	$234,443	$2,931	$14,891	$219,552

Type	Length	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
375uPVC	812	$225,124	$2,814	$16,204	$208,920
1350uPVC	102	$147,941	$1,849	$16,334	$131,606
225uPVC	725	$145,293	$1,816	$9,251	$136,042
1200uPVC	117	$144,265	$1,803	$15,877	$128,387
300uPVC	594	$138,730	$1,734	$9,382	$129,348
900uPVC	169	$135,540	$1,694	$14,965	$120,575
100uPVC	1,002	$127,442	$1,593	$13,660	$113,782
450uPVC	365	$113,454	$1,418	$4,995	$108,459
150RCP	723	$106,208	$1,328	$16,861	$89,347
375AC	327	$90,622	$1,133	$28,100	$62,521
675FRC	121	$63,392	$792	$2,303	$61,089
525uPVC	136	$50,094	$626	$2,903	$47,191
750FRC	84	$49,709	$621	$2,804	$46,905
600uPVC	113	$49,231	$615	$3,690	$45,541
225FRC	208	$41,698	$521	$4,751	$36,947
375FRC 2	149	$41,419	$518	$3,607	$37,812
300AC	159	$37,079	$463	$10,921	$26,158
525FRC 2	89	$32,999	$412	$2,825	$30,174
375CL 2	113	$31,238	$390	$2,765	$28,472
525AC	74	$27,387	$342	$9,875	$17,512
450FRCP	73	$22,611	$283	$7,046	$15,565
100RCP	168	$21,406	$268	$2,417	$18,989
825FRC	31	$21,177	$265	$1,916	$19,261
450CL 3	65	$20,359	$254	$1,802	$18,557
675AC	35	$18,106	$226	$4,831	$13,275
150FRC	103	$15,157	$189	$1,233	$13,924
600AC	29	$12,674	$158	$4,570	$8,104
750AC	16	$9,535	$119	$2,544	$6,991
RCBC	13	$9,257	$116	$115	$9,142
1500FRC	4	$7,493	$94	$1,546	$5,947
375CL 3	23	$6,475	$81	$573	$5,902
525DICL	17	$6,362	$80	$246	$6,116
375FRCP	22	$6,079	$76	$1,894	$4,185
900DICL	7	$5,921	$74	$1,956	$3,965
450CL 2	17	$5,419	$68	$480	$4,940
300FRCP	21	$4,939	$62	$1,539	$3,400
600FRCP	11	$4,824	$60	$1,503	$3,321
450AC	11	$3,404	$43	$1,133	$2,270
250uPVC	15	$3,270	$41	$97	$3,172
675uPVC	5	$2,447	$31	$114	$2,333
150AC	14	$2,021	$25	$662	$1,358
225AC	9	$1,860	$23	$457	$1,403
300RCP 2	7	$1,630	$20	$144	$1,486
Grand Total	**568,998**	**$257,123,433**	**$3,214,043**	**$58,413,116**	**$198,710,318**

The current replacement value of the pipe asset is around $257 million which represents the largest value out of all of the stormwater assets. The pipe type with the largest value is 375mm diameter reinforced concrete pipes.

The detailed unit rate calculation and assumptions are provided in Appendix A.

4.5 Box Culverts

In the GIS asset database there are 567 box culverts of various spans and heights and a total length of 12.7km. The following table provides a summary of the most representative dimensions and accounts

for 90% of the total number of box culverts. The table is sorted by the most prevalent size to the least prevalent size.

Dimensions (width x height)	Number	Average Age	Length	%	Cum%
3600 x 2400	6	16	1245	10%	10%
1200 x 600	48	19	986	8%	18%
1200 x 450	56	10	902	7%	25%
3000 x 1830	3	4	594	5%	29%
2400 x 900	20	7	444	3%	33%
2400 x 1800	14	17	373	3%	36%
2100 x 2100	25	11	362	3%	39%
1200 x 750	7	7	344	3%	41%
2400 x 600	14	9	305	2%	44%
2400 x 2100	6	10	272	2%	46%
1800 x 600	13	6	253	2%	48%
1200 x 900	23	28	235	2%	50%
3000 x 1200	12	16	233	2%	51%
2700 x 1800	7	18	226	2%	53%
3600 x 1200	10	16	223	2%	55%
2800 x 750	2	4	222	2%	57%
2400 x 2400	4	9	214	2%	58%
3300 x 2100	2	11	208	2%	60%
600 x 300	10	19	208	2%	62%
2100 x 1500	14	27	204	2%	63%
1200 x 300	10	16	200	2%	65%
2100 x 900	14	18	181	1%	66%
3000 x 2400	7	15	172	1%	68%
3000 x 1800	4	12	165	1%	69%
900 x 450	11	17	163	1%	70%
450 x 225	12	20	158	1%	71%
2100 x 750	9	10	157	1%	73%
3600 x 1800	7	19	155	1%	74%
1500 x 600	6	12	154	1%	75%
2400 x 1500	7	14	135	1%	76%
1500 x 750	6	11	130	1%	77%
2400 x 750	5	7	126	1%	78%
2700 x 1200	7	12	124	1%	79%
3600 x 2100	1	11	123	1%	80%
1500 x 900	5	28	112	1%	81%
2100 x 1200	6	9	110	1%	82%
450 x 300	11	13	108	1%	83%
1800 x 1800	2	12	108	1%	83%
375 x 225	10	30	106	1%	84%
2400 x	3	15	102	1%	85%
1800 x 1200	7	16	101	1%	86%
900 x 300	5	22	98	1%	87%
1500 x 1200	1	17	96	1%	87%
3000 x 1500	3	14	95	1%	88%
750 x 600	3	7	84	1%	89%
600 x 225	7	19	79	1%	89%
1800 x 900	5	13	68	1%	90%

Table demonstrates that there is fairly broad distribution of sizes and no particular culvert size is particularly dominant compared to the total number of culverts. Only four sizes count for more than 5% of the total length of culverts whereas all other sizes represent less than 5% each.

Unit rates have been calculated for standard dimensions with spans and heights ranging between 300 to 3600 mm. The Unit Rates include demolition, excavation, supply and installation of the box culvert including U-shells and platforms and reinstatement works. Allowance for construction on-costs has been included in the rates.

It was assumed that box culverts have a useful life of 80. This is consistent with the typical value used throughout the industry. It is also assumed that the residual value of all box culvert type is zero.

The following table provides a summary of the unit rates for the box culverts by span and height.

Span	Height	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
					Min	Max	
1500	600	$1,695	$3,411	-50%	$1,781	$2,195	BC1500x600
1500	900	$2,040	$3,530	-42%	$2,102	$2,468	BC1500x900
1500	1200	$2,261	$3,644	-38%	$1,891	$3,691	BC1500x1200
1500	1500	$2,460			$2,328	$3,013	BC1500x1500
1800	600	$2,075			$2,287	$2,535	BC1800x600
1800	900	$2,301			$2,424	$2,696	BC1800x900
1800	1200	$2,474	$3,725	-34%	$2,482	$2,964	BC1800x1200
1800	1500	$2,683			$2,593	$3,144	BC1800x1500
1800	1800	$2,883	$4,141	-30%	$2,690	$3,309	BC1800x1800
2100	600	$2,223	$3,600	-38%	$2,437	$2,974	BC2100x600
2100	900	$2,466	$3,670	-33%	$2,600	$3,192	BC2100x900
2100	1200	$2,701	$3,862	-30%	$3,133	$3,390	BC2100x1200
2100	1500	$2,935	$4,013	-27%	$1,942	$4,913	BC2100x1500
2100	1800	$3,194			$3,677	$3,979	BC2100x1800
2100	2100	$3,453	$4,340	-20%	$3,277	$4,268	BC2100x2100
2400	900	$2,725	$3,891	-30%	$2,916	$3,706	BC2400x900
2400	1200	$2,956	$4,016	-26%	$3,630	$3,928	BC2400x1200
2400	1500	$3,188			$3,205	$4,259	BC2400x1500
2400	1800	$3,428	$4,292	-20%	$3,364	$4,589	BC2400x1800
2400	2100	$3,729	$4,505	-17%	$3,615	$4,919	BC2400x2100
2400	2400	$3,990			$4,851	$9,569	BC2400x2400
2700	900	$3,042	$4,098	-26%	$3,324	$4,297	BC2700x900
2700	1200	$3,108	$4,226	-26%	$3,216	$4,381	BC2700x1200
2700	1500	$3,439			$4,255	$7,386	BC2700x1500
2700	1800	$3,769	$4,529	-17%	$3,810	$5,041	BC2700x1800
2700	2100	$3,969			$4,964	$5,371	BC2700x2100
2700	2400	$4,220			$5,269	$5,701	BC2700x2400
2700	2700	$4,473			$5,575	$6,032	BC2700x2700
3000	1200	$3,584	$4,358	-18%	$3,885	$4,203	BC3000x1200
3000	1500	$3,854	$4,556	-15%	$5,008	$7,929	BC3000x1500
3000	1800	$4,150					BC3000x1800
3000	2100	$4,447					BC3000x2100
3000	2400	$4,705	$5,134	-8%	$4,770	$5,161	BC3000x2400

Span	Height	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
					Min	Max	
3000	2700	$5,040	$5,538	-9%			BC3000x2700
3000	3000	$5,338					BC3000x3000
3300	1200	$3,926					BC3300x1200
3300	1500	$4,232					BC3300x1500
3300	1800	$4,539					BC3300x1800
3300	2100	$4,845	$5,097	-5%			BC3300x2100
3300	2400	$5,152					BC3300x2400
3300	2700	$5,459					BC3300x2700
3300	3000	$5,766					BC3300x3000
3300	3300	$6,073					BC3300x3300
3600	1200	$4,311	$4,840	-11%			BC3600x1200
3600	1500	$4,611	$4,993	-8%			BC3600x1500
3600	1800	$4,911	$5,273	-7%			BC3600x1800
3600	2100	$5,177					BC3600x2100
3600	2400	$5,443	$5,640	-3%			BC3600x2400
3600	2700	$5,740					BC3600x2700
3600	3000	$6,024					BC3600x3000
3600	3300	$6,307					BC3600x3300
3600	3600	$6,591					BC3600x3600
300	300	$508					BC300x300
450	300	$603	$409	48%			BC450x300
450	450	$738					BC450x450
600	300	$727	$517	41%			BC600x300
600	450	$833	$558	49%			BC600x450
600	600	$939					BC600x600
900	300	$942	$698	35%			BC900x300
900	600	$1,216					BC900x600
900	900	$1,490	$869	71%			BC900x900
1200	300	$1,218	$940	30%			BC1200x300
1200	600	$1,429	$1,020	40%	$1,436	$1,924	BC1200x600
1200	900	$1,650	$1,112	48%	$1,214	$2,551	BC1200x900
1200	1200	$1,864			$2,886	$3,123	BC1200x1200
525	525	$882					BC525x525
1500	1500	$2,460					BC1500x1500
2400	2400	$3,990					BC2400x2400

The table above shows an increase in the unit rates for small culverts (<1500 mm span) but an average decrease in the rates for the larger culverts (>1500 mm span) of around 23%. The reason for this decrease is the reduction of the cost of the box culvert precast elements compared to the 2004 valuation. This was confirmed by comparing price lists from a supplier in 2004 with the 2007 price lists. The precast element cost represents about 60% of the unit rate and by comparing the indexed 2004 precast element price and the current price, the prices have reduced by 38% on average. Where benchmark data was available, the current unit rates are generally within the typical benchmark ranges.

The table below provides a summary of the total value for box culverts for each culvert type.

Dimensions (width x height)	Length	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
3600 x 2400	1245	$6,777,193	$84,715	$1,121,843	$5,655,349
3000 x 1830	594	$2,465,222	$30,815	$108,571	$2,356,651
1200 x 600	986	$1,408,800	$17,610	$406,238	$1,002,561
2400 x 1800	373	$1,279,672	$15,996	$250,637	$1,029,036
2100 x 2100	362	$1,251,451	$15,643	$193,209	$1,058,242
2400 x 900	444	$1,210,496	$15,131	$135,646	$1,074,850
1200 x 450	902	$1,193,943	$14,924	$116,566	$1,077,376
2400 x 2100	272	$1,013,498	$12,669	$73,743	$939,755
3300 x 2100	208	$1,010,007	$12,625	$54,542	$955,465
3600 x 1200	223	$963,428	$12,043	$173,505	$789,924
2400 x 2400	214	$852,678	$10,658	$126,409	$726,269
2700 x 1800	226	$851,180	$10,640	$211,744	$639,436
3000 x 1200	233	$835,791	$10,447	$134,347	$701,443
2400 x 600	305	$830,444	$10,381	$91,097	$739,347
3000 x 2400	172	$808,255	$10,103	$163,452	$644,803
3600 x 1800	155	$761,068	$9,513	$178,199	$582,869
3000 x 1800	165	$683,932	$8,549	$101,044	$582,888
2800 x 750	222	$674,009	$8,425	$29,684	$644,325
3600 x 2100	123	$636,120	$7,952	$88,817	$547,303
2100 x 1500	204	$598,166	$7,477	$183,179	$414,987
1200 x 750	344	$529,791	$6,622	$56,920	$472,871
1800 x 600	253	$525,840	$6,573	$40,801	$485,039
2100 x 900	181	$445,456	$5,568	$102,876	$342,581
2400 x 1500	135	$431,501	$5,394	$85,351	$346,150
3600 x 3300	66	$415,335	$5,192	$113,349	$301,986
2400 x	102	$408,725	$5,109	$70,186	$338,540
1200 x 900	235	$386,949	$4,837	$139,922	$247,027
2700 x 1200	124	$385,080	$4,813	$64,522	$320,557
3000 x 1500	95	$367,635	$4,595	$66,602	$301,033
2100 x 750	157	$367,438	$4,593	$62,532	$304,906
2400 x 750	126	$342,578	$4,282	$28,697	$313,881
1800 x 1800	108	$312,051	$3,901	$46,765	$265,286
2100 x 1200	110	$296,085	$3,701	$26,534	$269,551
1500 x 600	154	$261,494	$3,269	$38,537	$222,957
1800 x 1200	101	$249,864	$3,123	$42,317	$207,547
1200 x 300	200	$243,414	$3,043	$52,502	$190,912
1500 x 750	130	$241,943	$3,024	$42,434	$199,510
1500 x 900	112	$229,192	$2,865	$78,977	$150,215
1500 x 1200	96	$217,978	$2,725	$47,657	$170,321
2700 x 900	60	$182,311	$2,279	$24,523	$157,788
900 x 450	163	$175,942	$2,199	$36,720	$139,221
1800 x 900	68	$156,441	$1,956	$32,948	$123,493
600 x 300	208	$151,529	$1,894	$35,401	$116,128
2300 x 600	65	$145,591	$1,820	$38,985	$106,605
2100 x 600	65	$145,057	$1,813	$27,281	$117,777
2400 x 1200	48	$141,906	$1,774	$48,802	$93,104
2400 x 1830	40	$137,634	$1,720	$6,062	$131,573
2000 x 900	55	$135,185	$1,690	$21,946	$113,240
1900 x 1200	51	$126,392	$1,580	$26,737	$99,655
3000 x	22	$118,817	$1,485	$9,147	$109,669
3600 x 1830	21	$104,452	$1,306	$4,600	$99,851

Dimensions (width x height)	Length	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
2150 x	30	$103,580	$1,295	$27,828	$75,752
450 x 225	158	$95,226	$1,190	$24,660	$70,566
900 x 300	98	$92,730	$1,159	$26,898	$65,832
750 x 600	84	$90,035	$1,125	$8,924	$81,111
2120 x 1500	30	$88,056	$1,101	$23,658	$64,399
3000 x 2700	17	$85,689	$1,071	$22,578	$63,110
2700 x 1830	20	$75,540	$944	$3,327	$72,213
450 x 300	108	$65,450	$818	$7,343	$58,107
2700 x 1400	19	$64,305	$804	$2,953	$61,352
900 x 1500	31	$63,749	$797	$2,423	$61,326
600 x 225	79	$57,290	$716	$14,636	$42,654
375 x 225	106	$57,201	$715	$21,120	$36,081
1200 x 1200	30	$56,221	$703	$13,826	$42,395
600 x 450	63	$52,589	$657	$2,294	$50,295
900 x 600	39	$47,018	$588	$3,050	$43,969
1200 x 1800	21	$39,668	$496	$1,849	$37,819
1200 x 375	28	$34,283	$429	$688	$33,595
3600 x 1500	7	$33,198	$415	$5,672	$27,526
750 x 375	39	$32,420	$405	$294	$32,126
450 x 150	51	$30,740	$384	$8,756	$21,984
500 x 450	37	$30,517	$381	$10,389	$20,128
4800 x 900	11	$29,434	$368	$4,967	$24,466
400 x 300	40	$29,263	$366	$7,320	$21,943
750 x 300	35	$28,825	$360	$5,729	$23,096
600 x 600	31	$28,721	$359	$1,017	$27,704
600 x 375	39	$28,187	$352	$207	$27,980
1800 x 750	13	$27,700	$346	$1,297	$26,403
900 x 750	18	$24,828	$310	$212	$24,616
750 x 450	20	$21,062	$263	$4,142	$16,920
0 x 0	28	$20,253	$253	$5,066	$15,187
900 x 375	13	$12,564	$157	$408	$12,156
1500 x 1500	4	$8,832	$110	$1,716	$7,115
375 x 150	16	$8,312	$104	$2,765	$5,547
300 x 150	16	$8,127	$102	$2,144	$5,983
750 x 225	9	$7,861	$98	$2,286	$5,575
900 x 900	5	$7,495	$94	$815	$6,680
375 x 300	13	$7,327	$92	$777	$6,550
450 x 375	8	$6,160	$77	$329	$5,832
Grand Total	**12738**	**$36,085,413**	**$451,068**	**$5,737,467**	**$30,347,945**

The current replacement value for box culvert assets is about $36 million and the largest value is represented by the BC3600x2400.

The detailed unit rate calculation and assumptions are provided in Appendix A.

4.6 Headwalls

In the GIS asset database there are 2,923 headwalls. The following table provides the headwalls dimensions that count for 90% of the total number of headwalls. The table is sorted in order of the most to least representative outlet diameter.

Type/Size	Number	Average of Age	%	Cum%
HW375	818	15	28%	28%
HW450	378	16	13%	41%
HW300	368	18	13%	54%
HW600	234	16	8%	62%
HW525	223	15	8%	69%
HW750	123	15	4%	73%
HW675	89	16	3%	76%
HW900	84	15	3%	79%
HW1200	80	15	3%	82%
HW1050	75	17	3%	85%
HW150	52	6	2%	86%
HW825	49	16	2%	88%
HW225	48	8	2%	90%

The table shows that single 375mm headwalls are the most common headwall representing 28% of the total number of headwalls. Single outlet headwalls with sizes 450, 300, 600 and 525 account for 8% to 13% of all headwalls, while the other sizes represent less than 5% each.

Unit rates have been calculated for standard headwall dimensions currently used with inlet or outlet diameters from 100 to 2100 mm. The unit rates include demolition, excavation, supply and installation of the headwall precast elements and reinstatement works. Allowance for construction on-costs has been included in the rates. Where no information regarding the headwall dimension was available, a diameter of 600 mm has been applied as this represents the average diameter for this asset category.

It was assumed that headwalls have a useful life of 80 years. This is consistent with the typical value used throughout the industry. It is also determined that the residual value for all headwalls is zero.

The following table provides a summary of the unit rates for the headwalls by width and height.

Width	Height	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
					Min	Max	
100	100	$316	$362	-13%			HW100
150	150	$396	$362	9%			HW150
225	225	$521	$362	44%			HW225
300	300	$630	$362	74%	$468	$1,025	HW300
375	375	$727			$707	$3,153	HW375
400	400	$762					HW400
450	300	$711					HW450x300
450	450	$836			$554	$2,679	HW450
525	375	$917					HW525x375
525	450	$1,065					HW525x450
525	525	$981			$1,160	$2,960	HW525
600	300	$833					HW600x300
600	375	$990					HW600x375
600	600	$1,141	$795	43%	$788	$3,254	HW600
675	675	$1,327					HW675
750	600	$1,710			$1,790	$1,937	HW750x600
750	750	$1,529					HW750
825	375	$1,211					HW825x375
825	825	$1,749	$1,163	50%			HW825

Width	Height	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Typical Benchmark Range		Unit Rate Code
					Min	Max	
900	900	$1,985	$1,286	54%	$1,562	$1,690	HW900
1050	1050	$2,667	$1,531	74%	$3,013	$3,260	HW1050
1200	375	$1,465					HW1200x375
1200	450	$1,580					HW1200x450
1200	600	$1,786					HW1200x600
1200	600	$1,786					HW1200x600
1200	900	$2,251					HW1200x900
1200	1200	$3,443	$1,777	94%	$3,375	$3,651	HW1200
1250	1250	$3,936					HW1250
1350	1350	$4,980	$2,023	146%			HW1350
1500	600	$1,899					HW1500x600
1500	1500	$6,691	$2,269	195%	$8,747	$9,464	HW1500
1650	1650	$7,900	$2,514	214%			HW1650
1800	1800	$9,220	$2,760	234%	$12,261	$13,266	HW1800
2030	2030	$10,788					HW2030
2100	600	$5,801					HW2100x600
2100	750	$7,187					HW2100x750
2100	1200	$11,466					HW2100x1200
2100	2100	$11,302	$3,252	248%	$12,072	$13,061	HW2100
2400	600	$6,545					HW2400x600
2400	1500	$16,235					HW2400x1500
2400	2400	$16,322	$3,742	336%			HW2400
2700	900	$10,791					HW2700x900
3000	3000	$26,158	$4,725	454%			HW3000
3300	2100	$30,735					HW3300x2100
5400	5400	$92,149					HW5400

The table shows substantial differences between the 2007 rate and the indexed 2004 valuation rate. The reasons are the addition of demolition, excavation, installation and reinstatements works that were not included in the 2004 rates. The current unit rates are generally within the typical benchmark ranges. We also note that the 2004 valuation only included on-costs as percentage without providing further allowance for installation works.

For headwalls with multiple outlets, the unit rate for the headwall with an inlet/outlet diameter equal to the diameter of largest attached pipe was initially determined. This rate was then adjusted using the following adjustment factor to account for the additional size of the headwall to account for the multiple pipes:

$$\text{Adjustment Factor} = 0.6 * \Sigma\,(\text{In/Outlet Diameters})/(\text{Max In/Outlet Diameter}) + 0.4$$

The above adjustment factor is based on an assessment of the typical cost components for headwalls that indicated that the face of the headwall accounts for approximately 60% of the total unit rate and the wings walls account for approximately 40%. The equation above takes into consideration that headwalls with multiple outlets have only two wings irrespective of the number of inlets or outlets and the only difference is the size of the face of the headwall the headwall apron.

For example, to a headwall with two outlets of diameter 825 and 375 the Unit Rate applied is HW825 with a factor 1.27. The factor is determined as follows: $0.6*(1 + 375/825) + 0.4 = 1.27$

We have assigned unit rates and adjustment factors to each headwall by evaluating the description field in the GIS asset database for this asset category.

The table below provides the total value of headwalls for each headwall type.

Decription (main inlet/outlet size shown only)	Number	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
HW375	818	$595,996.82	$7,449.96	$108,986.10	$487,010.72
HW450	378	$315,936.17	$3,949.20	$61,352.11	$254,584.06
HW1800	33	$304,269.54	$3,803.37	$61,904.45	$242,365.09
HW1200	80	$270,839.61	$3,385.50	$50,059.36	$220,780.25
HW600	234	$267,759.89	$3,347.00	$52,279.78	$215,480.11
HW300	368	$232,103.73	$2,901.30	$52,415.14	$179,688.60
HW525	223	$218,693.84	$2,733.67	$41,228.47	$177,465.37
HW1500	30	$200,743.19	$2,509.29	$29,952.44	$170,790.75
HW1050	75	$198,911.83	$2,486.40	$41,618.08	$157,293.75
HW750	123	$188,340.59	$2,354.26	$34,373.39	$153,967.20
HW900	84	$166,776.95	$2,084.71	$31,598.62	$135,178.33
HW1350	32	$155,525.22	$1,944.07	$36,268.19	$119,257.03
HW675	89	$117,552.26	$1,469.40	$24,044.78	$93,507.48
HW825	49	$85,698.55	$1,071.23	$17,575.51	$68,123.04
HW1650	11	$80,143.48	$1,001.79	$23,146.57	$56,996.91
HW2100	7	$79,113.46	$988.92	$15,021.49	$64,091.97
HW2400x1500	4	$65,287.36	$816.09	$11,163.69	$54,123.67
HW2400x900	11	$64,849.03	$810.61	$5,626.11	$59,222.92
HW3000	2	$52,315.06	$653.94	$7,084.03	$45,231.03
HW3000x1800	2	$52,315.06	$653.94	$7,729.01	$44,586.05
HW3600x3300	2	$52,315.05	$653.94	$14,277.35	$38,037.70
HW2400	3	$48,965.52	$612.07	$8,235.82	$40,729.70
HW2400x2100	4	$45,207.70	$565.10	$5,499.24	$39,708.46
HW2100x2100	4	$45,207.69	$565.10	$7,684.53	$37,523.16
HW3600x2400	5	$39,119.22	$488.99	$5,988.07	$33,131.15
HW2400x2400	2	$32,643.68	$408.05	$2,169.91	$30,473.77
HW3000x2400	2	$32,643.68	$408.05	$5,851.27	$26,792.41
HW2100x1200	4	$29,489.27	$368.62	$3,582.82	$25,906.45
HW2100x750	6	$28,721.59	$359.02	$5,758.10	$22,963.49
HW225	48	$25,644.35	$320.55	$2,353.41	$23,290.94
HW3300x2100	2	$22,603.85	$282.55	$836.03	$21,767.82
HW150	52	$20,579.00	$257.24	$1,555.89	$19,023.11
HW1200x450	11	$20,366.20	$254.58	$1,438.78	$18,927.42
HW2400x1800	2	$18,440.57	$230.51	$5,246.09	$13,194.48
HW2700x1800	2	$18,440.57	$230.51	$1,419.67	$17,020.90
HW600x1800	2	$18,440.57	$230.51	$416.18	$18,024.40
HW3600x1200	5	$17,213.58	$215.17	$3,063.66	$14,149.92
HW2400x1200	1	$16,321.84	$204.02	$4,387.89	$11,933.95
HW2700x1200	4	$13,770.87	$172.14	$1,522.11	$12,248.76
HW1200x600	6	$13,750.80	$171.88	$4,607.12	$9,143.68
HW3000x1500	2	$13,382.87	$167.29	$2,424.50	$10,958.37
HW3600x1500	2	$13,382.87	$167.29	$2,286.55	$11,096.33
HW1200x900	5	$12,841.76	$160.52	$3,562.66	$9,279.10
HW3000x1200	3	$10,328.15	$129.10	$2,514.36	$7,813.79
HW3600	3	$10,328.15	$129.10	$2,006.92	$8,321.23
HW2700	2	$9,960.28	$124.50	$457.42	$9,502.86
HW2700x900	5	$9,927.20	$124.09	$1,071.12	$8,856.08
HW2400x1830	1	$9,220.29	$115.25	$406.07	$8,814.21
HW3000x1830	1	$9,220.29	$115.25	$406.07	$8,814.21
HW1200x300	4	$8,242.18	$103.03	$852.02	$7,390.17
HW1900x1200	2	$6,885.43	$86.07	$1,456.55	$5,428.88
HW1800x1200	3	$5,724.48	$71.56	$781.07	$4,943.41

Decription (main inlet/outlet size shown only)	Number	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
HW750x600	4	$4,749.43	$59.37	$349.93	$4,399.49
HW2100x600	4	$4,563.52	$57.04	$160.19	$4,403.33
HW1200x750	3	$3,785.93	$47.32	$252.41	$3,533.51
HW900x450	3	$3,657.05	$45.71	$732.19	$2,924.86
HW1200x375	5	$3,635.27	$45.44	$69.39	$3,565.88
HW4x1200x600	1	$3,442.72	$43.03	$1,582.35	$1,860.37
HW1200	1	$3,442.72	$43.03	$172.61	$3,270.11
HW1800x1200	1	$3,442.72	$43.03	$160.46	$3,282.25
HW3600x1200	1	$3,442.72	$43.03	$668.97	$2,773.74
HW1800x600	3	$3,422.64	$42.78	$87.36	$3,335.28
HW1950	3	$3,422.64	$42.78	$933.29	$2,489.34
HW1500x750	2	$3,058.88	$38.24	$140.48	$2,918.40
HW2400x750	2	$3,058.88	$38.24	$256.23	$2,802.64
HW900	1	$2,667.33	$33.34	$518.30	$2,149.03
HW675	2	$2,653.57	$33.17	$107.23	$2,546.34
HW2400x600	2	$2,467.66	$30.85	$446.55	$2,021.12
HW2300x600	2	$2,281.76	$28.52	$611.00	$1,670.76
HW900x600	2	$2,281.76	$28.52	$148.00	$2,133.76
HW100	6	$1,894.86	$23.69	$230.10	$1,664.76
HW600x450	2	$1,671.61	$20.90	$65.23	$1,606.38
HW450x300	2	$1,547.31	$19.34	$462.30	$1,085.00
HW1800x750	1	$1,529.44	$19.12	$71.60	$1,457.84
HW900x750	1	$1,529.44	$19.12	$13.04	$1,516.40
HW400	2	$1,524.09	$19.05	$35.96	$1,488.13
HW600x225	1	$1,140.88	$14.26	$97.99	$1,042.89
HW600x300	1	$1,140.88	$14.26	$166.40	$974.48
HW1500x600	1	$1,140.88	$14.26	$70.64	$1,070.24
HW2700x550	1	$1,140.88	$14.26	$33.17	$1,107.71
HWGABION	1	$1,140.88	$14.26	$48.53	$1,092.35
HW4500x525	1	$980.69	$12.26	$45.91	$934.78
HW600x375	1	$727.05	$9.09	$5.33	$721.73
HW750x375	1	$727.05	$9.09	$6.60	$720.46
HW900x375	1	$727.05	$9.09	$5.33	$721.73
HW200	1	$521.35	$6.52	$137.53	$383.82
HW250	1	$521.35	$6.52	$15.52	$505.84
HW450x225	1	$521.35	$6.52	$165.69	$355.66
HW750x225	1	$521.35	$6.52	$165.69	$355.66
HW160	1	$395.75	$4.95	$29.69	$366.06
Grand Total	**2923**	**$4,473,022.53**	**$55,912.78**	**$826,815.81**	**$3,646,206.72**

The current replacement value for headwalls is about $4.5 million and the largest value is represented by single 375mm headwalls.

The detailed unit rate calculation and assumptions are provided in Appendix A.

4.7 Open Drains

The following table provides the total length of open drains in the different width classes grouped by type. Width class 0 includes the open drains 0 to 0.99 m wide, width class 1 includes open drains 1 to 1.99 m wide and so on. The table is sorted in descending order of total length.

Width Class (metres)	Lined	Partially Lined	Rock Lined	Undefined	Total
0	468			441	909
1	425	33	4	214	676
2	1,568			1,022	2,590
3	741	239		519	1,500
4	324				324
5	216				216
>5	1,074	1,052			2,126
Total	**4,816**	**1,324**	**4**	**2,196**	**8,340**

The table shows a number of the lined open drains that do not have a description to indicate if they are fully or partially lined. It has been assumed that these are fully lined open drains as with the majority of lined drains.

The open drains valued in this valuation only include lined drains. The industry guidelines and standard practice is not to value 'natural assets' and this generally includes natural open drains. Redlands Shire Council's current approach includes not valuing unlined drains and this is considered to be a common approach throughout local government. However, it could also be argued that the work required to construct an open drain is not dissimilar to the formation costs for roads which are to be capitalised and not expensed. In some cases open drains are eventually piped and filled in and recognising the initial value and future benefits of excavation of the drain is consistent with the general valuation approach.

An issue that has been recognised is that the current information for unlined open drains does not indicate whether or not it is a natural watercourse or other form of natural asset. It is therefore difficult to differentiate between the unlined drains that should be recognised and those that should not. Taking this into account, it is therefore a more reasonable to not value them than it would be to value them given the general lack of information that is required to provide value with a high degree of confidence. To some extent the valuation of unlined open drains is academic because of their total value represents less than 2% of the total value of all stormwater assets and less than 0.4% of all infrastructure assets and is therefore not considered to be material.

Although the unit rates have been developed for the unlined unit rates, they have not been aggregated into the revaluation summaries unless noted otherwise.

Unit rates have been calculated for unlined, lined and partially lined open drains with base widths from 500 mm to 5000 mm and depths from 500 mm to 2000 mm. Where no information regarding the type of open drain was available, an unlined open drain with a width of 3000mm has been assumed, being the average dimension for open drains in the asset database. We have assumed 1:1.5 batters for lined open drains, 1:6 for partially lined drains and 1:5 for unlined open drains as these represent the typical standard profiles for open drains. For partially lined drains we have assumed concrete only on the base of the open drain. The Unit Rates include demolition, excavation, and reinstatement works. Allowance for construction on-costs has been included in the rates.

The following table provides a summary of the unit rates for the open drains for the various combinations of material, depth and width.

Base Width	Depth	Open Drain Type	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Unit Rate Code
500	500	L	$128	$165	-26%	L500-500
500	1000	L	$242	$287	-28%	L500-1000
500	1500	L	$370	$422	-30%	L500-1500
500	2000	L	$510	$567	-33%	L500-2000

Base Width	Depth	Open Drain Type	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Unit Rate Code
1000	500	L	$157	$165	-4%	L1000-500
1000	1000	L	$276	$287	-15%	L1000-1000
1000	1500	L	$408	$422	-22%	L1000-1500
1000	2000	L	$552	$567	-27%	L1000-2000
2000	500	L	$216	$227	1%	L2000-500
2000	1000	L	$344	$357	-12%	L2000-1000
2000	1500	L	$484	$499	-19%	L2000-1500
2000	2000	L	$636	$652	-25%	L2000-2000
3000	500	L	$276	$288	4%	L3000-500
3000	1000	L	$411	$426	-9%	L3000-1000
3000	1500	L	$560	$576	-18%	L3000-1500
3000	2000	L	$721	$737	-24%	L3000-2000
4000	500	L	$335	$350	6%	L4000-500
4000	1000	L	$479	$496	-23%	L4000-1000
4000	1500	L	$636	$653	-16%	L4000-1500
4000	2000	L	$805	$822	-12%	L4000-2000
					-10%	
5000	500	L	$394	$412		L5000-500
5000	1000	L	$547	$565	-5%	L5000-1000
5000	1500	L	$712	$730	-4%	L5000-1500
5000	2000	L	$890	$907	-3%	L5000-2000
					-3%	
500	500	U	$60	$67		U500-500
500	1000	U	$159	$172	-5%	U500-1000
500	1500	U	$299	$315	-4%	U500-1500
500	2000	U	$482	$498	-3%	U500-2000
					-2%	
1000	500	U	$67	$67		U1000-500
1000	1000	U	$170	$172	-4%	U1000-1000
1000	1500	U	$315	$315	-4%	U1000-1500
1000	2000	U	$502	$498	-3%	U1000-2000
					-2%	
2000	500	U	$82	$100		U2000-500
2000	1000	U	$193	$221	-4%	U2000-1000
2000	1500	U	$347	$380	-3%	U2000-1500
2000	2000	U	$542	$578	-3%	U2000-2000
					-2%	
3000	500	U	$96	$117		U3000-500
3000	1000	U	$216	$246	-4%	U3000-1000
3000	1500	U	$378	$413	-3%	U3000-1500
3000	2000	U	$582	$618	-3%	U3000-2000
					-2%	
4000	500	U	$111			U4000-500
4000	1000	U	$239		-10%	U4000-1000
4000	1500	U	$409		-8%	U4000-1500
4000	2000	U	$622		-5%	U4000-2000
					-3%	
5000	500	U	$126			U5000-500
5000	1000	U	$262		1%	U5000-1000

Base Width	Depth	Open Drain Type	2007 Valuation Unit Rate	Indexed 2004 Unit Rate		Unit Rate Code
5000	1500	U	$441		-1%	U5000-1500
5000	2000	U	$661		0%	U5000-2000
					1%	
500	500	PL	$96	$79		PL500-500
500	1000	PL	$213	$205	-19%	PL500-1000
500	1500	PL	$381	$377	-13%	PL500-1500
500	2000	PL	$599	$596	-9%	PL500-2000
					-6%	
1000	500	PL	$128	$141		PL1000-500
1000	1000	PL	$250	$275	-18%	PL1000-1000
1000	1500	PL	$422	$455	-12%	PL1000-1500
1000	2000	PL	$645	$681	-8%	PL1000-2000
					-6%	
2000	500	PL	$194	$136		PL2000-500
2000	1000	PL	$324	$344		PL2000-1000
2000	1500	PL	$504	$532		PL2000-1500
2000	2000	PL	$735	$766		PL2000-2000
3000	500	PL	$259	$265		PL3000-500
3000	1000	PL	$398	$414		PL3000-1000
3000	1500	PL	$587	$609		PL3000-1500
3000	2000	PL	$826	$851		PL3000-2000
4000	500	PL	$325	$326		PL4000-500
4000	1000	PL	$471	$483	20%	PL4000-1000
4000	1500	PL	$669	$686	4%	PL4000-1500
4000	2000	PL	$917	$935	1%	PL4000-2000
					1%	
5000	500	PL	$390	$388		PL5000-500
5000	1000	PL	$545	$553	-9%	PL5000-1000
5000	1500	PL	$751	$763	-9%	PL5000-1500
5000	2000	PL	$1,007	$1,020	-7%	PL5000-2000

The table shows that current unit rates are generally within 20% of the indexed 2004 valuation rates.

The table below provides a summary of the total value for each type of open drain.

Type	Length	Current Replacement Cost	Annual Depreciation	Accumulated Depreciation	Written Down Value
Lined	4,816	$2,565,292	$32,066	$520,908	$2,044,384
Partially Lined	1,324	$1,223,531	$15,431	$210,293	$1,013,237
Rock Lined	4	$1,223	$15	$43	$1,180
Unspecified lined	2,196	$823,407	$10,293	$151,527	$671,880
Grand Total	**8,340**	**$4,613,453**	**$57,805**	**$882,772**	**$3,730,682**

The current replacement value for all open drains is about $4.6million and the largest value is represented by the unlined drains with a width of 3 metres, followed by partially open drains with a width of 5 metres and depth of 2 metres.

The detailed unit rate calculation and assumptions are provided in Appendix A.

5. Improvements

Redlands Shire Council has already recognised the need to continuously improve systems, procedures and data to provide a robust foundation upon which to base their asset management decisions and related processes such as accounting for non-current assets.

Council has already implemented, or is in the process of implementing the following improvements that will assist with future revaluations:

- Implementation of a city-wide review of Council's GIS database to improve asset data and ensure that the database of kept current
- Implementation of the ADAC (Asset Design and As Constructed) asset classification system. The ADAC system has been developed and maintained by a consortium of Local Government agencies in South East Queensland to facilitate the collection and lodgement of civil engineering infrastructure information by the private sector to councils and defines the asset information requirements and standardisation of terminology and allowable values.

Observations made during the 2007 revaluation of stormwater assets also identified the following activities that may improve future asset management processes and asset valuation outcomes and support Council in achieving or maintaining a best-practice approach. The activities listed below are suggested improvements for further consideration only as the costs, resources and ultimately the future benefits will need to be individually assessed.

Condition Assessment and Useful Lives

Council's infrastructure is relatively new, being on average only 22% into its expected useful life and is not expected to show evidence of any widespread maintenance problems across the network. To date Council has not implemented a area wide CCTV inspection program for its underground assets and this is considered to be a reasonable approach considering the relatively young age of the infrastructure.

However, some of the Shire's older assets have exceeded 50% of their life and are reaching the age where defects may potentially start occur, especially in aggressive coastal environments. This has been demonstrated from research Connell Wagner has undertaken for other Queensland councils located in coastal areas.

It is suggested that some of the older assets have reached the age where implementation of a condition inspection program would be prudent. The information from the inspection program will also be useful in improving the general knowledge of the performance of the asset. This knowledge can be used in decision making processes for the planned upgrading and replacement of infrastructure, as well as for valuation purposes through providing the information required for a more detailed review of the economic lives of assets.

The economic lives used in the revaluation have largely been based on industry values and the expected asset performance based on experience from other councils located in similar coastal environments. To some extent, a conservative approach has been used due to the lack of knowledge of the condition of buried assets. The condition assessment will allow better knowledge of actual asset performance to date and will provide the data necessary for a detailed analysis of asset performance and extending the live, if that is the case.

It is therefore recommended that consideration is given to implementing CCTV inspection for the oldest assets at least and using the data to carry out a detailed analysis of asset performance and a review of the useful asset lives.

Regional Approach to Asset Live

The challenges in determining an appropriate useful life for infrastructure assets is not unique to Redlands Shire Council and is a challenge faced by all councils. What differentiates Redlands Shire Council from many other councils is that its infrastructure is relatively young and it does not have a proven maintenance history upon which to base its estimate of asset lifecycles.

A regional approach would provide some benefits to other councils in a similar situation through sharing their experience on the performance of assets, especially within coastal areas.

Consideration should be given to engaging such an approach and seeking input from other councils within the region. However, upon engaging such an approach it should also be recognised that the useful life also takes into account other factors that may be particular to each council such as level of service, maintenance practices, construction standards, and environmental issues.

Unlined Drains

The unlined drains have not been included in the asset valuation summaries, and are not material from a valuation perspective. However, it would be prudent to improve the data held on each open drain from an asset management approach.

The information held may also be used for future network modelling of the stormwater catchment if at some time a citywide model is developed.

Further discussion regarding the recognition of at least some unlined open drains may also be considered with respect to whether or not the excavation and formation of the drain should be capitalised and the potential benefits of capitalising such drains. It is suggested that it would be useful in obtaining QAO's comments with respect to this matter.

Stormwater Quality Improvement Devices (SQIDS)

SQIDS are often seen as natural assets and are not valued on that basis despite them often been man-made and the result of significant initial investment and ongoing investment to maintain, replace and reconstruct such infrastructure. Consideration should be given whether these assets should be excluded from valuation or if there would be benefits in recognising at least their site improvement value.

At minimum it is suggest that details of the devices and their value should be captured in the asset management plans even if they not recognised as a reportable asset for asset accounting purposes.

Appendix A

Detailed Unit Cost Calculation and Assumptions

Unit Rate Summary Table

Element Type	Unit Rate Code*	Unit	Unit Cost
Manhole	MH1050-2	Each	$2,605
Manhole	MH1050-3	Each	$3,361
Manhole	MH1050-4	Each	$4,119
Manhole	MH1050-5	Each	$4,879
Manhole	MH1200-2	Each	$3,581
Manhole	MH1200-3	Each	$4,660
Manhole	MH1200-4	Each	$5,741
Manhole	MH1200-5	Each	$6,824
Manhole	MH1500-2	Each	$4,320
Manhole	MH1500-3	Each	$5,595
Manhole	MH1500-4	Each	$6,872
Manhole	MH1500-5	Each	$8,152
Manhole	MH1800-2	Each	$5,448
Manhole	MH1800-3	Each	$7,044
Manhole	MH1800-4	Each	$8,643
Manhole	MH1800-5	Each	$10,245
Manhole	MH2100-2	Each	$6,813
Manhole	MH2100-3	Each	$8,771
Manhole	MH2100-4	Each	$10,731
Manhole	MH2100-5	Each	$12,695
Manhole	MH2400x1500-2	Each	$6,459
Manhole	MH2400x1500-3	Each	$8,335
Manhole	MH2400x1500-4	Each	$10,214
Manhole	MH2400x1500-5	Each	$12,096
Manhole	SP2400x2200-3	Each	$12,070
Manhole	SP2500x1200-3	Each	$9,561
Manhole	SP4500x1200-3	Each	$13,818
Manhole	SP3000x2400-3	Each	$11,436
Manhole	GPT1050-2	Each	$6,365
Manhole	GPT1050-3	Each	$7,569
Manhole	GPT1200-2	Each	$6,626
Manhole	GPT1200-3	Each	$8,327
Manhole	GPT1500-2	Each	$7,493
Manhole	GPT2000-2	Each	$9,030
Manhole	GPT2000-4	Each	$13,464
Manhole	GPT3000x1500-2	Each	$9,817
Manhole	GPT3650x1950-2	Each	$11,692
Catch Pit	CP2400	Each	$2,525
Catch Pit	CP3600	Each	$2,876
Catch Pit	FI	Each	$2,145
Catch Pit	AP	Each	$1,920
Pipe	100uPVC	m	$127
Pipe	150uPVC	m	$147
Pipe	225uPVC	m	$200
Pipe	250uPVC	m	$225
Pipe	300FRC	m	$234
Pipe	375FRC	m	$277
Pipe	450FRC	m	$311
Pipe	525FRC	m	$370
Pipe	600FRC	m	$436
Pipe	675FRC	m	$522
Pipe	750FRC	m	$593

Unit Rate Summary Table

Element Type	Unit Rate Code*	Unit	Unit Cost
Pipe	825RCP	m	$687
Pipe	900RCP	m	$802
Pipe	1050RCP	m	$1,010
Pipe	1200RCP	m	$1,234
Pipe	1350RCP	m	$1,452
Pipe	1500RCP	m	$1,873
Pipe	1650RCP	m	$2,225
Pipe	1800RCP	m	$2,556
Pipe	1950RCP	m	$3,113
Pipe	2100RCP	m	$3,469
Box Culvert	BC1500x600	m	$1,695
Box Culvert	BC1500x900	m	$2,040
Box Culvert	BC1500x1200	m	$2,261
Box Culvert	BC1500x1500	m	$2,460
Box Culvert	BC1800x600	m	$2,075
Box Culvert	BC1800x900	m	$2,301
Box Culvert	BC1800x1200	m	$2,474
Box Culvert	BC1800x1500	m	$2,683
Box Culvert	BC1800x1800	m	$2,883
Box Culvert	BC2100x600	m	$2,223
Box Culvert	BC2100x900	m	$2,466
Box Culvert	BC2100x1200	m	$2,701
Box Culvert	BC2100x1500	m	$2,935
Box Culvert	BC2100x1800	m	$3,194
Box Culvert	BC2100x2100	m	$3,453
Box Culvert	BC2400x900	m	$2,725
Box Culvert	BC2400x1200	m	$2,956
Box Culvert	BC2400x1500	m	$3,188
Box Culvert	BC2400x1800	m	$3,428
Box Culvert	BC2400x2100	m	$3,729
Box Culvert	BC2400x2400	m	$3,990
Box Culvert	BC2700x900	m	$3,042
Box Culvert	BC2700x1200	m	$3,108
Box Culvert	BC2700x1500	m	$3,439
Box Culvert	BC2700x1800	m	$3,769
Box Culvert	BC2700x2100	m	$3,969
Box Culvert	BC2700x2400	m	$4,220
Box Culvert	BC2700x2700	m	$4,473
Box Culvert	BC3000x1200	m	$3,584
Box Culvert	BC3000x1500	m	$3,854
Box Culvert	BC3000x1800	m	$4,150
Box Culvert	BC3000x2100	m	$4,447
Box Culvert	BC3000x2400	m	$4,705
Box Culvert	BC3000x2700	m	$5,040
Box Culvert	BC3000x3000	m	$5,338
Box Culvert	BC3300x1200	m	$3,926
Box Culvert	BC3300x1500	m	$4,232
Box Culvert	BC3300x1800	m	$4,539
Box Culvert	BC3300x2100	m	$4,845
Box Culvert	BC3300x2400	m	$5,152
Box Culvert	BC3300x2700	m	$5,459
Box Culvert	BC3300x3000	m	$5,766

Unit Rate Summary Table

Element Type	Unit Rate Code*	Unit	Unit Cost
Box Culvert	BC3300x3300	m	$6,073
Box Culvert	BC3600x1200	m	$4,311
Box Culvert	BC3600x1500	m	$4,611
Box Culvert	BC3600x1800	m	$4,911
Box Culvert	BC3600x2100	m	$5,177
Box Culvert	BC3600x2400	m	$5,443
Box Culvert	BC3600x2700	m	$5,740
Box Culvert	BC3600x3000	m	$6,024
Box Culvert	BC3600x3300	m	$6,307
Box Culvert	BC3600x3600	m	$6,591
Box Culvert	BC300x300	m	$508
Box Culvert	BC450x300	m	$603
Box Culvert	BC450x450	m	$738
Box Culvert	BC600x300	m	$727
Box Culvert	BC600x450	m	$833
Box Culvert	BC600x600	m	$939
Box Culvert	BC900x300	m	$942
Box Culvert	BC900x600	m	$1,216
Box Culvert	BC900x900	m	$1,490
Box Culvert	BC1200x300	m	$1,218
Box Culvert	BC1200x600	m	$1,429
Box Culvert	BC1200x900	m	$1,650
Box Culvert	BC1200x1200	m	$1,864
Box Culvert	BC525x525	m	$882
Headwall	HW100	Each	$316
Headwall	HW150	Each	$396
Headwall	HW225	Each	$521
Headwall	HW300	Each	$630
Headwall	HW375	Each	$727
Headwall	HW400	Each	$762
Headwall	HW450x300	Each	$711
Headwall	HW450	Each	$836
Headwall	HW525x375	Each	$917
Headwall	HW525x450	Each	$1,065
Headwall	HW525	Each	$981
Headwall	HW600x300	Each	$833
Headwall	HW600x375	Each	$990
Headwall	HW600	Each	$1,141
Headwall	HW675	Each	$1,327
Headwall	HW750x600	Each	$1,710
Headwall	HW750	Each	$1,529
Headwall	HW825x375	Each	$1,211
Headwall	HW825	Each	$1,749
Headwall	HW900	Each	$1,985
Headwall	HW1050	Each	$2,667
Headwall	HW1200x375	Each	$1,465
Headwall	HW1200x450	Each	$1,580
Headwall	HW1200x600	Each	$1,786
Headwall	HW1200x900	Each	$2,251
Headwall	HW1200	Each	$3,443
Headwall	HW1250	Each	$3,936
Headwall	HW1350	Each	$4,980

Unit Rate Summary Table

Element Type	Unit Rate Code*	Unit	Unit Cost
Headwall	HW1500x600	Each	$1,899
Headwall	HW1500	Each	$6,691
Headwall	HW1650	Each	$7,900
Headwall	HW1800	Each	$9,220
Headwall	HW2030	Each	$10,788
Headwall	HW2100x600	Each	$5,801
Headwall	HW2100x750	Each	$7,187
Headwall	HW2100x1200	Each	$11,466
Headwall	HW2100	Each	$11,302
Headwall	HW2400x600	Each	$6,545
Headwall	HW2400x1500	Each	$16,235
Headwall	HW2400	Each	$16,322
Headwall	HW2700x900	Each	$10,791
Headwall	HW3000	Each	$26,158
Headwall	HW3300x2100	Each	$30,735
Headwall	HW5400	Each	$92,149
Open Drain	L500-500	m	$128
Open Drain	L500-1000	m	$242
Open Drain	L500-1500	m	$370
Open Drain	L500-2000	m	$510
Open Drain	L1000-500	m	$157
Open Drain	L1000-1000	m	$276
Open Drain	L1000-1500	m	$408
Open Drain	L1000-2000	m	$552
Open Drain	L2000-500	m	$216
Open Drain	L2000-1000	m	$344
Open Drain	L2000-1500	m	$484
Open Drain	L2000-2000	m	$636
Open Drain	L3000-500	m	$276
Open Drain	L3000-1000	m	$411
Open Drain	L3000-1500	m	$560
Open Drain	L3000-2000	m	$721
Open Drain	L4000-500	m	$335
Open Drain	L4000-1000	m	$479
Open Drain	L4000-1500	m	$636
Open Drain	L4000-2000	m	$805
Open Drain	L5000-500	m	$394
Open Drain	L5000-1000	m	$547
Open Drain	L5000-1500	m	$712
Open Drain	L5000-2000	m	$890
Open Drain	U500-500	m	$60
Open Drain	U500-1000	m	$159
Open Drain	U500-1500	m	$299
Open Drain	U500-2000	m	$482
Open Drain	U1000-500	m	$67
Open Drain	U1000-1000	m	$170
Open Drain	U1000-1500	m	$315
Open Drain	U1000-2000	m	$502
Open Drain	U2000-500	m	$82
Open Drain	U2000-1000	m	$193
Open Drain	U2000-1500	m	$347
Open Drain	U2000-2000	m	$542

Unit Rate Summary Table

Element Type	Unit Rate Code*	Unit	Unit Cost
Open Drain	U3000-500	m	$96
Open Drain	U3000-1000	m	$216
Open Drain	U3000-1500	m	$378
Open Drain	U3000-2000	m	$582
Open Drain	U4000-500	m	$111
Open Drain	U4000-1000	m	$239
Open Drain	U4000-1500	m	$409
Open Drain	U4000-2000	m	$622
Open Drain	U5000-500	m	$126
Open Drain	U5000-1000	m	$262
Open Drain	U5000-1500	m	$441
Open Drain	U5000-2000	m	$661
Open Drain	PL500-500	m	$96
Open Drain	PL500-1000	m	$213
Open Drain	PL500-1500	m	$381
Open Drain	PL500-2000	m	$599
Open Drain	PL1000-500	m	$128
Open Drain	PL1000-1000	m	$250
Open Drain	PL1000-1500	m	$422
Open Drain	PL1000-2000	m	$645
Open Drain	PL2000-500	m	$194
Open Drain	PL2000-1000	m	$324
Open Drain	PL2000-1500	m	$504
Open Drain	PL2000-2000	m	$735
Open Drain	PL3000-500	m	$259
Open Drain	PL3000-1000	m	$398
Open Drain	PL3000-1500	m	$587
Open Drain	PL3000-2000	m	$826
Open Drain	PL4000-500	m	$325
Open Drain	PL4000-1000	m	$471
Open Drain	PL4000-1500	m	$669
Open Drain	PL4000-2000	m	$917
Open Drain	PL5000-500	m	$390
Open Drain	PL5000-1000	m	$545
Open Drain	PL5000-1500	m	$751
Open Drain	PL5000-2000	m	$1,007

* Unit Rate Code — Each asset has been defined with an "Unit Rate Code" Field that is linked with the "Unit Rate Code" in the table above to lookup the according Unit Rate

Catch Pits Unit Rate Summary Table

Type	2007 Valuation						2004 Valuation			Difference		Unit Rate Code*
	Base Rate GF	Base Rate BF	On Costs	Discount	Unit Rate GF	Unit Rate	2004 Valuation	Escalation	2004 Valuation Excalated	(C)/(F)-1	(D)/(F)-1	
	(A)	(B)			(C)	(D)	(E)		(F)			
Catch Pits 2400	$1,797	$2,227	26%	10%	$2,038	$2,525	$1,697	23.5%	$2,096	-3%	20%	*CP2400*
Catch Pits 3600	$2,056	$2,536	26%	10%	$2,332	$2,876	$1,697	23.5%	$2,096	11%	37%	*CP3600*
Field Inlet	$1,632	$1,891	26%	10%	$1,850	$2,145	$1,755	23.5%	$2,167	-15%	-1%	*FI*
Anti Ponding	$1,518	$1,693	26%	10%	$1,721	$1,920	$1,521	23.5%	$1,878	-8%	2%	*AP*

Manholes Unit Rate Summary Table

Type	2007 Valuation						2004 Valuation			Difference		Unit Rate Code*
	Base Rate GF	Base Rate BF	On Costs	Discount	Unit Rate GF	Unit Rate BF	2004 Valuation	Escalation	2004 Valuation Excalated	(C)/(F)-1	(D)/(F)-1	
	(A)	(B)			(C)	(D)	(E)		(F)			
1050 - 2.0m	$2,033	$2,298	26%	10%	$2,305	$2,605	$2,340	23.5%	$2,890	-20%	-10%	*MH1050-2*
1050 - 3.0m	$2,659	$2,964	26%	10%	$3,015	$3,361	$2,859	23.5%	$3,531	-15%	-5%	*MH1050-3*
1050 - 4.0m	$3,287	$3,632	26%	10%	$3,727	$4,119	$3,494	23.5%	$4,315	-14%	-5%	*MH1050-4*
1050 - 5.0m	$3,916	$4,302	26%	10%	$4,441	$4,879	$4,267	23.5%	$5,270	-16%	-7%	*MH1050-5*
1200 - 2.0m	$2,717	$3,158	26%	10%	$3,081	$3,581	$2,470	23.5%	$3,050	1%	17%	*MH1200-2*
1200 - 3.0m	$3,568	$4,109	26%	10%	$4,047	$4,660	$3,018	23.5%	$3,727	9%	25%	*MH1200-3*
1200 - 4.0m	$4,422	$5,062	26%	10%	$5,015	$5,741	$3,687	23.5%	$4,553	10%	26%	*MH1200-4*
1200 - 5.0m	$5,278	$6,017	26%	10%	$5,985	$6,824	$4,505	23.5%	$5,564	8%	23%	*MH1200-5*
1500 - 2.0m	$3,249	$3,809	26%	10%	$3,684	$4,320	$2,600	23.5%	$3,211	15%	35%	*MH1500-2*
1500 - 3.0m	$4,260	$4,934	26%	10%	$4,831	$5,595	$3,172	23.5%	$3,917	23%	43%	*MH1500-3*
1500 - 4.0m	$5,274	$6,060	26%	10%	$5,981	$6,872	$3,840	23.5%	$4,742	26%	45%	*MH1500-4*
1500 - 5.0m	$6,290	$7,188	26%	10%	$7,133	$8,152	$4,721	23.5%	$5,830	22%	40%	*MH1500-5*
1800 - 2.0m	$4,053	$4,804	26%	10%	$4,596	$5,448						*MH1800-2*
1800 - 3.0m	$5,312	$6,212	26%	10%	$6,024	$7,044						*MH1800-3*
1800 - 4.0m	$6,573	$7,622	26%	10%	$7,454	$8,643						*MH1800-4*
1800 - 5.0m	$7,836	$9,035	26%	10%	$8,886	$10,245						*MH1800-5*
2100 - 2.0m	$5,040	$6,008	26%	10%	$5,716	$6,813						*MH2100-2*
2100 - 3.0m	$6,577	$7,734	26%	10%	$7,458	$8,771						*MH2100-3*
2100 - 4.0m	$8,116	$9,463	26%	10%	$9,204	$10,731						*MH2100-4*
2100 - 5.0m	$9,658	$11,195	26%	10%	$10,953	$12,695						*MH2100-5*
2400x1500 - 2.0m	$4,805	$5,696	26%	10%	$5,449	$6,459	$6,758	23.5%	$8,346	-35%	-23%	*MH2400x1500-2*
2400x1500 - 3.0m	$6,267	$7,350	26%	10%	$7,107	$8,335	$6,758	23.5%	$8,346	-15%	0%	*MH2400x1500-3*
2400x1500 - 4.0m	$7,731	$9,007	26%	10%	$8,767	$10,214	$6,758	23.5%	$8,346	5%	22%	*MH2400x1500-4*
2400x1500 - 5.0m	$9,198	$10,667	26%	10%	$10,431	$12,096	$6,758	23.5%	$8,346	25%	45%	*MH2400x1500-5*
SP - 2400x2200 - 3.0m	$9,263	$10,644	26%	10%	$10,504	$12,070	$6,082	23.5%	$7,511	40%	61%	*SP2400x2200-3*
SP - 2500x1200 - 3.0m	$7,161	$8,432	26%	10%	$8,120	$9,561	$6,082	23.5%	$7,511	8%	27%	*SP2500x1200-3*
SP - 4500x1200 - 3.0m	$10,449	$12,185	26%	10%	$11,849	$13,818	$7,256	23.5%	$8,961	32%	54%	*SP4500x1200-3*
SP 3000x2400 - 3.0m	$9,145	$10,085	26%	10%	$10,370	$11,436	$10,297	23.5%	$12,717	-18%	-10%	*SP3000x2400-3*

GPT Unit Rate Summary Table

Type	2007 Valuation						2004 Valuation			Difference		Unit Rate Code*
	Base Rate GF	Base Rate BF	On Costs	Discount	Unit Rate GF	Unit Rate BF	2004 Valuation	Escalation	2004 Valuation Excalated	(C)/(F)-1	(D)/(F)-1	
	(A)	(B)			(C)	(D)	(E)		(F)			
GPT 1050x1050 - 2.0m	$5,226	$5,613	26%	10%	$5,926	$6,365	$2,855	23.5%	$3,526	68%	81%	*GPT1050-2*
GPT 1050x1050 - 3.0m	$6,151	$6,674	26%	10%	$6,975	$7,569						*GPT1050-3*
GPT 1200x1200 - 2.0m	$5,428	$5,843	26%	10%	$6,156	$6,626						*GPT1200-2*
GPT 1200x1200 - 3.0m	$6,571	$7,129	26%	10%	$7,452	$8,084						*GPT1200-3*
GPT 1500x1500 - 2.0m	$6,146	$6,607	26%	10%	$6,970	$7,493	$2,855	23.5%	$3,526	98%	113%	*GPT1500-2*
GPT 2000x2000 - 2.0m	$7,452	$7,963	26%	10%	$8,450	$9,030	$2,855	23.5%	$3,526	140%	156%	*GPT2000-2*
GPT 2000x2000 - 4.0m	$10,687	$11,497	26%	10%	$12,119	$13,038						*GPT2000-4*
GPT 3000x1500 - 2.0m	$8,095	$8,657	26%	10%	$9,180	$9,817						*GPT3000x1500-2*
GPT 3650x1950 - 2.0m	$9,740	$10,311	26%	10%	$11,045	$11,692						*GPT3650x1950-2*

* Unit Rate Code Each asset has been defined with an "Unit Rate Code" Field that is linked with the "Unit Rate Code" in the table above to lookup the according Unit Rate

Catch Pit - M 2400

Dimension

Length (l)	800	mm	(1) Pit dimension according to stardard dwawing
Width (w)	600	mm	(1) Pit dimension according to stardard dwawing
Depth (h)	1250	mm	(2) Average depth from existing pits
Lintels	2400	mm	
Wall Thickness	150		
Excavation Grade	0.01	89˚	

Unit Costs

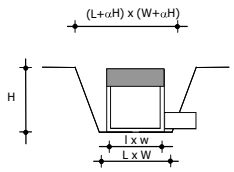
Task				UC	Total	Unit Rate Source	Comments
Demolition				**24%**	**$545**		
Asphalt and Foothpath Demolition	2.6	m2		$3.4	$9	Rawlinsons	(3) Allow 1707x1507mm area for demolition 150mm thick
Lintel and Kerb Demolition	0.4	m3		$291	$112	Rawlinsons	
Asphalt Reinstatement	0.4	m3		$85	$33	Council SoR	
Kerb Reinstatement	0.6	m		$33	$20	Different Projects	
Catch Pit Demolition	1.0	mhrs		$54	$54	Local Labour Rate	Allow 1hrs per pit (1hrs per 800x600x1250)
Demolition aids	1.0	hrs		$155	$155	Recent Projects Review	
Excavation for demolition	1.0	mhrs		$95	$95	Local Labour Rate	Allow 1hrs per pit (1hrs per 800x600x1250)
Excavation aids	1.0	hrs		$55	$55	Recent Projects Review	
Tip Fee	1.2	m3		$10	$12	Recent Projects Review	
Excavation				**6%**	**$137**		
Compacted to Loose factor	1						
Excavation	3.6	m3		$32	$115	Council SoR	(3) Allow 1707x1507mm area for excavation in light soil
Back Filling	1.8	m3		$0	$0	Rawlinsons	Included in excavation
Tip Fee	2.1	m3		$10	$21	Council SoR	
Catch Pit Box				**75%**	**$1,661**		
Floor							
Concrete	0.11	m3		$128	$14	Rawlinsons	(1) Allow for 950x750mm base according to standard drawings
Labour	0.16	mhrs		$54	$9	Local Labour Rate	Allow for 1.5mhrs/m3
Walls							
Formworks	7.75	m2		$75	$580	Rawlinsons	
Concrete	0.64	m3		$128	$82	Rawlinsons	
Labour	0.96	mhrs		$54	$52	Local Labour Rate	
Top & Lintel							
Supply precast element	1.00	No		$157	$157	Council Supplier	
Lintel	2.40	m		$200	$200	Council Supplier	
Installation	2.00	mhr		$54	$108	Local Labour Rate	Allow 2mhrs installation
Grating	800	mm	600 mm	$459	$459	Council Supplier	
Total Pit (GF)				**(A)**	**$1,797**		
Total Pit (BF)				**(B)**	**$2,227**		
On Costs				26.0%		Council Projects review	(4) Refer to % breakdown
Discount				10.0%			
Total Pit (GF)				**(C)**	**$2,038**		
Total Pit (BF)				**(D)**	**$2,525**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
CP - MR 2.4	$1,700	2006	7.1%	A	$1,821	-1%	Council Evaluation	Demolitions and on costs not included
CP (unsure if 2.4 or 3.6)	$1,697	2004	23.5%	C	$2,096	-3%	2004 Revaluation	Excluding demolitions and restatement

Detailed Assumptions

1. Pit Dimensions

Pit dimensions are assumed according to standard drawing D-0063, D-0069, D-RSC-3, D-RSC-6



2. Average Excavation Depth

The average excavation depth is calculated from the information in the GIS database

H = [SURFLEVE] – [ILEVEL] + t
t = groud slab thickness = 150mm

For the calculation of the average, only valid data has been considered.
We have assumed the data is valid when:
* Both [SURFLEVE] and [ILEVEL] are available
* The calculated depth has value between 0.6m and 2m

Total No of Catch Pits	12763	100%
[SURFLEVE] and [ILEVEL] = 0	4035	32%
[SURFLEVE] = 0	246	2%
[ILEVEL] = 0	4534	36%
Depth <0.6m	55	0%
Valid Data	3893	31%

h(avg) = 1250 mm

3. Demolition area and excavation

The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

4. On Costs and Overheads

On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Catch Pit - M 3600

Dimension

Length (l)	800	mm	(1) Pit dimension according to stardard dwawing
Width (w)	600	mm	(1) Pit dimension according to stardard dwawing
Depth (h)	1250	mm	(2) Average depth from existing pits
Lintels	3600	mm	
Wall Thickness	150		
Excavation Grade	0.01	89˚	

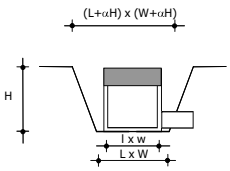
Unit Costs

Task				UC	Total	Unit Rate Source	Comments
Demolition				**23%**	**$595**		
Asphalt and Foothpath Demolition	2.6	m2		$3.38	$9	Rawlinsons	(3) Allow 1707x1507mm area for demolition 150mm thick
Lintel and Kerb Demolition	0.6	m3		$291	$162	Rawlinsons	
Asphalt Reinstatement	0.4	m3		$85	$33	Council SoR	
Kerb Reinstatement	0.6	m		$33	$20	Different Projects	
Catch Pit Demolition	1.0	mhrs		$54	$54	Local Labour Rate	Allow 1hrs per pit (1hrs per 800x600x1250)
Demolition aids	1.0	hrs		$155	$155	Recent Projects Review	
Excavation for demolition	1.0	mhrs		$95	$95	Local Labour Rate	Allow 1hrs per pit (1hrs per 800x600x1250)
Excavation aids	1.0	hrs		$55	$55	Recent Projects Review	
Tip Fee	1.2	m3		$10	$12	Different Projects	
Excavation				**5%**	**$137**		
Compacted to Loose factor	1						
Excavation	3.6	m3		$32	$115	Council SoR	(3) Allow 1707x1507mm area for excavation in light soil
Back Filling	1.8	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	2.1	m3		$10	$21	Council SoR	
Catch Pit Box				**76%**	**$1,920**		
Floor							
Concrete	0.11	m3		$128	$14	Rawlinsons	(1) Allow for 950x750mm base according to standard drawings
Labour	0.16	mhrs		$54	$9	Local Labour Rate	Allow for 1.5mhrs/m3
Walls							
Formworks	7.75	m2		$75	$580	Rawlinsons	
Concrete	0.64	m3		$128	$82	Rawlinsons	
Labour	0.96	mhrs		$54	$52	Local Labour Rate	
Top & Lintel							
Supply precast element	1.00	No		$157	$157	Rawlinsons	
Lintel	3.60	m		$259	$259	Council Supplier	
Installation	2.00	mhr		$54	$108	Local Labour Rate	Allow 2mhrs installation
Grating	800	mm	600 mm	$660	$660	Council Supplier	
Total Pit (GF)				**(A)**	**$2,056**		
Total Pit (BF)				**(B)**	**$2,536**		
On Costs				26.0%		Council Projects review	(4) Refer to % breakdown
Discount				10.0%			
Total Pit (GF)				**(C)**	**$2,332**		
Total Pit (BF)				**(D)**	**$2,876**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
CP - MR 3.6	$1,900	2006	7.1%	A	$2,035	1%	Council Evaluation	Demolitions and on costs not included
Concrete gullies, roadway type kerb in line, 3.6m lintel, type M	$2,010	2006	7.1%	A	$2,153	-4%	DMR Project	Demolitions and on costs not included
CP (unsure if 2.4 or 3.6)	$1,697	2004	23.5%	C	$2,096	11%	2004 Revaluation	Excluding demolitions and restatement

Detailed Assumptions

1. Pit Dimensions — Pit dimensions are assumed according to standard drawing D-0063, D-0069, D-RSC-3, D-RSC-6



2. Average Excavation Depth — The average excavation depth is calculated from the information in the GIS database

H = [SURFLEVE] – [ILEVEL] + t
t = groud slab thickness = 150mm

For the calculation of the average, only valid data has been considered.
We have assumed the data is valid when:
* Both [SURFLEVE] and [ILEVEL] are available
* The calculated depth has value between 0.6m and 2m

Total No of Catch Pits	12763	100%
[SURFLEVE] and [ILEVEL] = 0	4035	32%
[SURFLEVE] = 0	246	2%
[ILEVEL] = 0	4534	36%
Depth <0.6m	55	0%
Valid Data	3893	31%

h(avg) = 1250 mm

3. Demolition area and excavation — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

4. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Field Inlet

Dimension

Length (l)	900	mm		(1) Pit dimension according to stardard dwawing
Width (w)	600	mm		(1) Pit dimension according to stardard dwawing
Depth (h)	1200	mm		(2) Average depth from existing pits
Wall Thickness	150			
Excavation Grade	0.01		89˚	

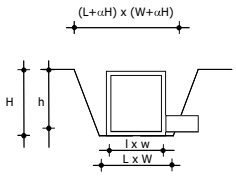
Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Brown Field Works				**21%**	**$401**		
Field Inlet Demolition	1.1	mhrs		$54	$58	Local Labour Rate	Allow 1hrs per FI (1hrs per 800x600x1250)
Demolition aids	1.1	hrs		$155	$167	Recent Projects Review	
Excavation for demolition	1.1	mhrs		$95	$103	Local Labour Rate	Allow 1hrs per FI (1hrs per 800x600x1250)
Excavation aids	1.1	hrs		$55	$59	Recent Projects Review	
Tip Fee	1.3	m3		$10	$13	Different Projects	
Excavation				**9%**	**$163**		
Compacted to Loose factor	1.2						
Excavation	4.4	m3		$32	$141	Council SoR	(3) Allow 1806x1506mm area for excavation
Back Filling	2.6	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	2.2	m3		$10	$22	Council SoR	
Field Inlet Box				**78%**	**$1,468**		
Floor							
Concrete	0.12	m3		$128	$15	Rawlinsons	(3) Allow for 1050x750mm base
Labour	0.24	mhrs		$54	$13	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Formworks	7.92	m2		$75	$593	Rawlinsons	
Concrete	0.65	m3		$128	$83	Rawlinsons	
Labour	0.97	mhrs		$54	$52	Local Labour Rate	
Top							
Grating	900	mm	600 mm	$389	$389	Council Rate	
Installation	2.00	mhr		$54	$108	Local Labour Rate	
Apron	1	(1 yes, 0 no)					
Apron concrete	0.32	m3		$128	$41	Rawlinsons	
Apron formwork	1.32	m2		$75	$99	Rawlinsons	
Apron steel	2.16	m2		$19	$40	Rawlinsons	
Installation	0.65	mhrs		$54	$35	Local Labour Rate	
Total Field Inlet (GF)				**(A)**	**$1,632**		
Total Field Inlet (BF)				**(B)**	**$1,891**		
On Costs				26%		Council Projects review	(4) Refer to % breakdown
Discount				10.0%			
Total Pit (GF)				**(C)**	**$1,850**		
Total Pit (BF)				**(D)**	**$2,145**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
FI	$1,755	2004	23.5%	C	$2,167	-15%	2004 Revaluation	Excluding demolitions and restatement
FI 900x600	$1,700	2006	7.1%	A	$1,821	-10%	Council evaluation	

Detailed Assumptions

1. Pit Dimensions — Pit dimensions are assumed according to standard drawing D-0050



2. Average Excavation Depth — The average excavation depth is calculated from the information in the GIS database

H = [SURFLEVE] – [ILEVEL] + t
t = groud slab thickness = 150mm

For the calculation of the average, only valid data has been considered.
We have assumed the data is valid when:
* Both [SURFLEVE] and [ILEVEL] are available
* The calculated depth has value between 0.6m and 2m

Total No of FI	873	100%
[SURFLEVE] and [ILEVEL] = 0	258	30%
[SURFLEVE] = 0	31	4%
[ILEVEL] = 0	218	25%
Depth <0.6m	42	5%
Valid Data	324	37%

h(avg) = 1200 mm

3. Demolition area and excav — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

4. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Anti Ponding

Dimension

Length (l)	600	mm	(1) Pit dimension according to stardard dwawing
Width (w)	420	mm	(1) Pit dimension according to stardard dwawing
Depth (h)	1250	mm	(2) Average depth from existing pits
Wall Thickness	150		
Excavation Grade	0.01	89˚	

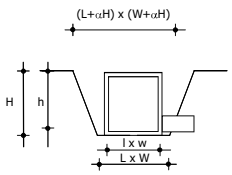
Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Brown Field Works				**17%**	**$283**		
Asphalt Surface							
Asphalt Demolition	0.3	m3		$22	$6	Rawlinsons	(3) Allow 1507x1327mm area for demolition 150mm thick
Lintel and Kerb Demolition	0.1	m3		$280	$36	Rawlinsons	
Asphalt Reinstatement	0.3	m3		$85	$25	Council SoR	
Kerb Reinstatement	0.6	m		$33	$20	Different Projects	
Anti Ponding Demolition	0.5	mhrs		$54	$28	Local Labour Rate	Allow 0.5hrs per AP (1hrs per 800x600x1250)
Demolition aids	0.5	hrs		$155	$81	Recent Projects Review	
Excavation for demolition	0.5	mhrs		$95	$50	Local Labour Rate	Allow 0.5hrs per AP (1hrs per 800x600x1250)
Excavation aids	0.5	hrs		$55	$29	Recent Projects Review	
Tip Fee	0.6	m3		$10	$6	Recent Projects Review	
Excavation				**7%**	**$123**		
Compacted to Loose factor	1.2						
Excavation	3.4	m3		$32	$108	Council SoR	(3) Allow 1507x1327mm area for excavation
Back Filling	2.1	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	1.5	m3		$10	$15	Council SoR	
Anti Ponding Box				**82%**	**$1,395**		
Floor							
Concrete	0.06	m3		$128	$8	Rawlinsons	(3) Allow for 750x570mm base
Labour	0.32	mhrs		$54	$17	Local Labour Rate	Allow for 1.5mhrs/m3
Inlet	1.00	No		$318	$318	Council Supplier	
Walls							
Formworks	5.85	m2		$75	$438	Rawlinsons	
Concrete	0.50	m3		$128	$63	Rawlinsons	
Labour	0.99	mhrs		$54	$53	Local Labour Rate	
Top							
Grating	600	mm	420 mm	$389	$389	Council Supplier	
Installation	2.00	mhr		$54	$108	Local Labour Rate	
Total Anti Ponding (GF)				**(A)**	**$1,518**		
Total Anti Ponding (BF)				**(B)**	**$1,693**		
On Costs				26%		Council Projects review	(4) Refer to % breakdown
Discount				10%			
Total Pit (GF)				**(C)**	**$1,721**		
Total Pit (BF)				**(D)**	**$1,920**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
AP	$1,521	2004	23.5%	C	$1,878	-8%	2004 Revaluation	Excluding demolitions and restatement
AP	$1,500	2006	7.1%	A	$1,607	-6%	Council Evaluation	

Detailed Assumptions

1. Pit Dimensions — Pit dimensions are assumed according to standard drawing D-0068 and D0070



2. Average Excavation Dept — The average excavation depth is calculated from the information in the GIS database

H = [SURFLEVE] **–** [ILEVEL] + t
t = groud slab thickness = 150mm

For the calculation of the average, only valid data has been considered.
We have assumed the data is valid when:
* Both [SURFLEVE] and [ILEVEL] are available
* The calculated depth has value between 0.6m and 2m

Total No of AP	521	100%
[SURFLEVE] and [ILEVEL] = 0	184	35%
[SURFLEVE] = 0	4	1%
[ILEVEL] = 0	179	34%
Depth <0.6m	10	2%
Valid Data	144	28%

h(avg) = 1120 mm

3. Demolition area and exca — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

4. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Manholes - 1050 / 2000

Dimension

Length	1050	mm		(1) Pit dimension according to stardard dwawing
Width	1050	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 1
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	162.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions				**29%**	**$668**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	0.6	m3		$23	$13	Rowlinsons	(5) Allow 1960x1960mm area for demolition 150mm thick
Asphalt Reinstatement	0.6	m3		$85	$49	Council SoR	
Excavation	3.5	m3		$43	$149	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	0.6	m3		$42	$24	Rawlinsons	
Concrete Reistatement	0.6	m3		$125	$72	Rawlinsons	
Labour	1.2	mhrs		$54	$62	Local Labour Rate	
Manhole Demolition							
Slab	0.9	m2		$37	$32	Rawlinsons	
Walls	1.0	m3		$305	$302	Rawlinsons	
Ground slab	0.9	m2		$37	$32	Rawlinsons	
Tip Fee	3.3	m3		$10	$33	Council SoR	
Excavation				**18%**	**$403**		
Compacted to Loose factor	1						
Excavation	8.3	m3		$43	$355	Council SoR	(5) Allow 1960x1960mm area for excavation in light soil
Back Filling	3.5	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	4.8	m3		$10	$48	Council SoR	
Manhole Box				**71%**	**$1,629**		
Floor							
Formworks	0.7	m2		$75	$52	Rawlinsons	
Concrete	0.23	m3		$128	$30	Rawlinsons	
Labour	0.47	mhrs		$54	$25	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$75	$75	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	3.70	hrs		$90	$333		Form lifting
Concrete	1.13	m3		$135	$153	Rawlinsons	
Labour	1.70	mhrs		$54	$92	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.17	m3		$132	$23	Rawlinsons	
Formwork	0.87	m2		$110	$95	Rawlinsons	
Reinforcement	10	kg		$2.23	$23	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.39	mhrs		$54	$129	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$2,033**		
Total Manhole (BF)				**(B)**	**$2,298**		
					$265		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$2,305**		
Total Manhole (BF)				**(D)**	**$2,605**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1050 - 0-1.99	$2,340	2004	23.5%	C	$2,890	-20%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Manhole 1050 - 2000	$1,920	2006	7.1%	A	$2,056	-1%	Recent Projects Review	
Manhole 1050 - 2000?	$1,900	2006	7.1%	A	$2,035	0%	Council Estimate	Excluding on-costs and Escalation

Manholes - 1050 / 3000

Dimension

Length	1050	mm		(1) Pit dimension according to stardard dwawing
Width	1050	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 2
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	162.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$901**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	0.6	m3		$23	$13	Rowlinsons	(5) Allow 1965x1965mm area for demolition 150mm thick
Asphalt Reinstatement	0.6	m3		$85	$49	Council SoR	
Excavation	5.0	m3		$43	$213	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	0.6	m3		$42	$24	Rawlinsons	
Concrete Reistatement	0.6	m3		$125	$72	Rawlinsons	
Labour	1.2	mhrs		$54	$63	Local Labour Rate	
Manhole Demolition							
Slab	0.9	m2		$37	$32	Rawlinsons	
Walls	1.5	m3		$305	$452	Rawlinsons	
Ground slab	0.9	m2		$37	$32	Rawlinsons	
Tip Fee	5.0	m3		$10	$50	Council SoR	
Excavation					**$595**		
Compacted to Loose factor	1						
Excavation	12.2	m3		$43	$523	Council SoR	(4) Allow 1965x1965mm area for excavation in light soil
Back Filling	5.0	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	7.2	m3		$10	$72	Council SoR	
Manhole Box					**$2,063**		
Floor							
Formworks	0.7	m2		$75	$52	Rawlinsons	
Concrete	0.23	m3		$128	$30	Rawlinsons	
Labour	0.47	mhrs		$54	$25	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$75	$112	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	5.54	hrs		$90	$499		Form lifting
Concrete	1.70	m3		$135	$229	Rawlinsons	
Labour	2.54	mhrs		$54	$137	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.17	m3		$132	$23	Rawlinsons	
Formwork	0.87	m2		$110	$95	Rawlinsons	
Reinforcement	10	kg		$2.23	$23	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.39	mhrs		$54	$129	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$2,659**		
Total Manhole (BF)				**(B)**	**$2,964**		
					$305		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$3,015**		
Total Manhole (BF)				**(D)**	**$3,361**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1050 - 2-2.99	$2,859	2004	23.5%	C	$3,531	-15%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Manhole 1050 - 3000 (prorata)				A	$2,560	4%	Recent Projects Review	With average ratio of 1.25
Ratio per meter depth						1.31		

Manholes - 1050 / 4000

Dimension

Length	1050	mm		(1) Pit dimension according to stardard dwawing
Width	1050	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	4000	mm		(2) Depth group 3
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	162.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,135**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	0.6	m3		$23	$13	Rowlinsons	(5) Allow 1970x1970mm area for demolition 150mm thick
Asphalt Reinstatement	0.6	m3		$85	$50	Council SoR	
Excavation	6.5	m3		$43	$280	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	0.6	m3		$42	$24	Rawlinsons	
Concrete Reistatement	0.6	m3		$125	$73	Rawlinsons	
Labour	1.2	mhrs		$54	$63	Local Labour Rate	
Manhole Demolition							
Slab	0.9	m2		$37	$32	Rawlinsons	
Walls	2.0	m3		$305	$603	Rawlinsons	
Ground slab	0.9	m2		$37	$32	Rawlinsons	
Tip Fee	6.6	m3		$10	$66	Council SoR	
Excavation					**$789**		
Compacted to Loose factor	1						
Excavation	16.1	m3		$43	$693	Council SoR	(4) Allow 1970x1970mm area for excavation in light soil
Back Filling	6.5	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	9.6	m3		$10	$96	Council SoR	
Manhole Box					**$2,497**		
Floor							
Formworks	0.7	m2		$75	$52	Rawlinsons	
Concrete	0.23	m3		$128	$30	Rawlinsons	
Labour	0.47	mhrs		$54	$25	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	4.00	lift					1.2m lift
Formworks Hire	2.00	days		$75	$150	Recent Projects Review	0.5 day/lift
Formwork labour	8.00	mhrs		$54	$432	Local Labour Rate	2hrs per lift
Construction aids	7.39	hrs		$90	$665		Form lifting
Concrete	2.26	m3		$135	$306	Rawlinsons	
Labour	3.39	mhrs		$54	$183	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.17	m3		$132	$23	Rawlinsons	
Formwork	0.87	m2		$110	$95	Rawlinsons	
Reinforcement	10	kg		$2.23	$23	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.39	mhrs		$54	$129	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$3,287**		
Total Manhole (BF)				**(B)**	**$3,632**		
					$346		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$3,727**		
Total Manhole (BF)				**(D)**	**$4,119**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1050 - 3-3.99	$3,494	2004	23.5%	C	$4,315	-14%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Manhole 1050 - 4000 (prorata)				A	$3,108	6%	Recent Projects Review	With average ratio of 1.25
Ratio per meter depth						1.24		

Manholes - 1050 / 5000

Dimension

Length	1050	mm		(1) Pit dimension according to stardard dwawing
Width	1050	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	5000	mm		(2) Depth group 4
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	162.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

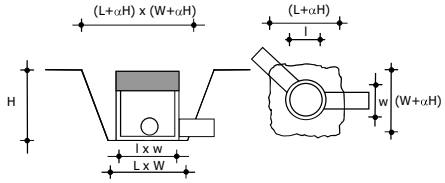
Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,371**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	0.6	m3		$23	$13	Rowlinsons	(5) Allow 1975x1975mm area for demolition 150mm thick
Asphalt Reinstatement	0.6	m3		$85	$50	Council SoR	
Excavation	8.1	m3		$43	$348	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	0.6	m3		$42	$24	Rawlinsons	
Concrete Reistatement	0.6	m3		$125	$73	Rawlinsons	
Labour	1.2	mhrs		$54	$63	Local Labour Rate	
Manhole Demolition							
Slab	0.9	m2		$37	$32	Rawlinsons	
Walls	2.5	m3		$305	$754	Rawlinsons	
Ground slab	0.9	m2		$37	$32	Rawlinsons	
Tip Fee	8.3	m3		$10	$83	Council SoR	
Excavation					**$985**		
Compacted to Loose factor	1						
Excavation	20.1	m3		$43	$864	Council SoR	(4) Allow 1975x1975mm area for excavation in light soil
Back Filling	8.1	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	12.0	m3		$10	$120	Council SoR	
Manhole Box					**$2,931**		
Floor							
Formworks	0.7	m2		$75	$52	Rawlinsons	
Concrete	0.23	m3		$128	$30	Rawlinsons	
Labour	0.47	mhrs		$54	$25	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	5.00	lift					1.2m lift
Formworks Hire	2.50	days		$75	$187	Recent Projects Review	0.5 day/lift
Formwork labour	10.00	mhrs		$54	$540	Local Labour Rate	2hrs per lift
Construction aids	9.24	hrs		$90	$832		Form lifting
Concrete	2.83	m3		$135	$382	Rawlinsons	
Labour	4.24	mhrs		$54	$229	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.17	m3		$132	$23	Rawlinsons	
Formwork	0.87	m2		$110	$95	Rawlinsons	
Reinforcement	10	kg		$2.23	$23	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.39	mhrs		$54	$129	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$3,916**		
Total Manhole (BF)				**(B)**	**$4,302**		
					$386		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$4,441**		
Total Manhole (BF)				**(D)**	**$4,879**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1050 - 4-4.99	$4,267	2004	23.5%	C	$5,270	-16%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Manhole 1050 - 5000 (prorata)				A	$3,703	6%	Recent Projects Review	With average ratio of 1.25
Ratio per meter depth						1.19		

Manholes - 1050 / 5000

Detailed Assumptions

1. Pit Dimensions — Manhole dimensions are assumed according to standard drawing D-0010, D-0012, D-0013



2. Average Excavation Depth — Depth Group 4

	Min	Max	Avg
Group 1	1.5	2.49	2
Group 2	2.5	3.49	3
Group 3	3.5	4.49	4
Group 4	4.5	5.49	5

3. Manhole Dimension — Manhole dimensions according to standard drawing D-0010

MH Diameter	Floor Thickness			Wall Thickness
	IL	OL	Avg	
0	175	150	162.5	150
1050	175	150	162.5	150
1200	250	225	237.5	225
1350	250	225	237.5	225
1500	250	225	237.5	225
1800	250	225	237.5	250
2100	275	250	262.5	275

4. Demolitions Area — Allowed for different demolition areas:
40% Asphalt surfaces
60% Concrete surfaces

5. Demolition area and excavati — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

6. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Manholes - 1200 / 2000

Dimension

Length	1200	mm		(1) Pit dimension according to stardard dwawing
Width	1200	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 1
Wall Thickness	225	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$999**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	0.8	m3		$23	$18	Rowlinsons	(5) Allow 2261x2261mm area for demolition 150mm thick
Asphalt Reinstatement	0.8	m3		$85	$65	Council SoR	
Excavation	4.5	m3		$43	$195	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	0.8	m3		$42	$32	Rawlinsons	
Concrete Reistatement	0.8	m3		$125	$96	Rawlinsons	
Labour	1.5	mhrs		$54	$83	Local Labour Rate	
Manhole Demolition							
Slab	1.1	m2		$37	$42	Rawlinsons	
Walls	1.7	m3		$305	$517	Rawlinsons	
Ground slab	1.1	m2		$37	$42	Rawlinsons	
Tip Fee	4.3	m3		$10	$43	Council SoR	
Excavation					**$558**		
Compacted to Loose factor	1						
Excavation	11.4	m3		$43	$489	Council SoR	(5) Allow 2261x2261mm area for excavation in light soil
Back Filling	4.5	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	6.8	m3		$10	$68	Council SoR	
Manhole Box					**$2,159**		
Floor							
Formworks	1.2	m2		$75	$92	Rawlinsons	
Concrete	0.51	m3		$128	$65	Rawlinsons	
Labour	1.02	mhrs		$54	$55	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$85	$85	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	5.02	hrs		$90	$452		Form lifting
Concrete	2.01	m3		$135	$272	Rawlinsons	
Labour	3.02	mhrs		$54	$163	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.36	m3		$132	$48	Rawlinsons	
Formwork	1.13	m2		$110	$125	Rawlinsons	
Reinforcement	22	kg		$2.23	$48	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.82	mhrs		$54	$152	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$2,717**		
Total Manhole (BF)				**(B)**	**$3,158**		
					$441		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$3,081**		
Total Manhole (BF)				**(D)**	**$3,581**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1200 - 0-1.99	$2,470	2004	23.5%	C	$3,050	1%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions

Manholes - 1200 / 3000

Dimension

Length	1200	mm		(1) Pit dimension according to stardard dwawing
Width	1200	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 2
Wall Thickness	225	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,356**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	0.8	m3		$23	$18	Rowlinsons	(5) Allow 2266x2266mm area for demolition 150mm thick
Asphalt Reinstatement	0.8	m3		$85	$65	Council SoR	
Excavation	6.3	m3		$43	$271	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	0.8	m3		$42	$32	Rawlinsons	
Concrete Reistatement	0.8	m3		$125	$96	Rawlinsons	
Labour	1.5	mhrs		$54	$83	Local Labour Rate	
Manhole Demolition							
Slab	1.1	m2		$37	$42	Rawlinsons	
Walls	2.5	m3		$305	$775	Rawlinsons	
Ground slab	1.1	m2		$37	$42	Rawlinsons	
Tip Fee	6.5	m3		$10	$65	Council SoR	
Excavation					**$815**		
Compacted to Loose factor	1						
Excavation	16.6	m3		$43	$712	Council SoR	(4) Allow 2266x2266mm area for excavation in light soil
Back Filling	6.3	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	10.3	m3		$10	$103	Council SoR	
Manhole Box					**$2,754**		
Floor							
Formworks	1.2	m2		$75	$92	Rawlinsons	
Concrete	0.51	m3		$128	$65	Rawlinsons	
Labour	1.02	mhrs		$54	$55	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$85	$128	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	7.53	hrs		$90	$678		Form lifting
Concrete	3.02	m3		$135	$409	Rawlinsons	
Labour	4.53	mhrs		$54	$245	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.36	m3		$132	$48	Rawlinsons	
Formwork	1.13	m2		$110	$125	Rawlinsons	
Reinforcement	22	kg		$2.23	$48	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.82	mhrs		$54	$152	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$3,568**		
Total Manhole (BF)				**(B)**	**$4,109**		
					$541		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$4,047**		
Total Manhole (BF)				**(D)**	**$4,660**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1200 - 2-2.99	$3,018	2004	23.5%	C	$3,727	9%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.31		

Manholes - 1200 / 4000

Dimension

Length	1200	mm		(1) Pit dimension according to stardard dwawing
Width	1200	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	4000	mm		(2) Depth group 3
Wall Thickness	225	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,714**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	0.8	m3		$23	$18	Rowlinsons	(5) Allow 2271x2271mm area for demolition 150mm thick
Asphalt Reinstatement	0.8	m3		$85	$66	Council SoR	
Excavation	8.1	m3		$43	$348	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	0.8	m3		$42	$32	Rawlinsons	
Concrete Reistatement	0.8	m3		$125	$97	Rawlinsons	
Labour	1.5	mhrs		$54	$84	Local Labour Rate	
Manhole Demolition							
Slab	1.1	m2		$37	$42	Rawlinsons	
Walls	3.4	m3		$305	$1,034	Rawlinsons	
Ground slab	1.1	m2		$37	$42	Rawlinsons	
Tip Fee	8.6	m3		$10	$86	Council SoR	
Excavation					**$1,074**		
Compacted to Loose factor	1						
Excavation	21.8	m3		$43	$937	Council SoR	(4) Allow 2271x2271mm area for excavation in light soil
Back Filling	8.1	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	13.7	m3		$10	$137	Council SoR	
Manhole Box					**$3,348**		
Floor							
Formworks	1.2	m2		$75	$92	Rawlinsons	
Concrete	0.51	m3		$128	$65	Rawlinsons	
Labour	1.02	mhrs		$54	$55	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	4.00	lift					1.2m lift
Formworks Hire	2.00	days		$85	$171	Recent Projects Review	0.5 day/lift
Formwork labour	8.00	mhrs		$54	$432	Local Labour Rate	2hrs per lift
Construction aids	10.04	hrs		$90	$904		Form lifting
Concrete	4.03	m3		$135	$545	Rawlinsons	
Labour	6.04	mhrs		$54	$326	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.36	m3		$132	$48	Rawlinsons	
Formwork	1.13	m2		$110	$125	Rawlinsons	
Reinforcement	22	kg		$2.23	$48	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.82	mhrs		$54	$152	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$4,422**		
Total Manhole (BF)				**(B)**	**$5,062**		
					$640		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$5,015**		
Total Manhole (BF)				**(D)**	**$5,741**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1200 - 3-3.99	$3,687	2004	23.5%	C	$4,553	10%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.24		

Manholes - 1200 / 5000

Dimension

Length	1200	mm		(1) Pit dimension according to stardard dwawing
Width	1200	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	5000	mm		(2) Depth group 4
Wall Thickness	225	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

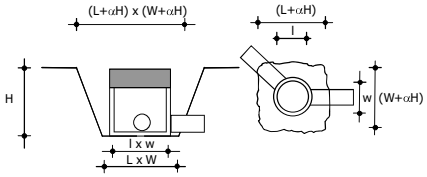
Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$2,075**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	0.8	m3		$23	$18	Rowlinsons	(5) Allow 2276x2276mm area for demolition 150mm thick
Asphalt Reinstatement	0.8	m3		$85	$66	Council SoR	
Excavation	10.0	m3		$43	$428	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	0.8	m3		$42	$32	Rawlinsons	
Concrete Reistatement	0.8	m3		$125	$97	Rawlinsons	
Labour	1.6	mhrs		$54	$84	Local Labour Rate	
Manhole Demolition							
Slab	1.1	m2		$37	$42	Rawlinsons	
Walls	4.2	m3		$305	$1,292	Rawlinsons	
Ground slab	1.1	m2		$37	$42	Rawlinsons	
Tip Fee	10.8	m3		$10	$108	Council SoR	
Excavation					**$1,335**		
Compacted to Loose factor	1						
Excavation	27.1	m3		$43	$1,164	Council SoR	(4) Allow 2276x2276mm area for excavation in light soil
Back Filling	10.0	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	17.1	m3		$10	$171	Council SoR	
Manhole Box					**$3,943**		
Floor							
Formworks	1.2	m2		$75	$92	Rawlinsons	
Concrete	0.51	m3		$128	$65	Rawlinsons	
Labour	1.02	mhrs		$54	$55	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	5.00	lift					1.2m lift
Formworks Hire	2.50	days		$85	$214	Recent Projects Review	0.5 day/lift
Formwork labour	10.00	mhrs		$54	$540	Local Labour Rate	2hrs per lift
Construction aids	12.55	hrs		$90	$1,130		Form lifting
Concrete	5.04	m3		$135	$681	Rawlinsons	
Labour	7.55	mhrs		$54	$408	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.36	m3		$132	$48	Rawlinsons	
Formwork	1.13	m2		$110	$125	Rawlinsons	
Reinforcement	22	kg		$2.23	$48	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.82	mhrs		$54	$152	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$5,278**		
Total Manhole (BF)				**(B)**	**$6,017**		
					$740		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$5,985**		
Total Manhole (BF)				**(D)**	**$6,824**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1050 - 4-4.99	$4,505	2004	23.5%	C	$5,564	8%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.19		

Manholes - 1200 / 5000

Detailed Assumptions

1. Pit Dimensions — Manhole dimensions are assumed according to standard drawing D-0010, D-0012, D-0013



2. Average Excavation Depth — Depth Group 4

	Min	Max	Avg
Group 1	1.5	2.49	2
Group 2	2.5	3.49	3
Group 3	3.5	4.49	4
Group 4	4.5	5.49	5

3. Manhole Dimension — Manhole dimensions according to standard drawing D-0010

MH Diameter	Floor Thickness			Wall Thickness
	IL	OL	Avg	
0	175	150	162.5	150
1050	175	150	162.5	150
1200	250	225	237.5	225
1350	250	225	237.5	225
1500	250	225	237.5	225
1800	250	225	237.5	250
2100	275	250	262.5	275

4. Demolitions Area — Allowed for different demolition areas:
40% Asphalt surfaces
60% Concrete surfaces

5. Demolition area and excavatic — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

6. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Manholes - 1500 / 2000

Dimension

Length	1500	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 1
Wall Thickness	225	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,280**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.0	m3		$23	$23	Rowlinsons	(5) Allow 2561x2561mm area for demolition 150mm thick
Asphalt Reinstatement	1.0	m3		$85	$84	Council SoR	
Excavation	5.3	m3		$43	$230	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.0	m3		$42	$41	Rawlinsons	
Concrete Reistatement	1.0	m3		$125	$123	Rawlinsons	
Labour	2.0	mhrs		$54	$106	Local Labour Rate	
Manhole Demolition							
Slab	1.8	m2		$37	$66	Rawlinsons	
Walls	2.1	m3		$305	$646	Rawlinsons	
Ground slab	1.8	m2		$37	$66	Rawlinsons	
Tip Fee	6.8	m3		$10	$68	Council SoR	
Excavation					**$720**		
Compacted to Loose factor	1						
Excavation	14.6	m3		$43	$628	Council SoR	(5) Allow 2561x2561mm area for excavation in light soil
Back Filling	5.3	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	9.2	m3		$10	$92	Council SoR	
Manhole Box					**$2,529**		
Floor							
Formworks	1.5	m2		$75	$109	Rawlinsons	
Concrete	0.71	m3		$128	$91	Rawlinsons	
Labour	1.42	mhrs		$54	$77	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$107	$107	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	5.66	hrs		$90	$509		Form lifting
Concrete	2.44	m3		$135	$330	Rawlinsons	
Labour	3.66	mhrs		$54	$198	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.53	m3		$132	$70	Rawlinsons	
Formwork	1.77	m2		$110	$195	Rawlinsons	
Reinforcement	32	kg		$2.23	$71	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.20	mhrs		$54	$173	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$3,249**		
Total Manhole (BF)				**(B)**	**$3,809**		
					$560		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$3,684**		
Total Manhole (BF)				**(D)**	**$4,320**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1500 - 0-1.99	$2,600	2004	23.5%	C	$3,211	15%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Manhole 1500 - 1.5	$2,150	2006	7.1%	A	$2,303	41%	Council Estimate	Excluding on-costs and Escalation

Manholes - 1500 / 3000

Dimension

Length	1500	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 2
Wall Thickness	225	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,725**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.0	m3		$23	$23	Rowlinsons	(5) Allow 2566x2566mm area for demolition 150mm thick
Asphalt Reinstatement	1.0	m3		$85	$84	Council SoR	
Excavation	7.4	m3		$43	$317	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.0	m3		$42	$41	Rawlinsons	
Concrete Reistatement	1.0	m3		$125	$123	Rawlinsons	
Labour	2.0	mhrs		$54	$107	Local Labour Rate	
Manhole Demolition							
Slab	1.8	m2		$37	$66	Rawlinsons	
Walls	3.2	m3		$305	$969	Rawlinsons	
Ground slab	1.8	m2		$37	$66	Rawlinsons	
Tip Fee	10.1	m3		$10	$101	Council SoR	
Excavation					**$1,052**		
Compacted to Loose factor	1						
Excavation	21.2	m3		$43	$913	Council SoR	(4) Allow 2566x2566mm area for excavation in light soil
Back Filling	7.4	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	13.9	m3		$10	$139	Council SoR	
Manhole Box					**$3,209**		
Floor							
Formworks	1.5	m2		$75	$109	Rawlinsons	
Concrete	0.71	m3		$128	$91	Rawlinsons	
Labour	1.42	mhrs		$54	$77	Local Labour Rate	Allow for 5mhrs/m2
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$107	$160	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	8.49	hrs		$90	$764		Form lifting
Concrete	3.66	m3		$135	$495	Rawlinsons	
Labour	5.49	mhrs		$54	$296	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.53	m3		$132	$70	Rawlinsons	
Formwork	1.77	m2		$110	$195	Rawlinsons	
Reinforcement	32	kg		$2.23	$71	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.20	mhrs		$54	$173	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$4,260**		
Total Manhole (BF)				**(B)**	**$4,934**		
					$673		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$4,831**		
Total Manhole (BF)				**(D)**	**$5,595**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1500 - 2-2.99	$3,172	2004	23.5%	C	$3,917	23%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.31		

Manholes - 1500 / 4000

Dimension

Length	1500	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	4000	mm		(2) Depth group 3
Wall Thickness	225	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$2,172**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.0	m3		$23	$23	Rowlinsons	(5) Allow 2571x2571mm area for demolition 150mm thick
Asphalt Reinstatement	1.0	m3		$85	$84	Council SoR	
Excavation	9.4	m3		$43	$406	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.0	m3		$42	$41	Rawlinsons	
Concrete Reistatement	1.0	m3		$125	$124	Rawlinsons	
Labour	2.0	mhrs		$54	$107	Local Labour Rate	
Manhole Demolition							
Slab	1.8	m2		$37	$66	Rawlinsons	
Walls	4.2	m3		$305	$1,292	Rawlinsons	
Ground slab	1.8	m2		$37	$66	Rawlinsons	
Tip Fee	13.5	m3		$10	$135	Council SoR	
Excavation					**$1,386**		
Compacted to Loose factor	1						
Excavation	27.9	m3		$43	$1,201	Council SoR	(4) Allow 2571x2571mm area for excavation in light soil
Back Filling	9.4	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	18.5	m3		$10	$185	Council SoR	
Manhole Box					**$3,888**		
Floor							
Formworks	1.5	m2		$75	$109	Rawlinsons	
Concrete	0.71	m3		$128	$91	Rawlinsons	
Labour	1.42	mhrs		$54	$77	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	4.00	lift					1.2m lift
Formworks Hire	2.00	days		$107	$214	Recent Projects Review	0.5 day/lift
Formwork labour	8.00	mhrs		$54	$432	Local Labour Rate	2hrs per lift
Construction aids	11.32	hrs		$90	$1,018		Form lifting
Concrete	4.88	m3		$135	$659	Rawlinsons	
Labour	7.32	mhrs		$54	$395	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.53	m3		$132	$70	Rawlinsons	
Formwork	1.77	m2		$110	$195	Rawlinsons	
Reinforcement	32	kg		$2.23	$71	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.20	mhrs		$54	$173	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$5,274**		
Total Manhole (BF)				**(B)**	**$6,060**		
					$786		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$5,981**		
Total Manhole (BF)				**(D)**	**$6,872**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1500 - 3-3.99	$3,840	2004	23.5%	C	$4,742	26%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.24		

Manholes - 1500 / 5000

Dimension

Length	1500	mm	(1) Pit dimension according to stardard dwawing
Width	1500	mm	(1) Pit dimension according to stardard dwawing
Depth (PIL)	5000	mm	(2) Depth group 4
Wall Thickness	225	mm	(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm	(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01	89°	

Unit Costs

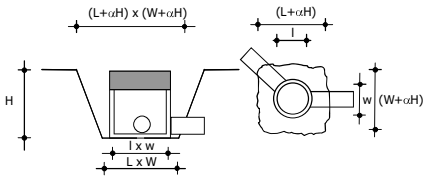
Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$2,621**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.0	m3		$23	$23	Rowlinsons	(5) Allow 2576x2576mm area for demolition 150mm thick
Asphalt Reinstatement	1.0	m3		$85	$85	Council SoR	
Excavation	11.6	m3		$43	$497	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.0	m3		$42	$41	Rawlinsons	
Concrete Reistatement	1.0	m3		$125	$124	Rawlinsons	
Labour	2.0	mhrs		$54	$108	Local Labour Rate	
Manhole Demolition							
Slab	1.8	m2		$37	$66	Rawlinsons	
Walls	5.3	m3		$305	$1,615	Rawlinsons	
Ground slab	1.8	m2		$37	$66	Rawlinsons	
Tip Fee	16.9	m3		$10	$169	Council SoR	
Excavation					**$1,722**		
Compacted to Loose factor	1						
Excavation	34.7	m3		$43	$1,491	Council SoR	(4) Allow 2576x2576mm area for excavation in light soil
Back Filling	11.6	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	23.1	m3		$10	$231	Council SoR	
Manhole Box					**$4,568**		
Floor							
Formworks	1.5	m2		$75	$109	Rawlinsons	
Concrete	0.71	m3		$128	$91	Rawlinsons	
Labour	1.42	mhrs		$54	$77	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	5.00	lift					1.2m lift
Formworks Hire	2.50	days		$107	$267	Recent Projects Review	0.5 day/lift
Formwork labour	10.00	mhrs		$54	$540	Local Labour Rate	2hrs per lift
Construction aids	14.14	hrs		$90	$1,273		Form lifting
Concrete	6.10	m3		$135	$824	Rawlinsons	
Labour	9.14	mhrs		$54	$494	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.53	m3		$132	$70	Rawlinsons	
Formwork	1.77	m2		$110	$195	Rawlinsons	
Reinforcement	32	kg		$2.23	$71	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.20	mhrs		$54	$173	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$6,290**		
Total Manhole (BF)				**(B)**	**$7,188**		
					$898		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$7,133**		
Total Manhole (BF)				**(D)**	**$8,152**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 1500 - 4-4.99	$4,721	2004	23.5%	C	$5,830	22%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.19		

Manholes - 1500 / 5000

Detailed Assumptions

1. Pit Dimensions — Manhole dimensions are assumed according to standard drawing D-0010, D-0012, D-0013



2. Average Excavation Depth — Depth Group 4

	Min	Max	Avg
Group 1	1.5	2.49	2
Group 2	2.5	3.49	3
Group 3	3.5	4.49	4
Group 4	4.5	5.49	5

3. Manhole Dimension — Manhole dimensions according to standard drawing D-0010

MH Diameter	Floor Thickness			Wall Thickness
	IL	OL	Avg	
0	175	150	162.5	150
1050	175	150	162.5	150
1200	250	225	237.5	225
1350	250	225	237.5	225
1500	250	225	237.5	225
1800	250	225	237.5	250
2100	275	250	262.5	275

4. Demolitions Area — Allowed for different demolition areas:
40% Asphalt surfaces
60% Concrete surfaces

5. Demolition area and excavatic — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

6. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Manholes - 1800 / 2000

Dimension

Length	1800	mm		(1) Pit dimension according to stardard dwawing
Width	1800	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 1
Wall Thickness	250	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,696**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.3	m3		$23	$29	Rowlinsons	(5) Allow 2911x2911mm area for demolition 150mm thick
Asphalt Reinstatement	1.3	m3		$85	$108	Council SoR	
Excavation	6.6	m3		$43	$282	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.3	m3		$42	$53	Rawlinsons	
Concrete Reistatement	1.3	m3		$125	$159	Rawlinsons	
Labour	2.5	mhrs		$54	$137	Local Labour Rate	
Manhole Demolition							
Slab	2.5	m2		$37	$95	Rawlinsons	
Walls	2.8	m3		$305	$862	Rawlinsons	
Ground slab	2.5	m2		$37	$95	Rawlinsons	
Tip Fee	9.7	m3		$10	$97	Council SoR	
Excavation					**$945**		
Compacted to Loose factor	1						
Excavation	19.1	m3		$43	$820	Council SoR	(5) Allow 2911x2911mm area for excavation in light soil
Back Filling	6.6	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	12.5	m3		$10	$125	Council SoR	
Manhole Box					**$3,108**		
Floor							
Formworks	1.7	m2		$75	$129	Rawlinsons	
Concrete	0.99	m3		$128	$126	Rawlinsons	
Labour	1.97	mhrs		$54	$107	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$128	$128	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	6.83	hrs		$90	$615		Form lifting
Concrete	3.22	m3		$135	$435	Rawlinsons	
Labour	4.83	mhrs		$54	$261	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.82	m3		$132	$108	Rawlinsons	
Formwork	2.54	m2		$110	$281	Rawlinsons	
Reinforcement	49	kg		$2.23	$110	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.86	mhrs		$54	$209	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$4,053**		
Total Manhole (BF)				**(B)**	**$4,804**		
					$751		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$4,596**		
Total Manhole (BF)				**(D)**	**$5,448**		

Benchmark Costs	Value	Year	Escalation	Comp.	Diff %

Manholes - 1800 / 3000

Dimension

Length	1800	mm		(1) Pit dimension according to stardard dwawing
Width	1800	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 2
Wall Thickness	250	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$2,276**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.3	m3		$23	$29	Rowlinsons	(5) Allow 2916x2916mm area for demolition 150mm thick
Asphalt Reinstatement	1.3	m3		$85	$108	Council SoR	
Excavation	8.9	m3		$43	$382	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.3	m3		$42	$53	Rawlinsons	
Concrete Reistatement	1.3	m3		$125	$159	Rawlinsons	
Labour	2.6	mhrs		$54	$138	Local Labour Rate	
Manhole Demolition							
Slab	2.5	m2		$37	$95	Rawlinsons	
Walls	4.2	m3		$305	$1,292	Rawlinsons	
Ground slab	2.5	m2		$37	$95	Rawlinsons	
Tip Fee	14.6	m3		$10	$146	Council SoR	
Excavation					**$1,376**		
Compacted to Loose factor	1						
Excavation	27.6	m3		$43	$1,189	Council SoR	(4) Allow 2916x2916mm area for excavation in light soil
Back Filling	8.9	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	18.8	m3		$10	$188	Council SoR	
Manhole Box					**$3,936**		
Floor							
Formworks	1.7	m2		$75	$129	Rawlinsons	
Concrete	0.99	m3		$128	$126	Rawlinsons	
Labour	1.97	mhrs		$54	$107	Local Labour Rate	Allow for 5mhrs/m2
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$128	$192	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	10.25	hrs		$90	$922		Form lifting
Concrete	4.83	m3		$135	$653	Rawlinsons	
Labour	7.25	mhrs		$54	$391	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.82	m3		$132	$108	Rawlinsons	
Formwork	2.54	m2		$110	$281	Rawlinsons	
Reinforcement	49	kg		$2.23	$110	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.86	mhrs		$54	$209	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$5,312**		
Total Manhole (BF)				**(B)**	**$6,212**		
					$900		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$6,024**		
Total Manhole (BF)				**(D)**	**$7,044**		

Benchmark Costs	Value	Year	Escalation	Comp.	Diff %

Manholes - 1800 / 4000

Dimension

Length	1800	mm	(1) Pit dimension according to stardard dwawing
Width	1800	mm	(1) Pit dimension according to stardard dwawing
Depth (PIL)	4000	mm	(2) Depth group 3
Wall Thickness	250	mm	(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm	(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01	89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$2,859**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.3	m3		$23	$29	Rowlinsons	(5) Allow 2921x2921mm area for demolition 150mm thick
Asphalt Reinstatement	1.3	m3		$85	$109	Council SoR	
Excavation	11.3	m3		$43	$485	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.3	m3		$42	$53	Rawlinsons	
Concrete Reistatement	1.3	m3		$125	$160	Rawlinsons	
Labour	2.6	mhrs		$54	$138	Local Labour Rate	
Manhole Demolition							
Slab	2.5	m2		$37	$95	Rawlinsons	
Walls	5.7	m3		$305	$1,723	Rawlinsons	
Ground slab	2.5	m2		$37	$95	Rawlinsons	
Tip Fee	19.4	m3		$10	$194	Council SoR	
Excavation					**$1,810**		
Compacted to Loose factor	1						
Excavation	36.3	m3		$43	$1,560	Council SoR	(4) Allow 2921x2921mm area for excavation in light soil
Back Filling	11.3	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	25.0	m3		$10	$250	Council SoR	
Manhole Box					**$4,763**		
Floor							
Formworks	1.7	m2		$75	$129	Rawlinsons	
Concrete	0.99	m3		$128	$126	Rawlinsons	
Labour	1.97	mhrs		$54	$107	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	4.00	lift					1.2m lift
Formworks Hire	2.00	days		$128	$256	Recent Projects Review	0.5 day/lift
Formwork labour	8.00	mhrs		$54	$432	Local Labour Rate	2hrs per lift
Construction aids	13.66	hrs		$90	$1,229		Form lifting
Concrete	6.44	m3		$135	$871	Rawlinsons	
Labour	9.66	mhrs		$54	$522	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.82	m3		$132	$108	Rawlinsons	
Formwork	2.54	m2		$110	$281	Rawlinsons	
Reinforcement	49	kg		$2.23	$110	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.86	mhrs		$54	$209	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$6,573**		
Total Manhole (BF)				**(B)**	**$7,622**		
					$1,049		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$7,454**		
Total Manhole (BF)				**(D)**	**$8,643**		

Benchmark Costs	Value	Year	Escalation Comp.	Diff %

Manholes - 1800 / 5000

Dimension

Length	1800	mm	(1) Pit dimension according to stardard dwawing
Width	1800	mm	(1) Pit dimension according to stardard dwawing
Depth (PIL)	5000	mm	(2) Depth group 4
Wall Thickness	250	mm	(3) Wall thickness based on std drawing D-0010
Floor Thickness	237.5	mm	(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01	89˚	

Unit Costs

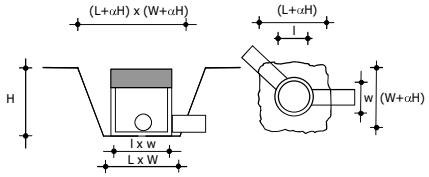
Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$3,444**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.3	m3		$23	$29	Rowlinsons	(5) Allow 2926x2926mm area for demolition 150mm thick
Asphalt Reinstatement	1.3	m3		$85	$109	Council SoR	
Excavation	13.7	m3		$43	$589	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.3	m3		$42	$53	Rawlinsons	
Concrete Reistatement	1.3	m3		$125	$160	Rawlinsons	
Labour	2.6	mhrs		$54	$139	Local Labour Rate	
Manhole Demolition							
Slab	2.5	m2		$37	$95	Rawlinsons	
Walls	7.1	m3		$305	$2,154	Rawlinsons	
Ground slab	2.5	m2		$37	$95	Rawlinsons	
Tip Fee	24.3	m3		$10	$243	Council SoR	
Excavation					**$2,246**		
Compacted to Loose factor	1						
Excavation	45.0	m3		$43	$1,933	Council SoR	(4) Allow 2926x2926mm area for excavation in light soil
Back Filling	13.7	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	31.3	m3		$10	$313	Council SoR	
Manhole Box					**$5,591**		
Floor							
Formworks	1.7	m2		$75	$129	Rawlinsons	
Concrete	0.99	m3		$128	$126	Rawlinsons	
Labour	1.97	mhrs		$54	$107	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	5.00	lift					1.2m lift
Formworks Hire	2.50	days		$128	$320	Recent Projects Review	0.5 day/lift
Formwork labour	10.00	mhrs		$54	$540	Local Labour Rate	2hrs per lift
Construction aids	17.08	hrs		$90	$1,537		Form lifting
Concrete	8.05	m3		$135	$1,088	Rawlinsons	
Labour	12.08	mhrs		$54	$652	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	0.82	m3		$132	$108	Rawlinsons	
Formwork	2.54	m2		$110	$281	Rawlinsons	
Reinforcement	49	kg		$2.23	$110	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.86	mhrs		$54	$209	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$7,836**		
Total Manhole (BF)				**(B)**	**$9,035**		
					$1,198		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$8,886**		
Total Manhole (BF)				**(D)**	**$10,245**		

Benchmark Costs	Value	Year	Escalation Comp.	Diff %

Manholes - 1800 / 5000

Detailed Assumptions

1. Pit Dimensions — Manhole dimensions are assumed according to standard drawing D-0010, D-0012, D-0013



2. Average Excavation Depth — Depth Group 4

	Min	Max	Avg
Group 1	1.5	2.49	2
Group 2	2.5	3.49	3
Group 3	3.5	4.49	4
Group 4	4.5	5.49	5

3. Manhole Dimension — Manhole dimensions according to standard drawing D-0010

MH Diameter	Floor Thickness			Wall Thickness
	IL	OL	Avg	
0	175	150	162.5	150
1050	175	150	162.5	150
1200	250	225	237.5	225
1350	250	225	237.5	225
1500	250	225	237.5	225
1800	250	225	237.5	250
2100	275	250	262.5	275

4. Demolitions Area — Allowed for different demolition areas:
40% Asphalt surfaces
60% Concrete surfaces

5. Demolition area and excavatic — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

6. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Manholes - 2100 / 2000

Dimension

Length	2100	mm		(1) Pit dimension according to stardard dwawing
Width	2100	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 1
Wall Thickness	275	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	262.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$2,171**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.6	m3		$23	$37	Rowlinsons	(5) Allow 3261x3261mm area for demolition 150mm thick
Asphalt Reinstatement	1.6	m3		$85	$136	Council SoR	
Excavation	8.0	m3		$43	$342	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.6	m3		$42	$66	Rawlinsons	
Concrete Reistatement	1.6	m3		$125	$199	Rawlinsons	
Labour	3.2	mhrs		$54	$172	Local Labour Rate	
Manhole Demolition							
Slab	3.5	m2		$37	$130	Rawlinsons	
Walls	3.6	m3		$305	$1,106	Rawlinsons	
Ground slab	3.5	m2		$37	$130	Rawlinsons	
Tip Fee	13.2	m3		$10	$132	Council SoR	
Excavation					**$1,203**		
Compacted to Loose factor	1						
Excavation	24.2	m3		$43	$1,041	Council SoR	(5) Allow 3261x3261mm area for excavation in light soil
Back Filling	8.0	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	16.2	m3		$10	$162	Council SoR	
Manhole Box					**$3,837**		
Floor							
Formworks	2.2	m2		$75	$164	Rawlinsons	
Concrete	1.45	m3		$128	$185	Rawlinsons	
Labour	2.90	mhrs		$54	$156	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$150	$150	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	8.16	hrs		$90	$734		Form lifting
Concrete	4.10	m3		$135	$555	Rawlinsons	
Labour	6.16	mhrs		$54	$332	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	1.21	m3		$132	$160	Rawlinsons	
Formwork	3.46	m2		$110	$382	Rawlinsons	
Reinforcement	73	kg		$2.23	$162	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	4.75	mhrs		$54	$257	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$5,040**		
Total Manhole (BF)				**(B)**	**$6,008**		
					$968		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$5,716**		
Total Manhole (BF)				**(D)**	**$6,813**		

Benchmark Costs	Value	Year	Escalation	Comp.	Diff %

Manholes - 2100 / 3000

Dimension

Length	2100	mm	(1) Pit dimension according to stardard dwawing
Width	2100	mm	(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm	(2) Depth group 2
Wall Thickness	275	mm	(3) Wall thickness based on std drawing D-0010
Floor Thickness	262.5	mm	(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01	89°	

Unit Costs

Task			UC	Total	Unit Rate Source	Assumptions
Demolitions				**$2,904**		
Asphalt Surface				*40%*		(4)
Asphalt Demolition	1.6	m3	$23	$37	Rowlinsons	(5) Allow 3266x3266mm area for demolition 150mm thick
Asphalt Reinstatement	1.6	m3	$85	$136	Council SoR	
Excavation	10.6	m3	$43	$455	Council SoR	
Concrete Surface				*60%*		(4)
Concrete Demolition	1.6	m3	$42	$67	Rawlinsons	
Concrete Reistatement	1.6	m3	$125	$200	Rawlinsons	
Labour	3.2	mhrs	$54	$173	Local Labour Rate	
Manhole Demolition						
Slab	3.5	m2	$37	$130	Rawlinsons	
Walls	5.4	m3	$305	$1,659	Rawlinsons	
Ground slab	3.5	m2	$37	$130	Rawlinsons	
Tip Fee	19.8	m3	$10	$198	Council SoR	
Excavation				**$1,746**		
Compacted to Loose factor	1					
Excavation	34.9	m3	$43	$1,502	Council SoR	(4) Allow 3266x3266mm area for excavation in light soil
Back Filling	10.6	m3	$0	$0	Council SoR	Included in excavation
Tip Fee	24.4	m3	$10	$244	Council SoR	
Manhole Box				**$4,831**		
Floor						
Formworks	2.2	m2	$75	$164	Rawlinsons	
Concrete	1.45	m3	$128	$185	Rawlinsons	
Labour	2.90	mhrs	$54	$156	Local Labour Rate	Allow for 5mhrs/m2
Walls						
Lifts	3.00	lift				1.2m lift
Formworks Hire	1.50	days	$150	$224	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs	$54	$324	Local Labour Rate	2hrs per lift
Construction aids	12.23	hrs	$90	$1,101		Form lifting
Concrete	6.16	m3	$135	$832	Rawlinsons	
Labour	9.23	mhrs	$54	$499	Local Labour Rate	Allow for 1.5mhrs/m3
Top						
Concrete	1.21	m3	$132	$160	Rawlinsons	
Formwork	3.46	m2	$110	$382	Rawlinsons	
Reinforcement	73	kg	$2.23	$162	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	4.75	mhrs	$54	$257	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm $385	$385	Recent Projects Review	
Total Manhole (GF)			**(A)**	**$6,577**		
Total Manhole (BF)			**(B)**	**$7,734**		
				$1,157		
On Costs			26%		Council Projects review	(5) Refer to % breakdown
Discount			10%			
Total Manhole (GF)			**(C)**	**$7,458**		
Total Manhole (BF)			**(D)**	**$8,771**		

Benchmark Costs	Value	Year	Escalation	Comp.	Diff %

Manholes - 2100 / 4000

Dimension

Length	2100	mm	(1) Pit dimension according to stardard dwawing
Width	2100	mm	(1) Pit dimension according to stardard dwawing
Depth (PIL)	4000	mm	(2) Depth group 3
Wall Thickness	275	mm	(3) Wall thickness based on std drawing D-0010
Floor Thickness	262.5	mm	(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01	89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$3,639**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.6	m3		$23	$37	Rowlinsons	(5) Allow 3271x3271mm area for demolition 150mm thick
Asphalt Reinstatement	1.6	m3		$85	$136	Council SoR	
Excavation	13.3	m3		$43	$570	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.6	m3		$42	$67	Rawlinsons	
Concrete Reistatement	1.6	m3		$125	$200	Rawlinsons	
Labour	3.2	mhrs		$54	$173	Local Labour Rate	
Manhole Demolition							
Slab	3.5	m2		$37	$130	Rawlinsons	
Walls	7.3	m3		$305	$2,211	Rawlinsons	
Ground slab	3.5	m2		$37	$130	Rawlinsons	
Tip Fee	26.5	m3		$10	$265	Council SoR	
Excavation					**$2,292**		
Compacted to Loose factor	1						
Excavation	45.8	m3		$43	$1,967	Council SoR	(4) Allow 3271x3271mm area for excavation in light soil
Back Filling	13.3	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	32.5	m3		$10	$325	Council SoR	
Manhole Box					**$5,824**		
Floor							
Formworks	2.2	m2		$75	$164	Rawlinsons	
Concrete	1.45	m3		$128	$185	Rawlinsons	
Labour	2.90	mhrs		$54	$156	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	4.00	lift					1.2m lift
Formworks Hire	2.00	days		$150	$299	Recent Projects Review	0.5 day/lift
Formwork labour	8.00	mhrs		$54	$432	Local Labour Rate	2hrs per lift
Construction aids	16.31	hrs		$90	$1,468		Form lifting
Concrete	8.21	m3		$135	$1,110	Rawlinsons	
Labour	12.31	mhrs		$54	$665	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	1.21	m3		$132	$160	Rawlinsons	
Formwork	3.46	m2		$110	$382	Rawlinsons	
Reinforcement	73	kg		$2.23	$162	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	4.75	mhrs		$54	$257	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$8,116**		
Total Manhole (BF)				**(B)**	**$9,463**		
					$1,347		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$9,204**		
Total Manhole (BF)				**(D)**	**$10,731**		

Benchmark Costs	Value	Year	Escalation	Comp.	Diff %

Manholes - 2100 / 5000

Dimension

Length	2100	mm	(1) Pit dimension according to stardard dwawing
Width	2100	mm	(1) Pit dimension according to stardard dwawing
Depth (PIL)	5000	mm	(2) Depth group 4
Wall Thickness	275	mm	(3) Wall thickness based on std drawing D-0010
Floor Thickness	262.5	mm	(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01	89˚	

Unit Costs

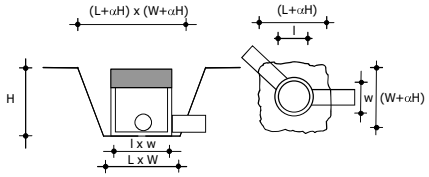
Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$4,377**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.6	m3		$23	$37	Rowlinsons	(5) Allow 3276x3276mm area for demolition 150mm thick
Asphalt Reinstatement	1.6	m3		$85	$137	Council SoR	
Excavation	16.0	m3		$43	$689	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.6	m3		$42	$67	Rawlinsons	
Concrete Reistatement	1.6	m3		$125	$201	Rawlinsons	
Labour	3.2	mhrs		$54	$174	Local Labour Rate	
Manhole Demolition							
Slab	3.5	m2		$37	$130	Rawlinsons	
Walls	9.1	m3		$305	$2,764	Rawlinsons	
Ground slab	3.5	m2		$37	$130	Rawlinsons	
Tip Fee	33.1	m3		$10	$331	Council SoR	
Excavation					**$2,841**		
Compacted to Loose factor	1						
Excavation	56.6	m3		$43	$2,435	Council SoR	(4) Allow 3276x3276mm area for excavation in light soil
Back Filling	16.0	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	40.6	m3		$10	$406	Council SoR	
Manhole Box					**$6,817**		
Floor							
Formworks	2.2	m2		$75	$164	Rawlinsons	
Concrete	1.45	m3		$128	$185	Rawlinsons	
Labour	2.90	mhrs		$54	$156	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	5.00	lift					1.2m lift
Formworks Hire	2.50	days		$150	$374	Recent Projects Review	0.5 day/lift
Formwork labour	10.00	mhrs		$54	$540	Local Labour Rate	2hrs per lift
Construction aids	20.39	hrs		$90	$1,835		Form lifting
Concrete	10.26	m3		$135	$1,387	Rawlinsons	
Labour	15.39	mhrs		$54	$831	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	1.21	m3		$132	$160	Rawlinsons	
Formwork	3.46	m2		$110	$382	Rawlinsons	
Reinforcement	73	kg		$2.23	$162	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	4.75	mhrs		$54	$257	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$9,658**		
Total Manhole (BF)				**(B)**	**$11,195**		
					$1,536		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$10,953**		
Total Manhole (BF)				**(D)**	**$12,695**		

Benchmark Costs	Value	Year	Escalation Comp.	Diff %

Manholes - 2100 / 5000

Detailed Assumptions

1. Pit Dimensions — Manhole dimensions are assumed according to standard drawing D-0010, D-0012, D-0013



2. Average Excavation Depth — Depth Group 4

	Min	Max	Avg
Group 1	1.5	2.49	2
Group 2	2.5	3.49	3
Group 3	3.5	4.49	4
Group 4	4.5	5.49	5

3. Manhole Dimension — Manhole dimensions according to standard drawing D-0010

MH Diameter	Floor Thickness			Wall Thickness
	IL	OL	Avg	
0	175	150	162.5	150
1050	175	150	162.5	150
1200	250	225	237.5	225
1350	250	225	237.5	225
1500	250	225	237.5	225
1800	250	225	237.5	250
2100	275	250	262.5	275

4. Demolitions Area — Allowed for different demolition areas:
40% Asphalt surfaces
60% Concrete surfaces

5. Demolition area and excavatic — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

6. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Manholes - 1050 / 2000

Dimension

Length	2400	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 1
Wall Thickness	275	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	262.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,960**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.4	m3		$23	$33	Rowlinsons	(5) Allow 3561x2661mm area for demolition 150mm thick
Asphalt Reinstatement	1.4	m3		$85	$121	Council SoR	
Excavation	7.4	m3		$43	$318	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.4	m3		$42	$59	Rawlinsons	
Concrete Reistatement	1.4	m3		$125	$177	Rawlinsons	
Labour	2.8	mhrs		$54	$154	Local Labour Rate	
Manhole Demolition							
Slab	2.8	m2		$37	$106	Rawlinsons	
Walls	3.4	m3		$305	$1,027	Rawlinsons	
Ground slab	2.8	m2		$37	$106	Rawlinsons	
Tip Fee	10.8	m3		$10	$108	Council SoR	
Excavation					**$1,069**		
Compacted to Loose factor	1						
Excavation	21.6	m3		$43	$927	Council SoR	(5) Allow 3561x2661mm area for excavation in light soil
Back Filling	7.4	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	14.2	m3		$10	$142	Council SoR	
Manhole Box					**$3,736**		
Floor							
Formworks	1.3	m2		$75	$99	Rawlinsons	
Concrete	1.35	m3		$128	$173	Rawlinsons	
Labour	2.70	mhrs		$54	$146	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$212	$212	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	7.77	hrs		$90	$699		Form lifting
Concrete	3.84	m3		$135	$520	Rawlinsons	
Labour	5.77	mhrs		$54	$311	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	1.35	m3		$132	$178	Rawlinsons	
Formwork	3.12	m2		$110	$344	Rawlinsons	
Reinforcement	81	kg		$2.23	$180	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	5.07	mhrs		$54	$274	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$4,805**		
Total Manhole (BF)				**(B)**	**$5,696**		
					$891		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$5,449**		
Total Manhole (BF)				**(D)**	**$6,459**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 2400x1500 - 0-1.99	$6,758	2004	23.5%	C	$8,346	-35%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions

Manholes - 1050 / 3000

Dimension

Length	2400	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 2
Wall Thickness	275	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	262.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$2,635**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.4	m3		$23	$33	Rowlinsons	(5) Allow 3566x2666mm area for demolition 150mm thick
Asphalt Reinstatement	1.4	m3		$85	$121	Council SoR	
Excavation	9.9	m3		$43	$425	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.4	m3		$42	$59	Rawlinsons	
Concrete Reistatement	1.4	m3		$125	$178	Rawlinsons	
Labour	2.9	mhrs		$54	$154	Local Labour Rate	
Manhole Demolition							
Slab	2.8	m2		$37	$106	Rawlinsons	
Walls	5.1	m3		$305	$1,540	Rawlinsons	
Ground slab	2.8	m2		$37	$106	Rawlinsons	
Tip Fee	16.2	m3		$10	$162	Council SoR	
Excavation					**$1,552**		
Compacted to Loose factor	1						
Excavation	31.1	m3		$43	$1,339	Council SoR	(4) Allow 3566x2666mm area for excavation in light soil
Back Filling	9.9	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	21.3	m3		$10	$213	Council SoR	
Manhole Box					**$4,715**		
Floor							
Formworks	1.3	m2		$75	$99	Rawlinsons	
Concrete	1.35	m3		$128	$173	Rawlinsons	
Labour	2.70	mhrs		$54	$146	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$212	$317	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	11.65	hrs		$90	$1,049		Form lifting
Concrete	5.77	m3		$135	$780	Rawlinsons	
Labour	8.65	mhrs		$54	$467	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	1.35	m3		$132	$178	Rawlinsons	
Formwork	3.12	m2		$110	$344	Rawlinsons	
Reinforcement	81	kg		$2.23	$180	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	5.07	mhrs		$54	$274	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$6,267**		
Total Manhole (BF)				**(B)**	**$7,350**		
					$1,083		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$7,107**		
Total Manhole (BF)				**(D)**	**$8,335**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 2400x1500 - 0-1.99	$6,758	2004	23.5%	C	$8,346	-15%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.30		

Manholes - 1050 / 4000

Dimension

Length	2400	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	4000	mm		(2) Depth group 3
Wall Thickness	275	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	262.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$3,313**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.4	m3		$23	$33	Rowlinsons	(5) Allow 3571x2671mm area for demolition 150mm thick
Asphalt Reinstatement	1.4	m3		$85	$122	Council SoR	
Excavation	12.4	m3		$43	$535	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.4	m3		$42	$60	Rawlinsons	
Concrete Reistatement	1.4	m3		$125	$179	Rawlinsons	
Labour	2.9	mhrs		$54	$155	Local Labour Rate	
Manhole Demolition							
Slab	2.8	m2		$37	$106	Rawlinsons	
Walls	6.7	m3		$305	$2,053	Rawlinsons	
Ground slab	2.8	m2		$37	$106	Rawlinsons	
Tip Fee	21.6	m3		$10	$216	Council SoR	
Excavation					**$2,037**		
Compacted to Loose factor	1						
Excavation	40.8	m3		$43	$1,754	Council SoR	(4) Allow 3571x2671mm area for excavation in light soil
Back Filling	12.4	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	28.4	m3		$10	$284	Council SoR	
Manhole Box					**$5,694**		
Floor							
Formworks	1.3	m2		$75	$99	Rawlinsons	
Concrete	1.35	m3		$128	$173	Rawlinsons	
Labour	2.70	mhrs		$54	$146	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	4.00	lift					1.2m lift
Formworks Hire	2.00	days		$212	$423	Recent Projects Review	0.5 day/lift
Formwork labour	8.00	mhrs		$54	$432	Local Labour Rate	2hrs per lift
Construction aids	15.53	hrs		$90	$1,398		Form lifting
Concrete	7.69	m3		$135	$1,040	Rawlinsons	
Labour	11.53	mhrs		$54	$623	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	1.35	m3		$132	$178	Rawlinsons	
Formwork	3.12	m2		$110	$344	Rawlinsons	
Reinforcement	81	kg		$2.23	$180	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	5.07	mhrs		$54	$274	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$7,731**		
Total Manhole (BF)				**(B)**	**$9,007**		
					$1,276		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$8,767**		
Total Manhole (BF)				**(D)**	**$10,214**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 2400x1500 - 0-1.99	$6,758	2004	23.5%	C	$8,346	5%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.23		

Manholes - 1050 / 5000

Dimension

Length	2400	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	5000	mm		(2) Depth group 4
Wall Thickness	275	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	262.5	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

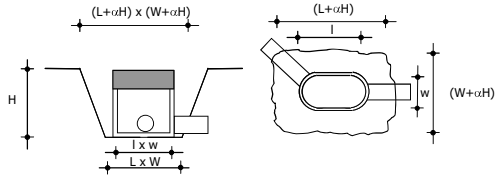
Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$3,994**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.4	m3		$23	$33	Rowlinsons	(5) Allow 3576x2676mm area for demolition 150mm thick
Asphalt Reinstatement	1.4	m3		$85	$122	Council SoR	
Excavation	15.1	m3		$43	$647	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.4	m3		$42	$60	Rawlinsons	
Concrete Reistatement	1.4	m3		$125	$179	Rawlinsons	
Labour	2.9	mhrs		$54	$155	Local Labour Rate	
Manhole Demolition							
Slab	2.8	m2		$37	$106	Rawlinsons	
Walls	8.4	m3		$305	$2,567	Rawlinsons	
Ground slab	2.8	m2		$37	$106	Rawlinsons	
Tip Fee	27.0	m3		$10	$270	Council SoR	
Excavation					**$2,525**		
Compacted to Loose factor	1						
Excavation	50.5	m3		$43	$2,171	Council SoR	(4) Allow 3576x2676mm area for excavation in light soil
Back Filling	15.1	m3		$0	$0	Council SoR	Included in excavation
Tip Fee	35.4	m3		$10	$354	Council SoR	
Manhole Box					**$6,673**		
Floor							
Formworks	1.3	m2		$75	$99	Rawlinsons	
Concrete	1.35	m3		$128	$173	Rawlinsons	
Labour	2.70	mhrs		$54	$146	Local Labour Rate	Allow for 2mhrs/m3
Walls							
Lifts	5.00	lift					1.2m lift
Formworks Hire	2.50	days		$212	$529	Recent Projects Review	0.5 day/lift
Formwork labour	10.00	mhrs		$54	$540	Local Labour Rate	2hrs per lift
Construction aids	19.42	hrs		$90	$1,748		Form lifting
Concrete	9.61	m3		$135	$1,299	Rawlinsons	
Labour	14.42	mhrs		$54	$779	Local Labour Rate	Allow for 1.5mhrs/m3
Top							
Concrete	1.35	m3		$132	$178	Rawlinsons	
Formwork	3.12	m2		$110	$344	Rawlinsons	
Reinforcement	81	kg		$2.23	$180	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	5.07	mhrs		$54	$274	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$9,198**		
Total Manhole (BF)				**(B)**	**$10,667**		
					$1,469		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$10,431**		
Total Manhole (BF)				**(D)**	**$12,096**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 2400x1500 - 0-1.99	$6,758	2004	23.5%	C	$8,346	25%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions
Ratio per meter depth						1.19		

Manholes - 1050 / 5000

Detailed Assumptions

1. Pit Dimensions — Manhole dimensions are assumed according to standard drawing D-0010, D-0012, D-0013



2. Average Excavation Depth — Depth Group 4

	Min	Max	Avg
Group 1	1.5	2.49	2
Group 2	2.5	3.49	3
Group 3	3.5	4.49	4
Group 4	4.5	5.49	5

3. Manhole Dimension — Manhole dimensions according to standard drawing D-0010

MH Diameter	Floor Thickness			Wall Thickness
	IL	OL	Avg	
0	175	150	162.5	150
1050	175	150	162.5	150
1200	250	225	237.5	225
1350	250	225	237.5	225
1500	250	225	237.5	225
1800	250	225	237.5	250
2100	275	250	262.5	275

4. Demolitions Area — Allowed for different demolition areas:
40% Asphalt surfaces
60% Concrete surfaces

5. Demolition area and excavatic — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

6. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

SP - 2400x2200

Dimension				
Length	2400	mm		(1) Pit dimension according to stardard dwawing
Width	2200	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 1
Wall Thickness	200	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				**UC**	**Total**	**Unit Rate Source**	**Assumptions**
Demolitions					**$3,144**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.6	m3		$23	$38	Rowlinsons	(5) Allow 3416x3216mm area for demolition 150mm thick
Asphalt Reinstatement	1.6	m3		$85	$140	Council SoR	
Excavation	10.0	m3		$43	$428	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.6	m3		$42	$69	Rawlinsons	
Concrete Reistatement	1.6	m3		$125	$206	Rawlinsons	
Labour	3.3	hrs		$54	$178	Local Labour Rate	
GPT Demolition							
Slab	2.2	m2		$37	$81	Rawlinsons	
Walls	6.5	m3		$305	$1,975	Rawlinsons	
Ground slab	2.2	m2		$37	$81	Rawlinsons	
Tip Fee	23.8	m3		$10	$238	Council SoR	
Excavation					**$2,211**		
Compacted to Loose factor	1						
Excavation	35.2	m3		$43	$1,512	Council SoR	(5) Allow 3416x3216mm area for excavation in light soil
Back Filling	10.0	m3		$0	$0	Rawlinsons	Included in excavation
Draining Aggregate Infill	6.6	m3		$68	$448	Rawlinsons	
Tip Fee	25.2	m3		$10	$252	Council SoR	
GPT					**$7,052**		
Floor							
Formworks	2.2	m2		$75	$162	Rawlinsons	
Concrete	1.46	m3		$128	$186	Rawlinsons	
Reinforcement	129.60	kg		$2.3	$303	Rawlinsons	
Labour	7.28	mhrs		$54	$393	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	1.06	m3		$125	$132	Rawlinsons	
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$180	$270	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	12.72	hrs		$90	$1,145	Recent Projects Review	Form lifting
Concrete	6.48	m3		$135	$876	Rawlinsons	
Wepp Holes	34.00	No		$15	$495	Rawlinsons	
Reinforcement	388.80	kg		$2.4	$930	Rawlinsons	
Labour	9.72	mhrs		$54	$525	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	1.46	m3		$132	$192	Rawlinsons	
Formwork	2.16	m2		$110	$238	Rawlinsons	
Reinforcement	87	kg		$2.39	$209	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	5.31	mhr		$54	$286	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$9,263**		
Total Manhole (BF)				**(B)**	**$10,644**		
					$1,381		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$10,504**		
Total Manhole (BF)				**(D)**	**$12,070**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 2400x1500 - Depth?	$6,082	2004	23.5%	C	$7,511	40%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions

SP - 2500x1200

Dimension

Length	2500	mm		(1) Pit dimension according to stardard dwawing
Width	1200	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 2
Wall Thickness	200	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$2,510**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.2	m3		$23	$27	Rowlinsons	(5) Allow 3516x2216mm area for demolition 150mm thick
Asphalt Reinstatement	1.2	m3		$85	$99	Council SoR	
Excavation	8.2	m3		$43	$352	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.2	m3		$42	$49	Rawlinsons	
Concrete Reistatement	1.2	m3		$125	$146	Rawlinsons	
Labour	2.3	hrs		$54	$126	Local Labour Rate	
GPT Demolition							
Slab	1.8	m2		$37	$67	Rawlinsons	
Walls	5.4	m3		$305	$1,645	Rawlinsons	
Ground slab	1.8	m2		$37	$67	Rawlinsons	
Tip Fee	13.5	m3		$10	$135	Council SoR	
Excavation					**$1,240**		
Compacted to Loose factor	1						
Excavation	24.9	m3		$43	$1,072	Council SoR	(5) Allow 3516x2216mm area for excavation in light soil
Back Filling	8.2	m3		$0	$0	Rawlinsons	Included in excavation
		m3		$68	$0	Rawlinsons	
Tip Fee	16.7	m3		$10	$167	Council SoR	
GPT Box					**$5,921**		
Floor							
Formworks	1.8	m2		$75	$135	Rawlinsons	
Concrete	0.93	m3		$128	$119	Rawlinsons	
Reinforcement	108.00	kg		$2.3	$253	Rawlinsons	
Labour	4.64	mhrs		$54	$251	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	0.60	m3		$125	$75	Rawlinsons	
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$237	$355	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	11.10	hrs		$90	$999	Recent Projects Review	Form lifting
Concrete	5.40	m3		$135	$730	Rawlinsons	
Wepp Holes	28.00	No		$15	$408	Rawlinsons	
Reinforcement	324.00	kg		$2.4	$775	Rawlinsons	
Labour	8.10	mhrs		$54	$437	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	0.93	m3		$132	$123	Rawlinsons	
Formwork	1.80	m2		$110	$198	Rawlinsons	
Reinforcement	56	kg		$2.39	$133	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	4.11	mhr		$54	$222	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$7,161**		
Total Manhole (BF)				**(B)**	**$8,432**		
					$1,271		
On Costs				26%		Council	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$8,120**		
Total Manhole (BF)				**(D)**	**$9,561**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 2400x1500 - Depth?	$6,082	2004	23.5%	C	$7,511	8%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions

SP - 4500x1200

Dimension

Length	4500	mm		(1) Pit dimension according to stardard dwawing
Width	1200	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 3
Wall Thickness	200	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$3,693**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.8	m3		$23	$42	Rowlinsons	(5) Allow 5516x2216mm area for demolition 150mm thick
Asphalt Reinstatement	1.8	m3		$85	$156	Council SoR	
Excavation	11.6	m3		$43	$498	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.8	m3		$42	$76	Rawlinsons	
Concrete Reistatement	1.8	m3		$125	$229	Rawlinsons	
Labour	3.7	hrs		$54	$198	Local Labour Rate	
GPT Demolition							
Slab	2.6	m2		$37	$97	Rawlinsons	
Walls	7.8	m3		$305	$2,377	Rawlinsons	
Ground slab	2.6	m2		$37	$97	Rawlinsons	
Tip Fee	24.3	m3		$10	$243	Council SoR	
Excavation					**$1,957**		
Compacted to Loose factor	1						
Excavation	39.1	m3		$43	$1,682	Council SoR	(5) Allow 5516x2216mm area for excavation in light soil
Back Filling	11.6	m3		$0	$0	Rawlinsons	Included in excavation
		m3		$68	$0	Rawlinsons	
Tip Fee	27.5	m3		$10	$275	Council SoR	
GPT Box					**$8,492**		
Floor							
Formworks	2.6	m2		$75	$195	Rawlinsons	
Concrete	1.57	m3		$128	$201	Rawlinsons	
Reinforcement	156.00	kg		$2.3	$365	Rawlinsons	
Labour	7.84	mhrs		$54	$423	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	1.08	m3		$125	$135	Rawlinsons	
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$470	$705	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	14.70	hrs		$90	$1,323	Recent Projects Review	Form lifting
Concrete	7.80	m3		$135	$1,055	Rawlinsons	
Wepp Holes	42.00	No		$15	$612	Rawlinsons	
Reinforcement	468.00	kg		$2.4	$1,119	Rawlinsons	
Labour	11.70	mhrs		$54	$632	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	1.57	m3		$132	$207	Rawlinsons	
Formwork	2.60	m2		$110	$287	Rawlinsons	
Reinforcement	94	kg		$2.39	$225	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	5.56	mhr		$54	$300	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$10,449**		
Total Manhole (BF)				**(B)**	**$12,185**		
					$1,736		
On Costs				26%		Council	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$11,849**		
Total Manhole (BF)				**(D)**	**$13,818**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 3000x1500 - Depth?	$7,256	2004	23.5%	C	$8,961	32%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions

SP 3000x2400

Dimension

Length	3000	mm		(1) Pit dimension according to stardard dwawing
Width	2400	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	3000	mm		(2) Depth group 4
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

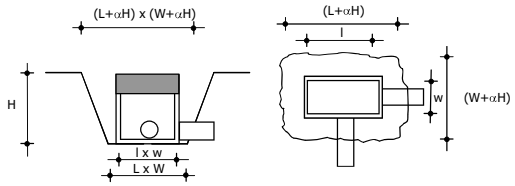
Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$3,003**		
Asphalt Surface					*40%*		(4)
Asphalt Demolition	1.9	m3		$23	$45	Rowlinsons	(5) Allow 3915x3315mm area for demolition 150mm thick
Asphalt Reinstatement	1.9	m3		$85	$166	Council SoR	
Excavation	10.4	m3		$43	$449	Council SoR	
Concrete Surface					*60%*		(4)
Concrete Demolition	1.9	m3		$42	$81	Rawlinsons	
Concrete Reistatement	1.9	m3		$125	$243	Rawlinsons	
Labour	3.9	hrs		$54	$210	Local Labour Rate	
GPT Demolition							
Slab	2.4	m2		$37	$90	Rawlinsons	
Walls	5.4	m3		$305	$1,645	Rawlinsons	
Ground slab	2.4	m2		$37	$90	Rawlinsons	
Tip Fee	32.4	m3		$10	$324	Council SoR	
Excavation					**$2,063**		
Compacted to Loose factor	1						
Excavation	40.9	m3		$43	$1,759	Council SoR	(5) Allow 3915x3315mm area for excavation in light soil
Back Filling	10.4	m3		$0	$0	Rawlinsons	Included in excavation
		m3		$68	$0	Rawlinsons	
Tip Fee	30.5	m3		$10	$305	Council SoR	
GPT Box					**$7,082**		
Floor							
Formworks	2.4	m2		$75	$180	Rawlinsons	
Concrete	1.78	m3		$128	$228	Rawlinsons	
Reinforcement	144.00	kg		$2.3	$337	Rawlinsons	
Labour	8.91	mhrs		$54	$481	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	1.44	m3		$125	$180	Rawlinsons	
Walls							
Lifts	3.00	lift					1.2m lift
Formworks Hire	1.50	days		$241	$361	Recent Projects Review	0.5 day/lift
Formwork labour	6.00	mhrs		$54	$324	Local Labour Rate	2hrs per lift
Construction aids	11.10	hrs		$90	$999	Recent Projects Review	Form lifting
Concrete	5.40	m3		$135	$730	Rawlinsons	
Wepp Holes	40.00	No		$15	$582	Rawlinsons	
Reinforcement	324.00	kg		$2.4	$775	Rawlinsons	
Labour	8.10	mhrs		$54	$437	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	1.78	m3		$132	$235	Rawlinsons	
Formwork	2.40	m2		$110	$265	Rawlinsons	
Reinforcement	107	kg		$2.39	$256	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	6.05	mhr		$54	$326	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Total Manhole (GF)				**(A)**	**$9,145**		
Total Manhole (BF)				**(B)**	**$10,085**		
					$940		
On Costs				26%		Council	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$10,370**		
Total Manhole (BF)				**(D)**	**$11,436**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %		
MH 2980x2980 - Depth?	$10,297	2004	23.5%	C	$12,717	-18%	2004 Revaluation	Including oncosts and Escalation, excluding demolitions

SP 3000x2400

Detailed Assumptions

1. Pit Dimensions



2. Average Excavation Depth — Depth 2000mmm

4. Demolitions Area — Allowed for different demolition areas:
40% Asphalt surfaces
60% Concrete surfaces

5. Demolition area and excavati — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

6. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

GPT - 1050x1050

Dimension

Length	1050	mm		(1) Pit dimension according to stardard dwawing
Width	1050	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 1
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$791**		
Soil Surface					*80%*		(4)
Top Soil Reistatement	0.6	m3		$5	$3	Rowlinsons	(5) Allow 1960x1960mm area for demolition 150mm thick
Excavation	3.5	m3		$43	$149	Council SoR	
Concrete Surface					*20%*		(4)
Concrete Demolition	0.6	m3		$42	$24	Rawlinsons	
Concrete Reistatement	0.6	m3		$125	$72	Rawlinsons	
Labour	1.2	hrs		$54	$62	Local Labour Rate	
GPT Demolition							
Slab	1.1	m2		$37	$40	Rawlinsons	
Walls	1.6	m3		$305	$494	Rawlinsons	
Ground slab	1.1	m2		$37	$40	Rawlinsons	
Tip Fee	3.3	m3		$10	$33	Council SoR	
Excavation					**$540**		
Compacted to Loose factor	1						
Excavation	8.3	m3		$43	$355	Council SoR	(5) Allow 1960x1960mm area for excavation in light soil
Back Filling	3.5	m3		$0	$0	Rawlinsons	Included in excavation
Draining Aggregate Infill	2.0	m3		$68	$136	Rawlinsons	
Tip Fee	4.8	m3		$10	$48	Council SoR	
GPT					**$4,686**		
Floor							
Formworks	1.1	m2		$75	$81	Rawlinsons	
Concrete	0.36	m3		$128	$47	Rawlinsons	
Reinforcement	64.80	kg		$2.3	$152	Rawlinsons	
Labour	1.82	mhrs		$54	$98	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	0.22	m3		$125	$28	Rawlinsons	
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$75	$75	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	4.43	hrs		$90	$399	Recent Projects Review	Form lifting
Concrete	1.62	m3		$135	$219	Rawlinsons	
Wepp Holes	18.00	No		$15	$262	Rawlinsons	
Reinforcement	97.20	kg		$2.4	$233	Rawlinsons	
Labour	2.43	mhrs		$54	$131	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	0.36	m3		$132	$48	Rawlinsons	
Formwork	1.08	m2		$110	$119	Rawlinsons	
Reinforcement	22	kg		$2.39	$52	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	2.83	mhr		$54	$153	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Apron							
Apron concrete	0.55	m3		$125	$327	Rawlinsons	
Apron formwork	0.51	m2		$75	$183	Rawlinsons	
Apron steel	2.7	m2		$19	$50	Rawlinsons	
Installation	0.82			$54	$212	Local Labour Rate	
GPT							
GPT Element (Trash rack)	1	No		$1,000	$1,000		
Installation	4	mhrs		$54	$216		
GPT Precst Unit							
GPT Unit Precast and delivery		No			$0		
Installation		mhrs			$0		
Total Manhole (GF)				**(A)**	**$5,226**		
Total Manhole (BF)				**(B)**	**$5,613**		
					$387		
On Costs				26%		Council Projects review	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$5,926**		
Total Manhole (BF)				**(D)**	**$6,365**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %	
Humeceptor	$2,855	2004	23.5%	C	$3,526	68%	2004 Revaluation

GPT - 1200x1200

Dimension

Length	1200	mm		(1) Pit dimension according to stardard dwawing
Width	1200	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 2
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$884**		
Soil Surface					*80%*		(4)
Top Soil Reistatement	0.7	m3		$5	$4	Rowlinsons	(5) Allow 2110x2110mm area for demolition 150mm thick
Excavation	3.8	m3		$43	$163	Council SoR	
Concrete Surface					*20%*		(4)
Concrete Demolition	0.7	m3		$42	$28	Rawlinsons	
Concrete Reistatement	0.7	m3		$125	$83	Rawlinsons	
Labour	1.3	hrs		$54	$72	Local Labour Rate	
GPT Demolition							
Slab	1.2	m2		$37	$45	Rawlinsons	
Walls	1.8	m3		$305	$548	Rawlinsons	
Ground slab	1.2	m2		$37	$45	Rawlinsons	
Tip Fee	4.3	m3		$10	$43	Council SoR	
Excavation					**$470**		
Compacted to Loose factor	1						
Excavation	9.6	m3		$43	$412	Council SoR	(5) Allow 2110x2110mm area for excavation in light soil
Back Filling	3.8	m3		$0	$0	Rawlinsons	Included in excavation
		m3		$68	$0	Rawlinsons	
Tip Fee	5.8	m3		$10	$58	Council SoR	
GPT Box					**$4,959**		
Floor							
Formworks	1.2	m2		$75	$90	Rawlinsons	
Concrete	0.45	m3		$128	$58	Rawlinsons	
Reinforcement	72.00	kg		$2.3	$168	Rawlinsons	
Labour	2.25	mhrs		$54	$122	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	0.29	m3		$125	$36	Rawlinsons	
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$85	$85	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	4.70	hrs		$90	$423	Recent Projects Review	Form lifting
Concrete	1.80	m3		$135	$243	Rawlinsons	
Wepp Holes	20.00	No		$15	$291	Rawlinsons	
Reinforcement	108.00	kg		$2.4	$258	Rawlinsons	
Labour	2.70	mhrs		$54	$146	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	0.45	m3		$132	$59	Rawlinsons	
Formwork	1.20	m2		$110	$132	Rawlinsons	
Reinforcement	27	kg		$2.39	$65	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.02	mhr		$54	$163	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Apron							
Apron concrete	0.56	m3		$125	$337	Rawlinsons	
Apron formwork	0.54	m2		$75	$194	Rawlinsons	
Apron steel	2.8	m2		$19	$52	Rawlinsons	
Installation	0.84			$54	$219	Local Labour Rate	
GPT							
GPT Element (Trash rack)	1	No		$1,000	$1,000		
Installation	4	mhrs		$54	$216		
GPT Precst Unit							
GPT Unit Precast and delivery		No			$0		
Installation		mhrs			$0		
Total Manhole (GF)				**(A)**	**$5,428**		
Total Manhole (BF)				**(B)**	**$5,843**		
					$415		
On Costs				26%		Council	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$6,156**		
Total Manhole (BF)				**(D)**	**$6,626**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %
			23.5%	C	$0	#DIV/0!

GPT - 1500x1500

Dimension

Length	1500	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 3
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89˚	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,078**		
Soil Surface					*80%*		(4)
Top Soil Reistatement	0.9	m3		$5	$5	Rowlinsons	(5) Allow 2410x2410mm area for demolition 150mm thick
Excavation	4.5	m3		$43	$193	Council SoR	
Concrete Surface					*20%*		(4)
Concrete Demolition	0.9	m3		$42	$36	Rawlinsons	
Concrete Reistatement	0.9	m3		$125	$109	Rawlinsons	
Labour	1.7	hrs		$54	$94	Local Labour Rate	
GPT Demolition							
Slab	1.4	m2		$37	$54	Rawlinsons	
Walls	2.2	m3		$305	$658	Rawlinsons	
Ground slab	1.4	m2		$37	$54	Rawlinsons	
Tip Fee	6.8	m3		$10	$68	Council SoR	
Excavation					**$617**		
Compacted to Loose factor	1						
Excavation	12.5	m3		$43	$537	Council SoR	(5) Allow 2410x2410mm area for excavation in light soil
Back Filling	4.5	m3		$0	$0	Rawlinsons	Included in excavation
		m3		$68	$0	Rawlinsons	
Tip Fee	8.0	m3		$10	$80	Council SoR	
GPT Box					**$5,529**		
Floor							
Formworks	1.4	m2		$75	$108	Rawlinsons	
Concrete	0.65	m3		$128	$83	Rawlinsons	
Reinforcement	86.40	kg		$2.3	$202	Rawlinsons	
Labour	3.24	mhrs		$54	$175	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	0.45	m3		$125	$56	Rawlinsons	
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$107	$107	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	5.24	hrs		$90	$472	Recent Projects Review	Form lifting
Concrete	2.16	m3		$135	$292	Rawlinsons	
Wepp Holes	24.00	No		$15	$349	Rawlinsons	
Reinforcement	129.60	kg		$2.4	$310	Rawlinsons	
Labour	3.24	mhrs		$54	$175	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	0.65	m3		$132	$86	Rawlinsons	
Formwork	1.44	m2		$110	$159	Rawlinsons	
Reinforcement	39	kg		$2.39	$93	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	3.47	mhr		$54	$187	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Apron							
Apron concrete	0.59	m3		$125	$356	Rawlinsons	
Apron formwork	0.6	m2		$75	$216	Rawlinsons	
Apron steel	3.0	m2		$19	$55	Rawlinsons	
Installation	0.89			$54	$231	Local Labour Rate	
GPT							
GPT Element (Trash rack)	1	No		$1,000	$1,000		
Installation	4	mhrs		$54	$216		
GPT Precst Unit							
GPT Unit Precast and delivery		No			$0		
Installation		mhrs			$0		
Total Manhole (GF)				**(A)**	**$6,146**		
Total Manhole (BF)				**(B)**	**$6,607**		
					$461		
On Costs				26%		Council	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$6,970**		
Total Manhole (BF)				**(D)**	**$7,493**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %
Humeceptor	$2,855	2004	23.5%	C	$3,526	98%

GPT - 2000x2000

Dimension

Length	2000	mm		(1) Pit dimension according to stardard dwawing
Width	2000	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 4
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,420**		
Soil Surface					*80%*		(4)
Top Soil Reistatement	1.3	m3		$5	$7	Rowlinsons	(5) Allow 2910x2910mm area for demolition 150mm thick
Excavation	5.7	m3		$43	$246	Council SoR	
Concrete Surface					*20%*		(4)
Concrete Demolition	1.3	m3		$42	$53	Rawlinsons	
Concrete Reistatement	1.3	m3		$125	$159	Rawlinsons	
Labour	2.5	hrs		$54	$137	Local Labour Rate	
GPT Demolition							
Slab	1.8	m2		$37	$69	Rawlinsons	
Walls	2.8	m3		$305	$841	Rawlinsons	
Ground slab	1.8	m2		$37	$69	Rawlinsons	
Tip Fee	12.0	m3		$10	$120	Council SoR	
Excavation					**$908**		
Compacted to Loose factor	1						
Excavation	18.2	m3		$43	$783	Council SoR	(5) Allow 2910x2910mm area for excavation in light soil
Back Filling	5.7	m3		$0	$0	Rawlinsons	Included in excavation
		m3		$68	$0	Rawlinsons	
Tip Fee	12.5	m3		$10	$125	Council SoR	
GPT Box					**$6,543**		
Floor							
Formworks	1.8	m2		$75	$138	Rawlinsons	
Concrete	1.06	m3		$128	$135	Rawlinsons	
Reinforcement	110.40	kg		$2.3	$258	Rawlinsons	
Labour	5.29	mhrs		$54	$286	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	0.80	m3		$125	$100	Rawlinsons	
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$142	$142	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	6.14	hrs		$90	$553	Recent Projects Review	Form lifting
Concrete	2.76	m3		$135	$373	Rawlinsons	
Wepp Holes	30.00	No		$15	$437	Rawlinsons	
Reinforcement	165.60	kg		$2.4	$396	Rawlinsons	
Labour	4.14	mhrs		$54	$224	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	1.06	m3		$132	$140	Rawlinsons	
Formwork	1.84	m2		$110	$203	Rawlinsons	
Reinforcement	63	kg		$2.39	$152	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	4.40	mhr		$54	$238	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Apron							
Apron concrete	0.65	m3		$125	$389	Rawlinsons	
Apron formwork	0.7	m2		$75	$252	Rawlinsons	
Apron steel	3.2	m2		$19	$60	Rawlinsons	
Installation	0.97			$54	$252	Local Labour Rate	
GPT							
GPT Element (Trash rack)	1	No		$1,000	$1,000		
Installation	4	mhrs		$54	$216		
GPT Precst Unit							
GPT Unit Precast and delivery		No			$0		
Installation		mhrs			$0		
Total Manhole (GF)				**(A)**	**$7,452**		
Total Manhole (BF)				**(B)**	**$7,963**		
					$512		
On Costs				26%		Council	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$8,450**		
Total Manhole (BF)				**(D)**	**$9,030**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %
Humeceptor	$2,855	2004	23.5%	C	$3,526	140%

GPT - 3000x1500

Dimension

Length	3000	mm		(1) Pit dimension according to stardard dwawing
Width	1500	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 4
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,574**		
Soil Surface					*80%*		(4)
Top Soil Reistatement	1.4	m3		$5	$8	Rowlinsons	(5) Allow 3910x2410mm area for demolition 150mm thick
Excavation	6.3	m3		$43	$270	Council SoR	
Concrete Surface					*20%*		(4)
Concrete Demolition	1.4	m3		$42	$59	Rawlinsons	
Concrete Reistatement	1.4	m3		$125	$176	Rawlinsons	
Labour	2.8	hrs		$54	$153	Local Labour Rate	
GPT Demolition							
Slab	2.0	m2		$37	$76	Rawlinsons	
Walls	3.1	m3		$305	$932	Rawlinsons	
Ground slab	2.0	m2		$37	$76	Rawlinsons	
Tip Fee	13.5	m3		$10	$135	Council SoR	
Excavation					**$1,012**		
Compacted to Loose factor	1						
Excavation	20.3	m3		$43	$872	Council SoR	(5) Allow 3910x2410mm area for excavation in light soil
Back Filling	6.3	m3		$0	$0	Rawlinsons	Included in excavation
		m3		$68	$0	Rawlinsons	
Tip Fee	14.0	m3		$10	$140	Council SoR	
GPT Box					**$7,084**		
Floor							
Formworks	2.0	m2		$75	$153	Rawlinsons	
Concrete	1.19	m3		$128	$152	Rawlinsons	
Reinforcement	122.40	kg		$2.3	$286	Rawlinsons	
Labour	5.94	mhrs		$54	$321	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	0.90	m3		$125	$112	Rawlinsons	
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$282	$282	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	6.59	hrs		$90	$593	Recent Projects Review	Form lifting
Concrete	3.06	m3		$135	$414	Rawlinsons	
Wepp Holes	34.00	No		$15	$495	Rawlinsons	
Reinforcement	183.60	kg		$2.4	$439	Rawlinsons	
Labour	4.59	mhrs		$54	$248	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	1.19	m3		$132	$157	Rawlinsons	
Formwork	2.04	m2		$110	$225	Rawlinsons	
Reinforcement	71	kg		$2.39	$171	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	4.70	mhr		$54	$254	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Apron							
Apron concrete	0.59	m3		$125	$356	Rawlinsons	
Apron formwork	0.9	m2		$75	$324	Rawlinsons	
Apron steel	3.0	m2		$19	$55	Rawlinsons	
Installation	0.89			$54	$231	Local Labour Rate	
GPT							
GPT Element (Trash rack)	1	No		$1,000	$1,000		
Installation	4	mhrs		$54	$216		
GPT Precst Unit							
GPT Unit Precast and delivery		No			$0		
Installation		mhrs			$0		
Total Manhole (GF)				**(A)**	**$8,095**		
Total Manhole (BF)				**(B)**	**$8,657**		
					$562		
On Costs				26%		Council	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$9,180**		
Total Manhole (BF)				**(D)**	**$9,817**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %
			23.5%	C	$0	#DIV/0!

GPT - 3650x1950

Dimension

Length	3650	mm		(1) Pit dimension according to stardard dwawing
Width	1950	mm		(1) Pit dimension according to stardard dwawing
Depth (PIL)	2000	mm		(2) Depth group 4
Wall Thickness	150	mm		(3) Wall thickness based on std drawing D-0010
Floor Thickness	200	mm		(3) Floor thickness based on std drawing D-0010
Excavation Grade	0.01		89°	

Unit Costs

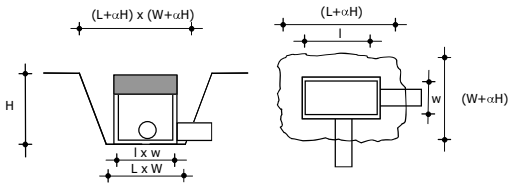
Task				UC	Total	Unit Rate Source	Assumptions
Demolitions					**$1,981**		
Soil Surface					*80%*		(4)
Top Soil Reistatement	2.0	m3		$5	$11	Rowlinsons	(5) Allow 4560x2860mm area for demolition 150mm thick
Excavation	7.7	m3		$43	$332	Council SoR	
Concrete Surface					*20%*		(4)
Concrete Demolition	2.0	m3		$42	$81	Rawlinsons	
Concrete Reistatement	2.0	m3		$125	$244	Rawlinsons	
Labour	3.9	hrs		$54	$211	Local Labour Rate	
GPT Demolition							
Slab	2.5	m2		$37	$93	Rawlinsons	
Walls	3.7	m3		$305	$1,134	Rawlinsons	
Ground slab	2.5	m2		$37	$93	Rawlinsons	
Tip Fee	21.4	m3		$10	$214	Council SoR	
Excavation					**$1,410**		
Compacted to Loose factor	1						
Excavation	28.1	m3		$43	$1,206	Council SoR	(5) Allow 4560x2860mm area for excavation in light soil
Back Filling	7.7	m3		$0	$0	Rawlinsons	Included in excavation
		m3		$68	$0	Rawlinsons	
Tip Fee	20.3	m3		$10	$203	Council SoR	
GPT Box					**$8,330**		
Floor							
Formworks	2.5	m2		$75	$186	Rawlinsons	
Concrete	1.78	m3		$128	$227	Rawlinsons	
Reinforcement	148.80	kg		$2.3	$348	Rawlinsons	
Labour	8.89	mhrs		$54	$480	Rawlinsons	Allow for 5mhrs/m3
River Stone basis	1.42	m3		$125	$178	Rawlinsons	
Walls							
Lifts	2.00	lift					1.2m lift
Formworks Hire	1.00	days		$337	$337	Recent Projects Review	0.5 day/lift
Formwork labour	4.00	mhrs		$54	$216	Local Labour Rate	2hrs per lift
Construction aids	7.58	hrs		$90	$682	Recent Projects Review	Form lifting
Concrete	3.72	m3		$135	$503	Rawlinsons	
Wepp Holes	40.00	No		$15	$582	Rawlinsons	
Reinforcement	223.20	kg		$2.4	$534	Rawlinsons	
Labour	5.58	mhrs		$54	$301	Rawlinsons	Allow for 1.5mhrs/m3
Top							
Concrete	1.78	m3		$132	$235	Rawlinsons	
Formwork	2.48	m2		$110	$273	Rawlinsons	
Reinforcement	107	kg		$2.39	$255	Rawlinsons	Allow 17hrs/ton installation of reinforcement
Labour	6.03	mhr		$54	$326	Local Labour Rate	Allow for 1.25mhrs/m3 + 2hrs cover installation
Iron Cover	600	mm	600 mm	$385	$385	Recent Projects Review	
Apron							
Apron concrete	0.64	m3		$125	$385	Rawlinsons	
Apron formwork	1.03	m2		$75	$371	Rawlinsons	
Apron steel	3.2	m2		$19	$59	Rawlinsons	
Installation	0.96			$54	$250	Local Labour Rate	
GPT							
GPT Element (Trash rack)	1	No		$1,000	$1,000		
Installation	4	mhrs		$54	$216		
GPT Precst Unit							
GPT Unit Precast and delivery		No			$0		
Installation		mhrs			$0		
Total Manhole (GF)				**(A)**	**$9,740**		
Total Manhole (BF)				**(B)**	**$10,311**		
					$571		
On Costs				26%		Council	(5) Refer to % breakdown
Discount				10%			
Total Manhole (GF)				**(C)**	**$11,045**		
Total Manhole (BF)				**(D)**	**$11,692**		

Benchmark Costs	Value	Year	Escalation	Comp.		Diff %
			23.5%	C	$0	#DIV/0!

GPT - 3650x1950

Detailed Assumptions

1. Pit Dimensions



2. Average Excavation Depth — Depth 2000mmm

4. Demolitions Area — Allowed for different demolition areas:
80% Asphalt surfaces
20% Concrete surfaces

5. Demolition area and excavati — The demolition and excavation area is based on the standard dimensions of the pit and the average depth.
The excavation grade is assumed to be almost vertical

6. On Costs and Overheads — On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Pipes

Diameter	Material	Replacement Material	Width	Compacted Backfill Depth	Pipe Depth	Excavation Grade	Base Rate (Supply and Install)	GF Rate (Base Rate + Exc.)	BF Rate (Base Rate + Exc.+ Dem.)	On-Costs	Discount	GF Rate and On-costs	BF Rate and On-costs	2004 Valuation	2004 Valuation Escalated	Difference		Asphalt Demolition		Asphalt Reinstatement		Pipe Demolition or Removal		Tip Fee		Trench Excavation		Back Filling I		Compacted Back Filling		Unit Rate Code*
mm			mm	mm	mm					26%	10%				23.50%			m3/m	$23	m3/m	$85	m3/m	$305	m3/m	$10	m3/m	$38	m3/m	$57	m3/m	$0	
(0)			(1)	(1)	(1)	(1)	(2)			(3)								(1)				(5)				(1)		(1)		(1)	(5)	
100	RCP	uPVC	1000	300	800	0.01	$27	$86	$112	26%	10%	$97	$127	$59	$73	33%	75%	0.2	$3	0.2	$13	0.0	$10	0.1	$1	0.8	$31	0.5	$28	0.3	$0	100uPVC
150	RCP	uPVC	1000	300	850	0.01	$35	$98	$130	26%	10%	$111	$147	$88	$109	2%	35%	0.2	$3	0.2	$13	0.0	$14	0.1	$1	0.9	$33	0.5	$31	0.3	$0	150uPVC
225	RCP	uPVC	1000	300	925	0.01	$68	$137	$177	26%	10%	$156	$200	$117	$144	8%	39%	0.2	$3	0.2	$13	0.1	$22	0.1	$1	0.9	$35	0.6	$34	0.3	$0	225uPVC
250	RCP	uPVC	1000	300	951	0.01	$85	$157	$199	26%	10%	$178	$225					0.2	$3	0.2	$13	0.1	$24	0.2	$2	1.0	$36	0.6	$35	0.3	$0	250uPVC
300	RCP	FRC	1000	300	1000	0.01	$84	$159	$206	26%	10%	$180	$234	$140	$173	4%	35%	0.2	$4	0.2	$13	0.1	$29	0.2	$2	1.0	$38	0.6	$36	0.3	$0	300FRC
375	RCP	FRC	1100	300	1075	0.01	$98	$188	$244	26%	10%	$213	$277	$152	$188	14%	48%	0.2	$4	0.2	$14	0.1	$36	0.2	$2	1.2	$45	0.8	$45	0.3	$0	375FRC
450	RCP	FRC	1100	300	1150	0.01	$115	$210	$274	26%	10%	$238	$311	$176	$217	10%	43%	0.2	$4	0.2	$14	0.1	$43	0.3	$3	1.3	$49	0.8	$47	0.3	$0	450FRC
525	RCP	FRC	1200	300	1225	0.01	$141	$253	$326	26%	10%	$286	$370	$187	$231	24%	60%	0.2	$4	0.2	$16	0.2	$50	0.3	$3	1.5	$56	1.0	$55	0.3	$0	525FRC
600	RCP	FRC	1300	300	1300	0.01	$173	$302	$385	26%	10%	$342	$436	$211	$261	31%	67%	0.2	$5	0.2	$17	0.2	$57	0.4	$4	1.7	$65	1.1	$64	0.3	$0	600FRC
675	RCP	FRC	1400	300	1375	0.01	$221	$368	$460	26%	10%	$418	$522	$234	$289	44%	81%	0.2	$5	0.2	$18	0.2	$65	0.4	$4	1.9	$74	1.3	$73	0.3	$0	675FRC
750	RCP	FRC	1500	300	1450	0.01	$255	$421	$523	26%	10%	$478	$593	$257	$317	51%	87%	0.2	$5	0.2	$19	0.2	$72	0.5	$5	2.2	$83	1.5	$83	0.3	$0	750FRC
825	RCP	RCP	1550	300	1525	0.01	$317	$496	$606	26%	10%	$563	$687	$328	$405	39%	70%	0.2	$5	0.2	$20	0.3	$79	0.5	$5	2.4	$91	1.6	$88	0.3	$0	825RCP
900	RCP	RCP	1600	300	1600	0.01	$397	$589	$707	26%	10%	$668	$802	$410	$506	32%	58%	0.2	$6	0.2	$21	0.3	$86	0.6	$6	2.6	$98	1.6	$94	0.3	$0	900RCP
1050	RCP	RCP	1800	300	1750	0.01	$518	$754	$891	26%	10%	$855	$1,010	$725	$895	-5%	13%	0.3	$6	0.3	$23	0.3	$101	0.7	$7	3.2	$121	2.0	$115	0.3	$0	1050RCP
1200	RCP	RCP	2000	300	1900	0.01	$650	$933	$1,088	26%	10%	$1,058	$1,234	$819	$1,011	5%	22%	0.3	$7	0.3	$26	0.4	$115	0.8	$8	3.8	$146	2.4	$137	0.3	$0	1200RCP
1350	RCP	RCP	2100	300	2050	0.01	$794	$1,108	$1,281	26%	10%	$1,257	$1,452	$1,024	$1,265	-1%	15%	0.3	$7	0.3	$27	0.4	$129	0.8	$8	4.3	$165	2.6	$149	0.3	$0	1350RCP
1500	RCP	RCP	2300	300	2200	0.25	$966	$1,444	$1,652	26%	10%	$1,637	$1,873	$1,229	$1,518	8%	23%	0.5	$12	0.5	$43	0.5	$144	0.9	$9	6.3	$238	4.2	$240	0.3	$0	1500RCP
1650	RCP	RCP	2600	300	2400	0.25	$1,142	$1,733	$1,962	26%	10%	$1,965	$2,225	$1,463	$1,807	9%	23%	0.6	$13	0.6	$48	0.5	$158	1.0	$10	7.7	$292	5.2	$299	0.3	$0	1650RCP
1800	RCP	RCP	2800	300	2550	0.25	$1,334	$2,005	$2,254	26%	10%	$2,273	$2,556	$1,697	$2,096	8%	22%	0.6	$14	0.6	$52	0.6	$172	1.1	$11	8.8	$333	5.9	$337	0.3	$0	1800RCP
1950	RCP	RCP	3100	300	2700	0.25	$1,693	$2,474	$2,745	26%	10%	$2,805	$3,113	$2,007	$2,479	13%	26%	0.7	$15	0.7	$57	0.6	$187	1.2	$12	10.2	$387	6.9	$394	0.3	$0	1950RCP
2100	RCP	RCP	3400	300	2850	0.25	$1,868	$2,767	$3,059	26%	10%	$3,138	$3,469	$2,311	$2,854	10%	22%	0.7	$17	0.7	$62	0.7	$201	1.3	$13	11.7	$445	8.0	$454	0.3	$0	2100RCP
150	FRC	uPVC	1000	300	850	0.01	$35	$98	$130	26%	10%	$111	$147	$88	$109	2%	35%	0.2	$3	0.2	$13	0.0	$14	0.1	$1	0.9	$33	0.5	$31	0.3	$0	150uPVC
225	FRC	uPVC	1000	300	925	0.01	$68	$137	$177	26%	10%	$156	$200	$117	$144	8%	39%	0.2	$3	0.2	$13	0.1	$22	0.1	$1	0.9	$35	0.6	$34	0.3	$0	225uPVC
300	FRC	FRC	1000	300	1000	0.01	$84	$159	$206	26%	10%	$180	$234	$140	$173	4%	35%	0.2	$4	0.2	$13	0.1	$29	0.2	$2	1.0	$38	0.6	$36	0.3	$0	300FRC
375	FRC	FRC	1100	300	1075	0.01	$98	$188	$244	26%	10%	$213	$277	$152	$188	14%	48%	0.2	$4	0.2	$14	0.1	$36	0.2	$2	1.2	$45	0.8	$45	0.3	$0	375FRC
450	FRC	FRC	1100	300	1150	0.01	$115	$210	$274	26%	10%	$238	$311	$176	$217	10%	43%	0.2	$4	0.2	$14	0.1	$43	0.3	$3	1.3	$49	0.8	$47	0.3	$0	450FRC
525	FRC	FRC	1200	300	1225	0.01	$141	$253	$326	26%	10%	$286	$370	$187	$231	24%	60%	0.2	$4	0.2	$16	0.2	$50	0.3	$3	1.5	$56	1.0	$55	0.3	$0	525FRC
600	FRC	FRC	1300	300	1300	0.01	$173	$302	$385	26%	10%	$342	$436	$211	$261	31%	67%	0.2	$5	0.2	$17	0.2	$57	0.4	$4	1.7	$65	1.1	$64	0.3	$0	600FRC
675	FRC	FRC	1400	300	1375	0.01	$221	$368	$460	26%	10%	$418	$522	$234	$289	44%	81%	0.2	$5	0.2	$18	0.2	$65	0.4	$4	1.9	$74	1.3	$73	0.3	$0	675FRC
750	FRC	FRC	1500	300	1450	0.01	$255	$421	$523	26%	10%	$478	$593	$257	$317	51%	87%	0.2	$5	0.2	$19	0.2	$72	0.5	$5	2.2	$83	1.5	$83	0.3	$0	750FRC
825	FRC	RCP	1550	300	1525	0.01	$317	$496	$606	26%	10%	$563	$687	$328	$405	39%	70%	0.2	$5	0.2	$20	0.3	$79	0.5	$5	2.4	$91	1.6	$88	0.3	$0	825RCP
1500	FRC	RCP	2300	300	2200	0.25	$966	$1,444	$1,652	26%	10%	$1,637	$1,873	$1,229	$1,518	8%	23%	0.5	$12	0.5	$43	0.5	$144	0.9	$9	6.3	$238	4.2	$240	0.3	$0	1500RCP
100	uPVC	uPVC	1000	300	800	0.01	$27	$86	$112	26%	10%	$97	$127	$59	$73	33%	75%	0.2	$3	0.2	$13	0.0	$10	0.1	$1	0.8	$31	0.5	$28	0.3	$0	100uPVC
150	uPVC	uPVC	1000	300	850	0.01	$35	$98	$130	26%	10%	$111	$147	$88	$109	2%	35%	0.2	$3	0.2	$13	0.0	$14	0.1	$1	0.9	$33	0.5	$31	0.3	$0	150uPVC
225	uPVC	uPVC	1000	300	925	0.01	$68	$137	$177	26%	10%	$156	$200	$117	$144	8%	39%	0.2	$3	0.2	$13	0.1	$22	0.1	$1	0.9	$35	0.6	$34	0.3	$0	225uPVC
250	uPVC	uPVC	1000	300	951	0.01	$85	$157	$199	26%	10%	$178	$225					0.2	$3	0.2	$13	0.1	$24	0.2	$2	1.0	$36	0.6	$35	0.3	$0	250uPVC
300	uPVC	FRC	1000	300	1000	0.01	$84	$159	$206	26%	10%	$180	$234	$140	$173	4%	35%	0.2	$4	0.2	$13	0.1	$29	0.2	$2	1.0	$38	0.6	$36	0.3	$0	300FRC
375	uPVC	FRC	1100	300	1075	0.01	$98	$188	$244	26%	10%	$213	$277	$152	$188	14%	48%	0.2	$4	0.2	$14	0.1	$36	0.2	$2	1.2	$45	0.8	$45	0.3	$0	375FRC
450	uPVC	FRC	1100	300	1150	0.01	$115	$210	$274	26%	10%	$238	$311	$176	$217	10%	43%	0.2	$4	0.2	$14	0.1	$43	0.3	$3	1.3	$49	0.8	$47	0.3	$0	450FRC
525	uPVC	FRC	1200	300	1225	0.01	$141	$253	$326	26%	10%	$286	$370	$187	$231	24%	60%	0.2	$4	0.2	$16	0.2	$50	0.3	$3	1.5	$56	1.0	$55	0.3	$0	525FRC
600	uPVC	FRC	1300	300	1300	0.01	$173	$302	$385	26%	10%	$342	$436					0.2	$5	0.2	$17	0.2	$57	0.4	$4	1.7	$65	1.1	$64	0.3	$0	600FRC
675	uPVC	FRC	1400	300	1375	0.01	$221	$368	$460	26%	10%	$418	$522	$234	$289	44%	81%	0.2	$5	0.2	$18	0.2	$65	0.4	$4	1.9	$74	1.3	$73	0.3	$0	675FRC
750	uPVC	FRC	1500	300	1450	0.01	$255	$421	$523	26%	10%	$478	$593					0.2	$5	0.2	$19	0.2	$72	0.5	$5	2.2	$83	1.5	$83	0.3	$0	750FRC
900	uPVC	RCP	1600	300	1600	0.01	$397	$589	$707	26%	10%	$668	$802	$410	$506	32%	58%	0.2	$6	0.2	$21	0.3	$86	0.6	$6	2.6	$98	1.6	$94	0.3	$0	900RCP
1200	uPVC	RCP	2000	300	1900	0.01	$650	$933	$1,088	26%	10%	$1,058	$1,234	$819	$1,011	5%	22%	0.3	$7	0.3	$26	0.4	$115	0.8	$8	3.8	$146	2.4	$137	0.3	$0	1200RCP
1350	uPVC	RCP	2100	300	2050	0.01	$794	$1,108	$1,281	26%	10%	$1,257	$1,452					0.3	$7	0.3	$27	0.4	$129	0.8	$8	4.3	$165	2.6	$149	0.3	$0	1350RCP

Detailed Assumptions

Pipes

0. Diameter

The displayed diameter count for the 100% of the existing pipes for material RCP, FRC and uPVC

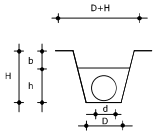
1. Trench Dimensions

Pit dimensions are assumed according to standard drawing D-RSC-11

b = Compacted backfill depth
b = 600 mm

h = Bedding depth
h is calculated according to the std drawing
h = C + Dia + 300 (C from table below)

D = Width
D is calculated according to the std drawing
D = E (E from the table below)



Dia	B	C	E	
100	36	100	1	Extrapolated data
150	36	100	1	Extrapolated data
300	36	100	1	
375	45	100	1.1	
450	53	100	1.1	
600	69	100	1.3	
750	85	100	1.5	
900	103	100	1.6	
1050	120	100	1.8	
1200	135	100	2	
1350	150	100	2.1	
1500	169	100	2.3	
1650	184	150	2.6	
1800	200	150	2.8	
1950	222	150	3.1	
2100	239	150	3.4	
2400	270	150	3.9	
2700	303	150	4.3	
3000	335	150	4.9	
525	61	100	1.2	Extrapolated data
675	77	100	1.4	Extrapolated data
825	94	100	1.6	Extrapolated data
225	36	100	1.0	Extrapolated data
250	36	101	1.0	
615	71	100	1.3	Extrapolated data

The demolition and excavation area is based on the standard dimensions of the trench and the average calculated depth
The excavation grade is assumed to be almost vertical

4. On Costs and Overheads

On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

5. Compacted Backfilling

Backfilling with excavation material already included in the excavation rates

2. Base Supply Rate

Dia	RCP	FRC	uPVC
100	50	50	26.5
150	57	70	34.5
300	108	84	106
375	132	98	142
450	176	115	172
600	220	173	238
750	315	255	303
900	440	300	368
1050	493	357	434
1200	990	414	499
1350	653	472	564
1500	770	529	629
1650	814	586	695
1800	894	644	760
1950	974	701	825
2100	1054	758	890
2400	1215	873	1021
2700	1375	988	1152
3000	1536	1102	1282
525	205	141	205
675	292	221	270
825	372	271	336
225	51	69	68
250	65	51	85
615	260	191	244

Extrapolated value

Council Rate	
FRC '2'	FCR '3'
135	
145	
165	200
200	240
240	
180	200
220	

Local Rates	
Dia	RCP
225	46
250	51
300	51
375	69
450	102
525	128
600	158
615	210
675	210
750	243
825	317
900	397
1050	518
1200	650
1350	794
1500	966
1650	1142
1800	1334
1950	1693
2100	1868

Box Culvert

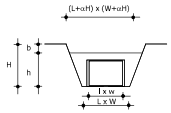
Span	Height	Length	No of Culverts	Comp BF Depth	Wall Tickness	GF Rate (Base Rate + Exc.)	BF Rate (Base Rate + Exc.+ Dem.)	On-Costs	Discount	GF Rate and On-costs	BF Rate and On-costs	2004 Valuation	2004 Valuation Escalated	Difference		Asphalt Demolition		Asphalt Reinstatement		Slab Demolition		Walls Demolition		Ground slab demolition		Tip Fee		Excavation		Back Filling		Tip Fee		Precast U Shape Element including Fundation or Lid		Labour		Installation aids		Unit Rate Code
mm	mm	mm	No	mm	mm			26%	10%				23.50%			m3	$23	m3	$85	m2	$37	m3	$305	m2	$37	m3	$10	m3	$43	m3	$10	m3	$10	No		mhrs	$54	hrs	$125	
								(5)								(1)												(2)		(1)				(3)		(4)				
1500	600	1000	1	300	150	$1,375	$1,495	26%	10%	$1,559	$1,695	$2,762	$3,411	-54%	-50%	0.3	$7	0.3	$26	1.5	$56	0.2	$55	1.5	$56	0.8	$8	1.8	$80	0.9	$9	0.9	$9	1	$1,022	1.7	$93	1.3	$162	BC1500x600
1500	900	1000	1	300	150	$1,681	$1,799	26%	10%	$1,907	$2,040	$2,858	$3,530	-46%	-42%	0.3	$7	0.3	$26	1.5	$56	0.3	$82	1.5	$56	1.0	$10	2.5	$107	1.1	$11	1.4	$14	1	$1,206	2.3	$126	1.7	$218	BC1500x900
1500	1200	1000	1	300	150	$1,879	$1,994	26%	10%	$2,131	$2,261	$2,951	$3,644	-42%	-38%	0.3	$7	0.3	$27	1.5	$56	0.4	$110	1.5	$56	1.2	$12	3.1	$135	1.3	$13	1.8	$18	1	$1,281	2.9	$158	2.2	$274	BC1500x1200
1500	1500	1000	1	300	150	$2,058	$2,169	26%	10%	$2,334	$2,460					0.3	$7	0.3	$27	1.5	$56	0.5	$137	1.5	$56	1.4	$14	3.8	$163	1.5	$15	2.3	$23	1	$1,336	3.5	$190	2.6	$330	BC1500x1500
1800	600	1000	1	300	150	$1,695	$1,830	26%	10%	$1,922	$2,075					0.4	$8	0.4	$30	1.8	$67	0.2	$55	1.8	$67	0.9	$9	2.1	$91	1.0	$10	1.1	$11	1	$1,312	1.8	$99	1.4	$172	BC1800x600
1800	900	1000	1	300	150	$1,901	$2,029	26%	10%	$2,156	$2,301					0.4	$8	0.4	$30	1.8	$67	0.3	$82	1.8	$67	1.1	$11	2.9	$123	1.2	$12	1.6	$16	1	$1,391	2.4	$131	1.8	$228	BC1800x900
1800	1200	1000	1	300	150	$2,062	$2,182	26%	10%	$2,339	$2,474	$3,016	$3,725	-37%	-34%	0.4	$8	0.4	$31	1.8	$67	0.4	$110	1.8	$67	1.3	$13	3.6	$155	1.4	$14	2.2	$22	1	$1,424	3.0	$164	2.3	$284	BC1800x1200
1800	1500	1000	1	300	150	$2,255	$2,366	26%	10%	$2,557	$2,683					0.4	$8	0.4	$31	1.8	$67	0.5	$137	1.8	$67	1.4	$14	4.4	$187	1.7	$17	2.7	$27	1	$1,488	3.6	$196	2.7	$340	BC1800x1500
1800	1800	1000	1	300	150	$2,440	$2,543	26%	10%	$2,767	$2,883	$3,353	$4,141	-33%	-30%	0.4	$8	0.4	$31	1.8	$67	0.5	$165	1.8	$67	1.6	$16	5.1	$220	1.9	$19	3.2	$32	1	$1,544	4.2	$228	3.2	$397	BC1800x1800
2100	600	1000	1	300	150	$1,811	$1,960	26%	10%	$2,054	$2,223	$2,915	$3,600	-43%	-38%	0.4	$9	0.4	$34	2.1	$79	0.2	$55	2.1	$79	1.0	$10	2.4	$103	1.1	$11	1.3	$13	1	$1,398	1.9	$104	1.5	$181	BC2100x600
2100	900	1000	1	300	150	$2,037	$2,175	26%	10%	$2,310	$2,466	$2,972	$3,670	-37%	-33%	0.4	$9	0.4	$34	2.1	$79	0.3	$82	2.1	$79	1.2	$12	3.2	$139	1.3	$13	1.9	$19	1	$1,492	2.5	$137	1.9	$238	BC2100x900
2100	1200	1000	1	300	150	$2,257	$2,381	26%	10%	$2,559	$2,701	$3,127	$3,862	-34%	-30%	0.4	$9	0.4	$35	2.1	$79	0.4	$110	2.1	$79	1.4	$14	4.1	$175	1.5	$15	2.5	$25	1	$1,579	3.1	$169	2.4	$294	BC2100x1200
2100	1500	1000	1	300	150	$2,477	$2,588	26%	10%	$2,809	$2,935	$3,249	$4,013	-30%	-27%	0.4	$9	0.4	$35	2.1	$79	0.5	$137	2.1	$79	1.5	$15	4.9	$211	1.8	$18	3.2	$32	1	$1,665	3.7	$202	2.8	$350	BC2100x1500
2100	1800	1000	1	300	150	$2,719	$2,816	26%	10%	$3,084	$3,194					0.4	$9	0.4	$35	2.1	$79	0.5	$165	2.1	$79	1.7	$17	5.8	$249	2.0	$20	3.8	$38	1	$1,773	4.3	$234	3.3	$406	BC2100x1800
2100	2100	1000	1	300	150	$2,962	$3,046	26%	10%	$3,359	$3,453	$3,514	$4,340	-23%	-20%	0.4	$10	0.4	$35	2.1	$79	0.6	$192	2.1	$79	1.9	$19	6.7	$266	2.3	$23	4.4	$44	1	$1,880	4.9	$266	3.7	$463	BC2100x2100
2400	900	1000	1	300	150	$2,260	$2,403	26%	10%	$2,563	$2,725	$3,151	$3,891	-34%	-30%	0.5	$11	0.5	$39	2.4	$90	0.3	$82	2.4	$90	1.3	$13	3.7	$160	1.6	$16	2.2	$22	1	$1,673	2.6	$143	2.0	$248	BC2400x900
2400	1200	1000	1	300	150	$2,483	$2,607	26%	10%	$2,816	$2,956	$3,252	$4,016	-30%	-26%	0.5	$11	0.5	$40	2.4	$90	0.4	$110	2.4	$90	1.4	$14	4.7	$201	1.8	$18	2.9	$29	1	$1,756	3.2	$175	2.4	$304	BC2400x1200
2400	1500	1000	1	300	150	$2,706	$2,811	26%	10%	$3,069	$3,188					0.5	$11	0.5	$40	2.4	$90	0.5	$137	2.4	$90	1.6	$16	5.7	$243	2.1	$21	3.6	$36	1	$1,839	3.8	$207	2.9	$360	BC2400x1500
2400	1800	1000	1	300	150	$2,939	$3,023	26%	10%	$3,333	$3,428	$3,475	$4,292	-22%	-20%	0.5	$11	0.5	$40	2.4	$90	0.5	$165	2.4	$90	1.8	$18	6.7	$286	2.3	$23	4.3	$43	1	$1,930	4.4	$240	3.3	$416	BC2400x1800
2400	2100	1000	1	300	150	$3,225	$3,288	26%	10%	$3,657	$3,729	$3,648	$4,505	-19%	-17%	0.5	$11	0.5	$41	2.4	$90	0.6	$192	2.4	$90	2.0	$20	7.7	$330	2.6	$26	5.0	$50	1	$2,074	5.0	$272	3.8	$473	BC2400x2100
2400	2400	1000	1	300	150	$3,477	$3,518	26%	10%	$3,942	$3,990					0.5	$11	0.5	$41	2.4	$90	0.7	$219	2.4	$90	2.2	$22	8.7	$374	2.9	$29	5.8	$58	1	$2,183	5.6	$305	4.2	$529	BC2400x2400
2700	900	1000	1	300	150	$2,529	$2,682	26%	10%	$2,868	$3,042	$3,318	$4,098	-30%	-26%	0.5	$12	0.5	$43	2.7	$101	0.3	$82	2.7	$101	1.4	$14	4.1	$176	1.7	$17	2.4	$24	1	$1,907	2.7	$148	2.1	$257	BC2700x900
2700	1200	1000	1	300	150	$2,612	$2,741	26%	10%	$2,962	$3,108	$3,422	$4,226	-30%	-26%	0.5	$12	0.5	$44	2.7	$101	0.4	$110	2.7	$101	1.5	$15	5.1	$221	1.9	$19	3.2	$32	1	$1,845	3.3	$181	2.5	$314	BC2700x1200
2700	1500	1000	1	300	150	$2,928	$3,032	26%	10%	$3,320	$3,439					0.5	$12	0.5	$44	2.7	$101	0.5	$137	2.7	$101	1.7	$17	6.2	$268	2.2	$22	4.1	$41	1	$2,016	3.9	$213	3.0	$370	BC2700x1500
2700	1800	1000	1	300	150	$3,245	$3,324	26%	10%	$3,690	$3,789	$3,667	$4,529	-19%	-17%	0.5	$12	0.5	$44	2.7	$101	0.5	$165	2.7	$101	1.9	$19	7.3	$314	2.5	$25	4.9	$49	1	$2,186	4.5	$245	3.4	$426	BC2700x1800
2700	2100	1000	1	300	150	$3,447	$3,500	26%	10%	$3,909	$3,989					0.5	$12	0.5	$45	2.7	$101	0.6	$192	2.7	$101	2.1	$21	8.4	$362	2.8	$28	5.7	$57	1	$2,240	5.1	$278	3.9	$482	BC2700x2100
2700	2400	1000	1	300	150	$3,696	$3,722	26%	10%	$4,191	$4,220					0.5	$12	0.5	$45	2.7	$101	0.7	$219	2.7	$101	2.3	$23	9.5	$410	3.1	$31	6.5	$65	1	$2,341	5.7	$310	4.3	$539	BC2700x2400
2700	2700	1000	1	300	150	$3,946	$3,944	26%	10%	$4,474	$4,473					0.5	$12	0.5	$45	2.7	$101	0.8	$247	2.7	$101	2.4	$24	10.7	$459	3.4	$34	7.3	$73	1	$2,442	6.3	$343	4.8	$595	BC2700x2700
3000	1200	1000	1	300	150	$3,011	$3,160	26%	10%	$3,415	$3,584	$3,529	$4,358	-22%	-18%	0.5	$12	0.5	$44	3.0	$112	0.4	$110	3.0	$112	1.6	$16	5.1	$221	1.5	$15	3.6	$36	1	$2,229	3.5	$196	2.6	$323	BC3000x1200
3000	1500	1000	1	300	150	$3,275	$3,398	26%	10%	$3,714	$3,854	$3,689	$4,556	-18%	-15%	0.5	$12	0.5	$44	3.0	$112	0.5	$137	3.0	$112	1.8	$18	6.2	$268	1.7	$17	4.5	$45	1	$2,347	4.1	$219	3.0	$380	BC3000x1500
3000	1800	1000	1	300	150	$3,563	$3,660	26%	10%	$4,040	$4,150					0.5	$12	0.5	$44	3.0	$112	0.5	$165	3.0	$112	2.0	$20	7.3	$314	1.9	$19	5.4	$54	1	$2,488	4.7	$251	3.5	$436	BC3000x1800
3000	2100	1000	1	300	150	$3,851	$3,921	26%	10%	$4,367	$4,447					0.5	$12	0.5	$45	3.0	$112	0.6	$192	3.0	$112	2.2	$22	8.4	$362	2.1	$21	6.3	$63	1	$2,629	5.3	$284	3.9	$492	BC3000x2100
3000	2400	1000	1	300	150	$4,107	$4,149	26%	10%	$4,658	$4,705	$4,157	$5,134	-9%	-8%	0.5	$12	0.5	$45	3.0	$112	0.7	$219	3.0	$112	2.3	$23	9.5	$410	2.3	$23	7.2	$72	1	$2,737	5.9	$316	4.4	$548	BC3000x2400
3000	2700	1000	1	300	150	$4,431	$4,445	26%	10%	$5,025	$5,040	$4,484	$5,538	-9%	-9%	0.5	$12	0.5	$45	3.0	$112	0.8	$247	3.0	$112	2.5	$25	10.7	$459	2.6	$26	8.1	$81	1	$2,912	6.5	$348	4.8	$605	BC3000x2700
3000	3000	1000	1	300	150	$4,722	$4,707	26%	10%	$5,355	$5,338					0.5	$12	0.5	$46	3.0	$112	0.9	$274	3.0	$112	2.7	$27	11.8	$509	2.8	$28	9.0	$90	1	$3,053	7.1	$381	5.3	$661	BC3000x3000
3300	1200	1000	1	300	150	$3,294	$3,462	26%	10%	$3,735	$3,926					0.5	$12	0.5	$44	3.3	$124	0.4	$110	3.3	$124	1.7	$17	5.1	$221	1.2	$12	4.0	$40	1	$2,496	3.6	$192	2.7	$333	BC3300x1200
3300	1500	1000	1	300	150	$3,590	$3,732	26%	10%	$4,071	$4,232					0.5	$12	0.5	$44	3.3	$124	0.5	$137	3.3	$124	1.9	$19	6.2	$268	1.3	$13	5.0	$50	1	$2,647	4.2	$224	3.1	$390	BC3300x1500
3300	1800	1000	1	300	150	$3,888	$4,002	26%	10%	$4,409	$4,539					0.5	$12	0.5	$44	3.3	$124	0.5	$165	3.3	$124	2.1	$21	7.3	$314	1.4	$14	5.9	$59	1	$2,797	4.8	$257	3.8	$446	BC3300x1800
3300	2100	1000	1	300	150	$4,186	$4,273	26%	10%	$4,747	$4,845	$4,127	$5,097	-7%	-5%	0.5	$12	0.5	$45	3.3	$124	0.6	$192	3.3	$124	2.3	$23	8.4	$362	1.5	$15	6.9	$69	1	$2,948	5.4	$289	4.0	$502	BC3300x2100
3300	2400	1000	1	300	150	$4,485	$4,543	26%	10%	$5,086	$5,152					0.5	$12	0.5	$45	3.3	$124	0.7	$219	3.3	$124	2.4	$24	9.5	$410	1.6	$16	7.9	$79	1	$3,099	6.0	$322	4.5	$558	BC3300x2400
3300	2700	1000	1	300	150	$4,785	$4,814	26%	10%	$5,426	$5,459					0.5	$12	0.5	$45	3.3	$124	0.8	$247	3.3	$124	2.6	$26	10.7	$459	1.8	$18	8.9	$89	1	$3,250	6.6	$354	4.9	$615	BC3300x2700
3300	3000	1000	1	300	150	$5,086	$5,085	26%	10%	$5,767	$5,766					0.5	$12	0.5	$46	3.3	$124	0.9	$274	3.3	$124	2.8	$28	11.8	$509	1.9	$19	9.9	$99	1	$3,401	7.2	$386	5.4	$671	BC3300x3000
3300	3300	1000	1	300	150	$5,387	$5,356	26%	10%	$6,109	$6,073					0.5	$12	0.5	$46	3.3	$124	1.0	$302	3.3	$124	3.0	$30	13.0	$560	2.1	$21	10.9	$109	1	$3,552	7.8	$419	5.8	$727	BC3300x3300
3600	1200	1000	1	300	150	$3,613	$3,802	26%	10%	$4,098	$4,311	$3,919	$4,840	-15%	-11%	0.5	$12	0.5	$44	3.6	$135	0.4	$110	3.6	$135	1.8	$18	5.1	$221	0.8	$8	4.3	$43	1	$2,800	3.7	$198	2.7	$343	BC3600x1200
3600	1500	1000	1	300	150	$3,905	$4,066	26%	10%	$4,428	$4,611	$4,043	$4,993	-11%	-8%	0.5	$12	0.5	$44	3.6	$135	0.5	$137	3.6	$135	2.0	$20	6.2	$268	0.8	$8	5.4	$54	1	$2,946	4.3	$230	3.2	$399	BC3600x1500
3600	1800	1000	1	300	150	$4,198	$4,330	26%	10%	$4,760	$4,911	$4,270	$5,273	-10%	-7%	0.5	$12	0.5	$44	3.6	$135	0.5	$165	3.6	$135	2.2	$22	7.3	$314	0.8	$8	6.5	$65	1	$3,092	4.9	$262	3.6	$456	BC3600x1800
3600	2100	1000	1	300	150	$4,461	$4,565	26%	10%	$5,059	$5,177					0.5	$12	0.5	$45	3.6	$135	0.6	$192	3.6	$135	2.3	$23	8.4	$362	0.9	$9	7.6	$76	1	$3,208	5.5	$295	4.1	$512	BC3600x2100
3600	2400	1000	1	300	150	$4,725	$4,800	26%	10%	$5,358	$5,443	$4,567	$5,640	-5%	-3%	0.5	$12	0.5	$45	3.6	$135	0.7	$219	3.6	$135	2.5	$25	9.5	$410	0.9	$9	8.6	$86	1	$3,324	6.1	$327	4.5	$568	BC3600x2400
3600	2700	1000	1	300	150	$5,017	$5,062	26%	10%	$5,690	$5,740					0.5	$12	0.5	$45	3.6	$135	0.8	$247	3.6	$135	2.7	$27	10.7	$459	1.0	$10	9.7	$97	1	$3,467	6.7	$360	5.0	$624	BC3600x2700
3600	3000	1000	1	300	150	$5,298	$5,312	26%	10%	$6,008	$6,024					0.5	$12	0.5	$46	3.6	$135	0.9	$274	3.6	$135	2.9	$29	11.8	$509	1.0	$10	10.8	$108	1	$3,598	7.3	$392	5.4	$681	BC3600x3000
3600	3300	1000	1	300	150	$5,580	$5,562	26%	10%	$6,328	$6,307					0.5	$12	0.5	$46	3.6	$135	1.0	$302	3.6	$135	3.1	$31	13.0	$560	1.1	$11	11.9	$119	1	$3,729	7.9	$424	5.9	$737	BC3600x3300
3600	3600	1000	1	300	150	$5,863	$5,812	26%	10%	$6,648	$6,591					0.5	$12	0.5	$46	3.6	$135	1.1	$329	3.6	$135	3.2	$32	14.2	$611	1.2	$12	13.0	$130	1	$3,860	8.5	$457	6.3	$793	BC3600x3600
300	300	1000	1	300	150	$406	$448	26%	10%	$461	$508					0.2	$4	0.2	$13	0.3	$11	0.1	$27	0.3	$11	0.3	$3	0.8	$26	0.5	$5	0.1	$1	1	$269	0.7	$38	0.5	$66	BC300x300
450	300	1000	1	300	150	$481	$532	26%	10%	$545	$603	$331	$409	33%	48%	0.2	$4	0.2	$16	0.5	$17	0.1	$27	0.5	$17	0.3	$3	0.7	$32	0.6	$6	0.1	$1	1	$330	0.8	$41	0.6	$71	BC450x300
450	450	1000	1	300	150	$594	$651	26%	10%	$673	$738					0.2	$4	0.2	$16	0.5	$17	0.1	$41	0.5	$17	0.4	$4	0.9	$40	0.7	$7	0.2	$2	1	$388	1.1	$57	0.8	$99	BC450x450
600	300	1000	1	300	150	$580	$641	26%	10%	$658	$727	$419	$517	27%	41%	0.2	$5	0.2	$17	0.6	$22	0.1	$27	0.6	$22	0.4	$4	0.8	$34	0.6	$6	0.2	$2	1	$418	0.8	$44	0.8	$76	BC600x300
600	450	1000	1	300	150	$668	$734	26%	10%	$758	$833	$452	$558	36%	49%	0.2	$5	0.2	$17	0.6	$22	0.1	$41	0.6	$22	0.5	$5	1.0	$43	0.7	$7	0.3	$3	1	$451	1.1	$60	0.8	$104	BC600x450
600	600	1000	1	300	150	$756	$828	26%	10%	$858	$939					0.2	$5	0.2	$17	0.6	$22	0.2	$55	0.6	$22	0.5	$5	1.2	$52	0.8	$8	0.4	$4	1	$484	1.4	$76	1.1	$132	BC600x600
900	300	1000	1	300	150	$751	$831	26%	10%	$851	$942	$565	$698	22%	35%	0.3	$6	0.3	$22	0.9	$34	0.1	$27	0.9	$34	0.5	$5	1.0	$45	0.8	$8	0.3	$3	1	$560	0.9	$49	0.7	$86	BC900x300
900	600	1000	1	300	150	$988	$1,072	26%	10%	$1,121	$1,216					0.3	$6	0.3	$22	0.9	$34	0.2	$55	0.9	$34	0.6	$6	1.6	$68	1.0	$10	0.5	$5	1	$681	1.5	$82	1.1	$142	BC900x600
900	900	1000	1	300	150	$1,227	$1,314	26%	10%	$1,391	$1,490	$704	$869	60%	71%	0.3	$6	0.3	$23	0.9	$34	0.3	$82	0.9	$34	0.8	$8	2.1	$91	1.3	$13	0.8	$8	1	$802	2.1	$114	1.6	$198	BC900x900
1200	300	1000	1	300	150	$974	$1,074	26%	10%	$1,105	$1,218	$761	$940	18%	30%	0.3	$7	0.3	$26	1.2	$45	0.1	$27	1.2	$45	0.5	$5	1.2	$53	0.9	$9	0.4	$4	1	$759	1.0	$55	0.8	$96	BC1200x300
1200	600	1000	1	300	150	$1,161	$1,260	26%	10%	$1,317	$1,429	$826	$1,020	29%	40%	0.3	$7	0.3	$26	1.2	$45	0.2	$55	1.2	$45	0.7	$7	1.8	$80	1.1	$11	0.7	$7	1	$824	1.6	$87	1.2	$152	BC1200x600
1200	900	1000	1	300	150	$1,358	$1,455	26%	10%	$1,540	$1,650	$900	$1,112	39%	48%	0.3	$7	0.3	$26	1.2	$45	0.3	$82	1.2	$45	0.9	$9	2.5	$107	1.4	$14	1.1	$11	1	$898	2.2	$120	1.7	$208	BC1200x900
1200	1200	1000	1	300	150	$1,549	$1,644	26%	10%	$1,756	$1,864					0.3	$7	0.3	$27	1.2	$45	0.4	$110	1.2	$45	1.1	$11	3.1	$135	1.7	$17	1.4	$14	1	$966	2.8	$152	2.1	$264	BC1200x1200
525	525	1000	1	300	150	$713	$778	26%	10%	$808	$882					0.2	$4	0.2	$16	0.5	$20	0.2	$48	0.5	$20	0.5	$5	1.0	$44	0.7	$7	0.3	$3	1	$476	1.2	$67	0.9	$116	BC525x525
1500	1500	1000	1	300	150	$2,058	$2,169	26%	10%	$2,334	$2,460					0.3	$7	0.3	$27	1.5	$56	0.5	$137	1.5	$56	1.4	$14	3.8	$163	1.5	$15	2.3	$23	1	$1,336	3.5	$190	2.6	$330	BC1500x1500
2400	2400	1000	1	300	150	$3,477	$3,518	26%	10%	$3,942	$3,990					0.5	$11	0.5	$41	2.4	$90	0.7	$219	2.4	$90	2.2	$22	8.7	$374	2.9	$29	5.8	$58	1	$2,183	5.6	$305	4.2	$529	BC2400x2400

Box Culvert

Detailed Assumptions

1. Box Culvert Dimensions

Box Culvert dimensions are assumed according to standard drawing D-0031



2. Excavation

The excavation dimension are based on the standard drawing D-0031

w	W2	E
300	420	1000
375	500	1100
450	570	1200
600	730	1300
750	890	1500
900	1050	1700
1200	1360	2000
1520	1700	2300
1820	2010	2600
2130	2340	3000
2440	2670	3300

3. Precast Element

The cost of the precast element are based on the schedule of rate provided by a local supplier

4. Installation Costs

We have assumed the following Tradesman Hours for the installation of the precast elements

U Shell	2x1 hrs/m2
Fundation Base	0.35 hrs/m2

Contruction Aids such as crane are assumed to be used for 75% of the labour time

5. On Costs a On cost and overheads are calculated based on previous projects

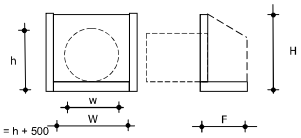
The detailed breakdown is provided in the general assumptions applicable to each asset element

Head Walls

Width	High	No	GF Rate (Base Rate + Exc.)	BF Rate (Base Rate + Exc.+ Dem.)	On-Costs	Discount	GF Rate and On-costs	BF Rate and On-costs	2004 Valuation	2004 Valuation Escalated	Difference		Wall, Slab and Apron Demolition		Tip Fee		Excavation		Back Filling		Precast Element		Installation		Installation Aids		Unit Rate Code
mm	mm				26%	10%				23.50%			m3	$305	m3/m	$10	m3	$43	m3	$10	No		mhrs	$54	hrs	$125	
													(1)				(1)					(2)	(3)		(3)		
100	100	1	$197	$278	26%	10%	$223	$316	$293	$362	-38%	-13%	0.26	$79	0.26	$3	0.2	$8	0.0	$0	1.00	$71	0.79	$43	0.60	$75	HW100
150	150	1	$254	$349	26%	10%	$288	$396	$293	$362	-20%	9%	0.30	$92	0.30	$3	0.2	$10	0.0	$0	1.00	$107	0.93	$50	0.70	$87	HW150
225	225	1	$344	$460	26%	10%	$390	$521	$293	$362	8%	44%	0.37	$112	0.37	$4	0.3	$14	0.0	$0	1.00	$160	1.15	$62	0.86	$108	HW225
300	300	1	$416	$555	26%	10%	$472	$630	$293	$362	30%	74%	0.44	$135	0.44	$4	0.4	$19	0.0	$0	1.00	$192	1.39	$75	1.04	$130	HW300
375	375	1	$477	$641	26%	10%	$541	$727					0.52	$159	0.52	$5	0.6	$24	0.0	$0	1.00	$208	1.66	$90	1.24	$155	HW375
400	400	1	$499	$672	26%	10%	$566	$762					0.55	$167	0.55	$5	0.6	$26	0.1	$1	1.00	$214	1.75	$95	1.31	$164	HW400
450	300	1	$477	$627	26%	10%	$541	$711					0.48	$145	0.48	$5	0.5	$22	0.0	$0	1.00	$236	1.49	$80	1.12	$139	HW450x300
450	450	1	$546	$737	26%	10%	$620	$836					0.61	$185	0.61	$6	0.7	$31	0.1	$1	1.00	$227	1.95	$105	1.46	$183	HW450
525	375	1	$633	$808	26%	10%	$717	$917					0.56	$170	0.56	$6	0.6	$28	0.1	$1	1.00	$343	1.76	$95	1.32	$165	HW525x375
525	450	1	$742	$939	26%	10%	$842	$1,065					0.63	$191	0.63	$6	0.8	$33	0.1	$1	1.00	$412	2.00	$108	1.50	$188	HW525x450
525	525	1	$646	$865	26%	10%	$732	$981					0.70	$212	0.70	$7	0.9	$38	0.2	$2	1.00	$272	2.26	$122	1.70	$212	HW525
600	300	1	$573	$735	26%	10%	$650	$833					0.51	$156	0.51	$5	0.6	$25	0.1	$1	1.00	$314	1.58	$85	1.19	$148	HW600x300
600	375	1	$691	$873	26%	10%	$784	$990					0.58	$176	0.58	$6	0.7	$30	0.1	$1	1.00	$393	1.82	$98	1.36	$170	HW600x375
600	600	1	$756	$1,006	26%	10%	$858	$1,141	$644	$795	8%	43%	0.79	$242	0.79	$8	1.1	$47	0.3	$3	1.00	$323	2.60	$140	1.95	$243	HW600
675	675	1	$888	$1,170	26%	10%	$1,007	$1,327					0.90	$273	0.90	$9	1.3	$57	0.4	$4	1.00	$390	2.96	$160	2.22	$277	HW675
750	600	1	$1,245	$1,508	26%	10%	$1,412	$1,710					0.84	$255	0.84	$8	1.2	$53	0.4	$4	1.00	$785	2.73	$147	2.05	$256	HW750x600
750	750	1	$1,033	$1,349	26%	10%	$1,171	$1,529					1.00	$306	1.00	$10	1.6	$68	0.6	$6	1.00	$466	3.34	$180	2.50	$313	HW750
825	375	1	$868	$1,068	26%	10%	$985	$1,211					0.63	$193	0.63	$6	0.8	$35	0.2	$2	1.00	$540	1.97	$107	1.48	$185	HW825x375
825	825	1	$1,191	$1,542	26%	10%	$1,350	$1,749	$942	$1,163	16%	50%	1.12	$340	1.12	$11	1.9	$81	0.8	$8	1.00	$549	3.75	$202	2.81	$351	HW825
900	900	1	$1,361	$1,751	26%	10%	$1,544	$1,985	$1,041	$1,286	20%	54%	1.24	$377	1.24	$12	2.2	$95	1.0	$10	1.00	$640	4.18	$225	3.13	$391	HW900
1050	1050	1	$1,882	$2,352	26%	10%	$2,134	$2,667	$1,240	$1,531	39%	74%	1.49	$455	1.49	$15	3.0	$128	1.5	$15	1.00	$985	5.11	$276	3.83	$479	HW1050
1200	375	1	$1,063	$1,292	26%	10%	$1,205	$1,465					0.73	$222	0.73	$7	1.0	$44	0.3	$3	1.00	$685	2.24	$121	1.68	$210	HW1200x375
1200	450	1	$1,140	$1,394	26%	10%	$1,293	$1,580					0.80	$245	0.80	$8	1.2	$52	0.4	$4	1.00	$712	2.52	$136	1.89	$236	HW1200x450
1200	600	1	$1,270	$1,575	26%	10%	$1,440	$1,786					0.97	$296	0.97	$10	1.6	$70	0.7	$7	1.00	$731	3.12	$169	2.34	$293	HW1200x600
1200	600	1	$1,270	$1,575	26%	10%	$1,440	$1,786					0.97	$296	0.97	$10	1.6	$70	0.7	$7	1.00	$731	3.12	$169	2.34	$293	HW1200x600
1200	900	1	$1,562	$1,985	26%	10%	$1,772	$2,251					1.34	$409	1.34	$13	2.6	$114	1.3	$13	1.00	$769	4.51	$244	3.38	$423	HW1200x900
1200	1200	1	$2,477	$3,036	26%	10%	$2,809	$3,443	$1,439	$1,777	58%	94%	1.77	$541	1.77	$18	3.9	$168	2.1	$21	1.00	$1,383	6.13	$331	4.60	$574	HW1200
1250	1250	1	$2,881	$3,471	26%	10%	$3,267	$3,936					1.87	$571	1.87	$19	4.2	$183	2.4	$24	1.00	$1,716	6.49	$350	4.87	$608	HW1250
1350	1350	1	$3,738	$4,392	26%	10%	$4,238	$4,980	$1,638	$2,023	110%	146%	2.08	$633	2.08	$21	5.0	$215	2.9	$29	1.00	$2,423	7.24	$391	5.43	$679	HW1350
1500	600	1	$1,341	$1,674	26%	10%	$1,521	$1,899					1.06	$323	1.06	$11	1.9	$82	0.8	$8	1.00	$750	3.39	$183	2.54	$318	HW1500x600
1500	1500	1	$5,144	$5,901	26%	10%	$5,833	$6,691	$1,837	$2,269	157%	195%	2.41	$733	2.41	$24	6.3	$271	3.9	$39	1.00	$3,585	8.45	$456	6.34	$792	HW1500
1650	1650	1	$6,099	$6,967	26%	10%	$6,917	$7,900	$2,036	$2,514	175%	214%	2.76	$840	2.76	$28	7.8	$335	5.0	$50	1.00	$4,272	9.76	$527	7.32	$915	HW1650
1800	1800	1	$7,146	$8,131	26%	10%	$8,103	$9,220	$2,235	$2,760	194%	234%	3.13	$954	3.13	$31	9.5	$409	6.4	$64	1.00	$5,025	11.15	$602	8.36	$1,045	HW1800
2030	2030	1	$8,334	$9,513	26%	10%	$9,451	$10,788					3.75	$1,142	3.75	$37	12.6	$543	8.9	$89	1.00	$5,712	13.47	$727	10.10	$1,263	HW2030
2100	600	1	$4,726	$5,115	26%	10%	$5,360	$5,801					1.24	$376	1.24	$12	2.5	$105	1.2	$12	1.00	$4,030	3.92	$212	2.94	$367	HW2100x600
2100	750	1	$5,884	$6,338	26%	10%	$6,672	$7,187					1.44	$439	1.44	$14	3.2	$136	1.7	$17	1.00	$5,038	4.69	$253	3.52	$440	HW2100x750
2100	1200	1	$9,435	$10,111	26%	10%	$10,699	$11,466					2.15	$655	2.15	$21	5.9	$252	3.7	$37	1.00	$8,060	7.35	$397	5.51	$689	HW2100x1200
2100	2100	1	$8,724	$9,966	26%	10%	$9,893	$11,302	$2,633	$3,252	204%	248%	3.95	$1,203	3.95	$39	13.7	$589	9.7	$97	1.00	$5,937	14.22	$768	10.67	$1,333	HW2100
2400	600	1	$5,355	$5,771	26%	10%	$6,072	$6,545					1.32	$403	1.32	$13	2.7	$117	1.4	$14	1.00	$4,606	4.18	$226	3.14	$392	HW2400x600
2400	1500	1	$13,425	$14,316	26%	10%	$15,224	$16,235					2.83	$863	2.83	$28	9.0	$387	6.2	$62	1.00	$11,514	9.89	$534	7.42	$927	HW2400x1500
2400	2400	1	$12,865	$14,393	26%	10%	$14,588	$16,322	$3,030	$3,742	290%	336%	4.86	$1,480	4.86	$49	18.9	$814	14.1	$141	1.00	$9,300	17.67	$954	13.25	$1,656	HW2400
2700	900	1	$8,925	$9,516	26%	10%	$10,121	$10,791					1.88	$572	1.88	$19	4.9	$209	3.0	$30	1.00	$7,772	6.19	$334	4.64	$580	HW2700x900
3000	3000	1	$20,877	$23,067	26%	10%	$23,674	$26,158	$3,826	$4,725	401%	454%	6.96	$2,120	6.96	$70	33.1	$1,422	26.1	$261	1.00	$15,400	25.67	$1,386	19.26	$2,407	HW3000
3300	2100	1	$25,636	$27,103	26%	10%	$29,072	$30,735					4.66	$1,420	4.66	$47	19.8	$850	15.1	$151	1.00	$22,165	16.72	$903	12.54	$1,567	HW3300x2100
5400	5400	1	$75,251	$81,260	26%	10%	$85,335	$92,149					19.09	$5,818	19.09	$191	156.6	$6,736	137.6	$1,376	1.00	$56,409	72.63	$3,922	54.47	$6,809	HW5400

Detailed Assumptions

1. Headwall Dimension



H = h + 500
W = w + 2*300
F = 0.75 * H

In the case of a pipe h=w=diameter

The excavation for the headwalls are assumed to be equivalent to the W*F*H volume

2. Supply Costs

Precast element cost have been extracted from Humes prices provided on 04/06/07

3. Installation

We have assumed the following Tradesman Hours for the installation of the precast elements
Headwalls 0.8 hrs/m2

Contruction Aids such as crane are assumed to be used for 75% of the labour time

4. On Costs and Overheads

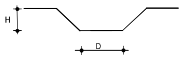
On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Open Drain

Base Width	Depth	Type	Excavation Grade		GF Rate (Base Rate + Exc.)	On-Costs	Discount	GF Rate and On-costs	2004 Valuation	2004 Valuation Escalated	Difference	Surface Demolition		Tip Fee		Excavation		Tufting		Concrete		Steel		Unit Rate Code
mm	mm					26%	10%			23.50%		m3/m	$42	m3/m	$10	m3/m	$15	m2/m	$5.46	m3/m	$239	m2/m	$8.94	
						(4)										(1)				(2)				
500	500	L	1.5	34°	$112	26.0%	10%	$128	$134	$165	-23%	0.3	$14	0.7	$7	0.6	$9	0.0	$0	1	0.35	$83	2.3	$21 L500-500
500	1000	L	1.5	34°	$214	26.0%	10%	$242	$233	$287	-16%	0.6	$26	1.2	$12	2.0	$30	0.0	$0	1	0.62	$147	4.1	$37 L500-1000
500	1500	L	1.5	34°	$326	26.0%	10%	$370	$341	$422	-12%	0.9	$37	1.8	$18	4.1	$61	0.0	$0	1	0.89	$212	5.9	$53 L500-1500
500	2000	L	1.5	34°	$449	26.0%	10%	$510	$459	$567	-10%	1.2	$48	2.3	$23	7.0	$104	0.0	$0	1	1.16	$277	7.7	$69 L500-2000
1000	500	L	1.5	34°	$139	26.0%	10%	$157	$134	$165	-5%	0.4	$17	0.8	$8	0.9	$13	0.0	$0	1	0.42	$101	2.8	$25 L1000-500
1000	1000	L	1.5	34°	$243	26.0%	10%	$276	$233	$287	-4%	0.7	$29	1.4	$14	2.5	$37	0.0	$0	1	0.69	$165	4.6	$41 L1000-1000
1000	1500	L	1.5	34°	$359	26.0%	10%	$408	$341	$422	-3%	1.0	$40	1.9	$19	4.9	$72	0.0	$0	1	0.96	$230	6.4	$57 L1000-1500
1000	2000	L	1.5	34°	$487	26.0%	10%	$552	$459	$567	-3%	1.2	$51	2.5	$25	8.0	$119	0.0	$0	1	1.23	$295	8.2	$73 L1000-2000
2000	500	L	1.5	34°	$191	26.0%	10%	$216	$184	$227	-5%	0.6	$24	1.1	$11	1.4	$20	0.0	$0	1	0.57	$136	3.8	$34 L2000-500
2000	1000	L	1.5	34°	$303	26.0%	10%	$344	$289	$357	-4%	0.8	$35	1.7	$17	3.5	$52	0.0	$0	1	0.84	$201	5.6	$50 L2000-1000
2000	1500	L	1.5	34°	$427	26.0%	10%	$484	$404	$499	-3%	1.1	$46	2.2	$22	6.4	$94	0.0	$0	1	1.11	$266	7.4	$66 L2000-1500
2000	2000	L	1.5	34°	$561	26.0%	10%	$636	$528	$652	-2%	1.4	$57	2.8	$28	10.0	$148	0.0	$0	1	1.38	$330	9.2	$82 L2000-2000
3000	500	L	1.5	34°	$243	26.0%	10%	$276	$234	$288	-4%	0.7	$30	1.4	$14	1.9	$28	0.0	$0	1	0.72	$172	4.8	$43 L3000-500
3000	1000	L	1.5	34°	$383	26.0%	10%	$411	$345	$426	-4%	1.0	$41	2.0	$20	4.5	$67	0.0	$0	1	0.99	$237	6.6	$59 L3000-1000
3000	1500	L	1.5	34°	$494	26.0%	10%	$560	$466	$576	-3%	1.3	$52	2.5	$25	7.9	$117	0.0	$0	1	1.26	$302	8.4	$75 L3000-1500
3000	2000	L	1.5	34°	$636	26.0%	10%	$721	$597	$737	-2%	1.5	$64	3.1	$31	12.0	$178	0.0	$0	1	1.53	$366	10.2	$91 L3000-2000
4000	500	L	1.5	34°	$295	26.0%	10%	$335	$284	$350	-4%	0.9	$36	1.7	$17	2.4	$35	0.0	$0	1	0.87	$208	5.8	$52 L4000-500
4000	1000	L	1.5	34°	$422	26.0%	10%	$479	$401	$496	-3%	1.1	$47	2.3	$23	5.5	$82	0.0	$0	1	1.14	$273	7.6	$68 L4000-1000
4000	1500	L	1.5	34°	$561	26.0%	10%	$636	$529	$653	-3%	1.4	$59	2.8	$28	9.4	$139	0.0	$0	1	1.41	$338	9.4	$84 L4000-1500
4000	2000	L	1.5	34°	$710	26.0%	10%	$805	$665	$822	-2%	1.7	$70	3.4	$34	14.0	$207	0.0	$0	1	1.68	$402	11.2	$100 L4000-2000
5000	500	L	1.5	34°	$348	26.0%	10%	$394	$334	$412	-4%	1.0	$42	2.0	$20	2.9	$43	0.0	$0	1	1.02	$244	6.8	$61 L5000-500
5000	1000	L	1.5	34°	$482	26.0%	10%	$547	$458	$565	-3%	1.3	$54	2.6	$26	6.5	$96	0.0	$0	1	1.29	$309	8.6	$77 L5000-1000
5000	1500	L	1.5	34°	$628	26.0%	10%	$712	$591	$730	-3%	1.6	$65	3.1	$31	10.9	$161	0.0	$0	1	1.56	$373	10.4	$93 L5000-1500
5000	2000	L	1.5	34°	$784	26.0%	10%	$890	$734	$907	-2%	1.8	$76	3.7	$37	16.0	$237	0.0	$0	1	1.83	$438	12.2	$109 L5000-2000
500	500	U	5	11°	$53	26.0%	10%	$60	$54	$67	-10%	0.0	$0	0.0	$0	1.5	$22	5.6	$31	0	0.00	$0	0.0	$0 U500-500
500	1000	U	5	11°	$140	26.0%	10%	$159	$139	$172	-8%	0.0	$0	0.0	$0	5.5	$82	10.7	$58	0	0.00	$0	0.0	$0 U500-1000
500	1500	U	5	11°	$264	26.0%	10%	$299	$255	$315	-5%	0.0	$0	0.0	$0	12.0	$178	15.8	$86	0	0.00	$0	0.0	$0 U500-1500
500	2000	U	5	11°	$425	26.0%	10%	$482	$403	$498	-3%	0.0	$0	0.0	$0	21.0	$311	20.9	$114	0	0.00	$0	0.0	$0 U500-2000
1000	500	U	5	11°	$59	26.0%	10%	$67	$54	$67	1%	0.0	$0	0.0	$0	1.8	$26	6.1	$33	0	0.00	$0	0.0	$0 U1000-500
1000	1000	U	5	11°	$150	26.0%	10%	$170	$139	$172	-1%	0.0	$0	0.0	$0	6.0	$89	11.2	$61	0	0.00	$0	0.0	$0 U1000-1000
1000	1500	U	5	11°	$278	26.0%	10%	$315	$255	$315	0%	0.0	$0	0.0	$0	12.8	$189	16.3	$89	0	0.00	$0	0.0	$0 U1000-1500
1000	2000	U	5	11°	$443	26.0%	10%	$502	$403	$498	1%	0.0	$0	0.0	$0	22.0	$326	21.4	$117	0	0.00	$0	0.0	$0 U1000-2000
2000	500	U	5	11°	$72	26.0%	10%	$82	$81	$100	-19%	0.0	$0	0.0	$0	2.3	$33	7.1	$39	0	0.00	$0	0.0	$0 U2000-500
2000	1000	U	5	11°	$170	26.0%	10%	$193	$179	$221	-13%	0.0	$0	0.0	$0	7.0	$104	12.2	$67	0	0.00	$0	0.0	$0 U2000-1000
2000	1500	U	5	11°	$306	26.0%	10%	$347	$308	$380	-9%	0.0	$0	0.0	$0	14.3	$211	17.3	$94	0	0.00	$0	0.0	$0 U2000-1500
2000	2000	U	5	11°	$478	26.0%	10%	$542	$468	$578	-6%	0.0	$0	0.0	$0	24.0	$356	22.4	$122	0	0.00	$0	0.0	$0 U2000-2000
3000	500	U	5	11°	$85	26.0%	10%	$96	$95	$117	-18%	0.0	$0	0.0	$0	2.8	$41	8.1	$44	0	0.00	$0	0.0	$0 U3000-500
3000	1000	U	5	11°	$191	26.0%	10%	$216	$199	$246	-12%	0.0	$0	0.0	$0	8.0	$119	13.2	$72	0	0.00	$0	0.0	$0 U3000-1000
3000	1500	U	5	11°	$333	26.0%	10%	$378	$334	$413	-8%	0.0	$0	0.0	$0	15.8	$233	18.3	$100	0	0.00	$0	0.0	$0 U3000-1500
3000	2000	U	5	11°	$513	26.0%	10%	$582	$500	$618	-6%	0.0	$0	0.0	$0	26.0	$385	23.4	$128	0	0.00	$0	0.0	$0 U3000-2000
4000	500	U	5	11°	$98	26.0%	10%	$111				0.0	$0	0.0	$0	3.3	$48	9.1	$50	0	0.00	$0	0.0	$0 U4000-500
4000	1000	U	5	11°	$211	26.0%	10%	$239				0.0	$0	0.0	$0	9.0	$133	14.2	$78	0	0.00	$0	0.0	$0 U4000-1000
4000	1500	U	5	11°	$361	26.0%	10%	$409				0.0	$0	0.0	$0	17.3	$256	19.3	$105	0	0.00	$0	0.0	$0 U4000-1500
4000	2000	U	5	11°	$548	26.0%	10%	$622				0.0	$0	0.0	$0	28.0	$415	24.4	$133	0	0.00	$0	0.0	$0 U4000-2000
5000	500	U	5	11°	$111	26.0%	10%	$126				0.0	$0	0.0	$0	3.8	$56	10.1	$55	0	0.00	$0	0.0	$0 U5000-500
5000	1000	U	5	11°	$231	26.0%	10%	$262				0.0	$0	0.0	$0	10.0	$148	15.2	$83	0	0.00	$0	0.0	$0 U5000-1000
5000	1500	U	5	11°	$389	26.0%	10%	$441				0.0	$0	0.0	$0	18.8	$278	20.3	$111	0	0.00	$0	0.0	$0 U5000-1500
5000	2000	U	5	11°	$583	26.0%	10%	$661				0.0	$0	0.0	$0	30.0	$445	25.4	$139	0	0.00	$0	0.0	$0 U5000-2000
500	500	PL	6	9°	$84	26.0%	10%	$96	$64	$79	20%	0.1	$3	0.2	$2	1.8	$26	6.6	$36	1	0.08	$18	0.5	$4 PL500-500
500	1000	PL	6	9°	$188	26.0%	10%	$213	$166	$205	4%	0.1	$3	0.2	$2	6.5	$96	12.7	$69	1	0.08	$18	0.5	$4 PL500-1000
500	1500	PL	6	9°	$336	26.0%	10%	$381	$306	$377	1%	0.1	$3	0.2	$2	14.3	$211	16.7	$102	1	0.08	$18	0.5	$4 PL500-1500
500	2000	PL	6	9°	$528	26.0%	10%	$599	$482	$596	1%	0.1	$3	0.2	$2	25.0	$371	24.8	$136	1	0.08	$18	0.5	$4 PL500-2000
1000	500	PL	6	9°	$113	26.0%	10%	$128	$114	$141	-9%	0.2	$6	0.3	$3	2.0	$30	7.1	$39	1	0.15	$36	1.0	$9 PL1000-500
1000	1000	PL	6	9°	$220	26.0%	10%	$250	$222	$275	-9%	0.2	$6	0.3	$3	7.0	$104	13.2	$72	1	0.15	$36	1.0	$9 PL1000-1000
1000	1500	PL	6	9°	$372	26.0%	10%	$422	$368	$455	-7%	0.2	$6	0.3	$3	15.0	$222	19.2	$105	1	0.15	$36	1.0	$9 PL1000-1500
1000	2000	PL	6	9°	$568	26.0%	10%	$645	$551	$681	-5%	0.2	$6	0.3	$3	26.0	$385	25.3	$138	1	0.15	$36	1.0	$9 PL1000-2000
2000	500	PL	6	9°	$171	26.0%	10%	$194	$111	$136	42%	0.3	$12	0.6	$6	2.5	$37	8.1	$44	1	0.30	$72	2.0	$18 PL2000-500
2000	1000	PL	6	9°	$286	26.0%	10%	$324	$279	$344	-6%	0.3	$12	0.6	$6	8.0	$119	14.2	$77	1	0.30	$72	2.0	$18 PL2000-1000
2000	1500	PL	6	9°	$445	26.0%	10%	$504	$431	$532	-5%	0.3	$12	0.6	$6	16.5	$245	20.2	$111	1	0.30	$72	2.0	$18 PL2000-1500
2000	2000	PL	6	9°	$648	26.0%	10%	$735	$620	$766	-4%	0.3	$12	0.6	$6	28.0	$415	26.3	$144	1	0.30	$72	2.0	$18 PL2000-2000
3000	500	PL	6	9°	$229	26.0%	10%	$259	$214	$265	-2%	0.5	$19	0.9	$9	3.0	$44	9.1	$50	1	0.45	$108	3.0	$27 PL3000-500
3000	1000	PL	6	9°	$351	26.0%	10%	$398	$335	$414	-4%	0.5	$19	0.9	$9	9.0	$133	15.2	$83	1	0.45	$108	3.0	$27 PL3000-1000
3000	1500	PL	6	9°	$517	26.0%	10%	$587	$493	$609	-4%	0.5	$19	0.9	$9	18.0	$267	21.2	$116	1	0.45	$108	3.0	$27 PL3000-1500
3000	2000	PL	6	9°	$728	26.0%	10%	$826	$689	$851	-3%	0.5	$19	0.9	$9	30.0	$445	27.3	$149	1	0.45	$108	3.0	$27 PL3000-2000
4000	500	PL	6	9°	$286	26.0%	10%	$325	$264	$326	-1%	0.6	$25	1.2	$12	3.5	$52	10.1	$55	1	0.60	$144	4.0	$36 PL4000-500
4000	1000	PL	6	9°	$416	26.0%	10%	$471	$391	$483	-2%	0.6	$25	1.2	$12	10.0	$148	16.2	$88	1	0.60	$144	4.0	$36 PL4000-1000
4000	1500	PL	6	9°	$590	26.0%	10%	$669	$556	$686	-3%	0.6	$25	1.2	$12	19.5	$289	22.2	$121	1	0.60	$144	4.0	$36 PL4000-1500
4000	2000	PL	6	9°	$808	26.0%	10%	$917	$757	$935	-2%	0.6	$25	1.2	$12	32.0	$474	28.3	$155	1	0.60	$144	4.0	$36 PL4000-2000
5000	500	PL	6	9°	$344	26.0%	10%	$390	$314	$388	0%	0.8	$31	1.5	$15	4.0	$59	11.1	$61	1	0.75	$179	5.0	$45 PL5000-500
5000	1000	PL	6	9°	$481	26.0%	10%	$545	$447	$553	-1%	0.8	$31	1.5	$15	11.0	$163	17.2	$94	1	0.75	$179	5.0	$45 PL5000-1000
5000	1500	PL	6	9°	$662	26.0%	10%	$751	$618	$763	-2%	0.8	$31	1.5	$15	21.0	$311	23.2	$127	1	0.75	$179	5.0	$45 PL5000-1500
5000	2000	PL	6	9°	$888	26.0%	10%	$1,007	$826	$1,020	-1%	0.8	$31	1.5	$15	34.0	$504	29.3	$160	1	0.75	$179	5.0	$45 PL5000-2000

Detailed Assumptions

1. Open Drain Dimensions



2. Lined

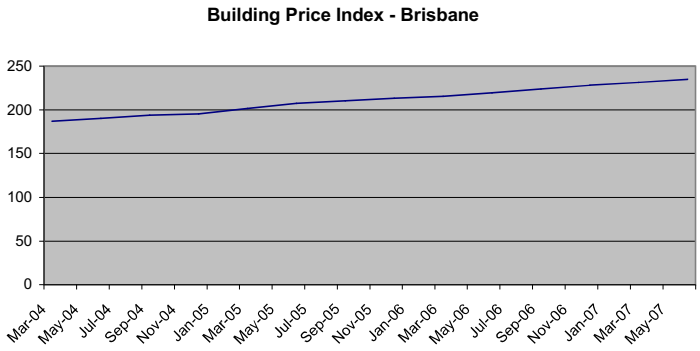
For lined drain it is assumed a concrete thickness of 150mm
For partially lined drain it is assumed a concrete surface of 50%

4. On Costs and Overheads

On cost and overheads are calculated based on previous projects
The detailed breakdown is provided in the general assumptions applicable to each asset element

Escalation - Building Price Index

Date	BPI	
31/03/2004	187	
30/06/2004	190.4	2004 Evaluation
30/09/2004	193.8	
31/12/2004	195.5	
31/03/2005	201.37	
30/06/2005	207.23	
30/09/2005	210.16	
31/12/2005	213.1	
31/03/2006	215.23	
30/06/2006	219.49	
30/09/2006	223.76	
31/12/2006	228.02	
31/03/2007	231.33	
30/06/2007	235.06	2007 Evaluation



% Variation (June to June)	
2004-2007	23.5%
2005-2007	13.4%
2006-2007	7.1%
09/06 - 06/07	5.0%

On Cost and Overheads

	2007 Revaluation*	Council Rates						RSC Water Waste	2004 Revaluation
Site Establishment (Incl. traffic control)	2.9%	0.9%	3.3%	5.5%	1.2%	3.4%	2.9%		
Construction On-Costs	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	11.0%	4.0%	
Project Management & Administration	3.5%	3.4%	3.4%	3.3%	3.0%	3.3%	4.5%	3.0%	
Planning								5.0%	
Design	6.0%	6.0%	6.0%	6.0%	5.0%	6.0%	6.7%	5.0%	
Surveys	4.2%	4.6%	5.0%	5.0%	3.0%	5.0%	2.3%	3.0%	
Total On Costs	**26%**	**25.9%**	**28.7%**	**30.8%**	**23.2%**	**28.7%**	**27.4%**	**20.0%**	**25%**

* average from Council rates

On Cost Factor	26%
Discount Factor	10%

Appendix B

Local Rates and Council Schedule of Rate

Benchmark Summary Table

Pipes

Diameter	Type	Units	Average	Min	Max	Oncost rate Range		Average	Min Rate	Max Rate
300	RCP	m	$103	$65	$166	1.22	1.32	$131	$80	$219
375	RCP	m	$146	$87	$459	1.22	1.32	$185	$107	$606
450	RCP	m	$195	$110	$433	1.22	1.32	$248	$134	$571
525	RCP	m	$195	$132	$383	1.22	1.32	$248	$160	$506
600	RCP	m	$217	$152	$303	1.22	1.32	$276	$185	$400
750	RCP	m	$293	$233	$384	1.22	1.32	$373	$284	$507
825	RCP	m	$345	$212	$488	1.22	1.32	$438	$259	$644
900	RCP	m	$401	$246	$611	1.22	1.32	$509	$300	$806
1050	RCP	m	$486	$314	$797	1.22	1.32	$617	$383	$1,052
1200	RCP	m	$637	$319	$1,000	1.22	1.32	$810	$389	$1,320
1350	RCP	m	$918	$568	$1,409	1.22	1.32	$1,166	$693	$1,860
1500	RCP	m	$1,218	$835	$1,486	1.22	1.32	$1,546	$1,019	$1,962
1650	RCP	m	$1,665	$1,573	$1,757	1.22	1.32	$2,115	$1,919	$2,319
1800	RCP	m	$1,453	$805	$2,052	1.22	1.32	$1,845	$982	$2,709
1950	RCP	m	$2,419	$2,234	$2,605	1.22	1.32	$3,073	$2,726	$3,438
2100	RCP	m	$2,744	$2,614	$2,874	1.22	1.32	$3,485	$3,189	$3,793
100	uPVC	m	$127	$64	$205	1.22	1.32	$161	$77	$270
150	uPVC	m	$135	$81	$243	1.22	1.32	$172	$99	$321
225	uPVC	m	$169	$95	$334	1.22	1.32	$214	$116	$440
250	uPVC	m	$171	$115	$336	1.22	1.32	$217	$141	$443
300	FRC	m	$134	$93	$198	1.22	1.32	$170	$114	$261
375	FRC	m	$154	$123	$231	1.22	1.32	$196	$149	$305
450	FRC	m	$192	$118	$284	1.22	1.32	$244	$145	$375
525	FRC	m	$236	$145	$359	1.22	1.32	$299	$176	$474
600	FRC	m	$264	$171	$434	1.22	1.32	$336	$209	$573
675	FRC	m	$338	$169	$531	1.22	1.32	$429	$207	$700
750	FRC	m	$412	$255	$632	1.22	1.32	$523	$311	$835

Headwalls

Item	Diameter	Units	Average	Min	Max	Oncost Range		Average	Min	Max
Headwall	300	each	$638	$384	$776	1.22	1.32	$810	$468	$1,025
Headwall	375	each	$1,093	$579	$2,388	1.22	1.32	$1,388	$707	$3,153
Headwall	450	each	$1,139	$454	$2,029	1.22	1.32	$1,447	$554	$2,679
Headwall	525	each	$1,668	$951	$2,243	1.22	1.32	$2,119	$1,160	$2,960
Headwall	600	each	$1,543	$646	$2,465	1.22	1.32	$1,960	$788	$3,254
Headwall	750	each	$1,467	$1,467	$1,467	1.22	1.32	$1,863	$1,790	$1,937
Headwall	825	each				1.22	1.32			
Headwall	900	each	$1,280	$1,280	$1,280	1.22	1.32	$1,626	$1,562	$1,690
Headwall	1050	each	$2,470	$2,470	$2,470	1.22	1.32	$3,137	$3,013	$3,260
Headwall	1200	each	$2,766	$2,766	$2,766	1.22	1.32	$3,513	$3,375	$3,651
Headwall	1350	each				1.22	1.32			
Headwall	1500	each	$7,170	$7,170	$7,170	1.22	1.32	$9,106	$8,747	$9,464
Headwall	1650	each				1.22	1.32			
Headwall	1800	each	$10,050	$10,050	$10,050	1.22	1.32	$12,764	$12,261	$13,266
Headwall	1950	each				1.22	1.32			
Headwall	2100	each	$9,895	$9,895	$9,895	1.22	1.32	$12,567	$12,072	$13,061

Box Culverts

Item	Width	Height	Type	Units	Average	Min	Max	Oncost rate		Average	Min	Max
Box Culvert	1200	300	RCBC	m	$1,181	$1,084	$1,277	1.22	1.32	$1,500	$1,323	$1,686
Box Culvert	1200	450	RCBC	m	$1,212	$959	$1,376	1.22	1.32	$1,539	$1,170	$1,816
Box Culvert	1200	600	RCBC	m	$1,317	$1,177	$1,458	1.22	1.32	$1,673	$1,436	$1,924
Box Culvert	1200	750	RCBC	m	$1,540	$1,540	$1,540	1.22	1.32	$1,955	$1,878	$2,032
Box Culvert	1200	900	RCBC	m	$1,472	$995	$1,932	1.22	1.32	$1,869	$1,214	$2,551
Box Culvert	1200	1200	RCBC	m	$2,366	$2,366	$2,366	1.22	1.32	$3,004	$2,886	$3,123
Box Culvert	1500	450	RCBC	m	$1,647	$1,558	$1,736	1.22	1.32	$2,092	$1,901	$2,292
Box Culvert	1500	600	RCBC	m	$1,561	$1,460	$1,663	1.22	1.32	$1,983	$1,781	$2,195
Box Culvert	1500	750	RCBC	m	$1,765	$1,765	$1,765	1.22	1.32	$2,242	$2,153	$2,330
Box Culvert	1500	900	RCBC	m	$1,796	$1,723	$1,870	1.22	1.32	$2,281	$2,102	$2,468
Box Culvert	1500	1200	RCBC	m	$2,225	$1,550	$2,796	1.22	1.32	$2,825	$1,891	$3,691
Box Culvert	1500	1500	RCBC	m	$2,096	$1,909	$2,283	1.22	1.32	$2,662	$2,328	$3,013
Box Culvert	1800	450	RCBC	m	$1,883	$1,883	$1,883	1.22	1.32	$2,392	$2,298	$2,486
Box Culvert	1800	600	RCBC	m	$1,897	$1,874	$1,920	1.22	1.32	$2,410	$2,287	$2,535
Box Culvert	1800	750	RCBC	m	$2,028	$2,028	$2,028	1.22	1.32	$2,575	$2,474	$2,677
Box Culvert	1800	900	RCBC	m	$2,015	$1,987	$2,042	1.22	1.32	$2,559	$2,424	$2,696
Box Culvert	1800	1200	RCBC	m	$2,140	$2,034	$2,245	1.22	1.32	$2,717	$2,482	$2,964
Box Culvert	1800	1500	RCBC	m	$2,254	$2,125	$2,382	1.22	1.32	$2,862	$2,593	$3,144

Box Culvert	1800	1800	RCBC	m	$2,356	$2,205	$2,507	1.22	1.32	$2,992	$2,690	$3,309
Box Culvert	2100	600	RCBC	m	$2,125	$1,997	$2,253	1.22	1.32	$2,699	$2,437	$2,974
Box Culvert	2100	750	RCBC	m	$2,370	$2,370	$2,370	1.22	1.32	$3,010	$2,892	$3,129
Box Culvert	2100	900	RCBC	m	$2,275	$2,131	$2,418	1.22	1.32	$2,889	$2,600	$3,192
Box Culvert	2100	1200	RCBC	m	$2,568	$2,568	$2,568	1.22	1.32	$3,261	$3,133	$3,390
Box Culvert	2100	1500	RCBC	m	$2,848	$1,592	$3,722	1.22	1.32	$3,617	$1,942	$4,913
Box Culvert	2100	1800	RCBC	m	$3,014	$3,014	$3,014	1.22	1.32	$3,828	$3,677	$3,979
Box Culvert	2100	2100	RCBC	m	$2,959	$2,686	$3,233	1.22	1.32	$3,758	$3,277	$4,268
Box Culvert	2400	600	RCBC	m	$2,626	$2,626	$2,626	1.22	1.32	$3,335	$3,204	$3,466
Box Culvert	2400	750	RCBC	m	$2,759	$2,759	$2,759	1.22	1.32	$3,504	$3,366	$3,642
Box Culvert	2400	900	RCBC	m	$2,599	$2,390	$2,807	1.22	1.32	$3,300	$2,916	$3,706
Box Culvert	2400	1200	RCBC	m	$2,976	$2,976	$2,976	1.22	1.32	$3,779	$3,630	$3,928
Box Culvert	2400	1500	RCBC	m	$2,927	$2,627	$3,227	1.22	1.32	$3,717	$3,205	$4,259
Box Culvert	2400	1800	RCBC	m	$3,117	$2,757	$3,477	1.22	1.32	$3,958	$3,364	$4,589
Box Culvert	2400	2100	RCBC	m	$3,345	$2,963	$3,727	1.22	1.32	$4,248	$3,615	$4,919
Box Culvert	2400	2400	RCBC	m	$5,414	$3,976	$7,249	1.22	1.32	$6,876	$4,851	$9,569
Box Culvert	2700	600	RCBC	m	$2,988	$2,988	$2,988	1.22	1.32	$3,795	$3,646	$3,945
Box Culvert	2700	750	RCBC	m	$3,111	$3,111	$3,111	1.22	1.32	$3,950	$3,795	$4,106
Box Culvert	2700	900	RCBC	m	$2,990	$2,724	$3,255	1.22	1.32	$3,797	$3,324	$4,297
Box Culvert	2700	1200	RCBC	m	$2,977	$2,636	$3,319	1.22	1.32	$3,781	$3,216	$4,381
Box Culvert	2700	1500	RCBC	m	$4,266	$3,488	$5,595	1.22	1.32	$5,418	$4,255	$7,386
Box Culvert	2700	1800	RCBC	m	$3,471	$3,123	$3,819	1.22	1.32	$4,408	$3,810	$5,041
Box Culvert	2700	2100	RCBC	m	$4,069	$4,069	$4,069	1.22	1.32	$5,167	$4,964	$5,371
Box Culvert	2700	2400	RCBC	m	$4,319	$4,319	$4,319	1.22	1.32	$5,485	$5,269	$5,701
Box Culvert	2700	2700	RCBC	m	$4,570	$4,570	$4,570	1.22	1.32	$5,804	$5,575	$6,032
Box Culvert	3000	750	RCBC	m	$1,500	$0	$0	1.22	1.32	$1,905	$0	$0
Box Culvert	3000	900	RCBC	m	$1,550	$0	$0	1.22	1.32	$1,969	$0	$0
Box Culvert	3000	1200	RCBC	m	$3,184	$3,184	$3,184	1.22	1.32	$4,044	$3,885	$4,203
Box Culvert	3000	1500	RCBC	m	$5,099	$4,105	$6,007	1.22	1.32	$6,476	$5,008	$7,929
Box Culvert	3000	1800	RCBC	m	#DIV/0!	$0	$0	1.22	1.32	#DIV/0!	$0	$0
Box Culvert	3000	2100	RCBC	m	#DIV/0!	$0	$0	1.22	1.32	#DIV/0!	$0	$0
Box Culvert	3000	2400	RCBC	m	$3,910	$3,910	$3,910	1.22	1.32	$4,966	$4,770	$5,161
Box Culvert	3000	2700	RCBC	m	#DIV/0!	$0	$0	1.22	1.32	#DIV/0!	$0	$0
Box Culvert	3000	3000	RCBC	m	#DIV/0!	$0	$0	1.22	1.32	#DIV/0!	$0	$0

Manholes

Item	Height	Diameter	Average	Min	Max	Oncost Range		Average	Min	Max
Manhole	<1.5 m depth	1050	$1,852	$1,300	$2,271	1.22	1.32	$2,352	$1,586	$2,998
Manhole	>1.5 m depth	1050	$2,390	$1,631	$3,630	1.22	1.32	$3,036	$1,990	$4,792
Manhole	2m depth	1050	$2,417	$1,820	$3,013	1.22	1.32	$3,069	$2,221	$3,978
Manhole	3m depth	1050	$3,218	$2,487	$3,949	1.22	1.32	$4,087	$3,034	$5,213
Manhole	4m depth	1050	$4,378	$3,506	$5,250	1.22	1.32	$5,560	$4,278	$6,930
Manhole	5m depth	1050	$5,266	$4,258	$6,274	1.22	1.32	$6,688	$5,195	$8,282
Manhole	2m depth	1200	$2,679	$2,024	$3,333	1.22	1.32	$3,402	$2,470	$4,400
Manhole	3m depth	1200	$3,553	$2,753	$4,354	1.22	1.32	$4,513	$3,358	$5,748
Manhole	4m depth	1200	$4,834	$3,879	$5,789	1.22	1.32	$6,140	$4,733	$7,642
Manhole	5m depth	1200	$5,806	$4,703	$6,909	1.22	1.32	$7,373	$5,737	$9,120
Manhole	2m depth	1500	$3,169	$2,392	$3,946	1.22	1.32	$4,025	$2,918	$5,209
Manhole	3m depth	1500	$4,191	$3,243	$5,139	1.22	1.32	$5,323	$3,957	$6,784
Manhole	4m depth	1500	$5,715	$4,587	$6,843	1.22	1.32	$7,258	$5,596	$9,033
Manhole	5m depth	1500	$6,855	$5,554	$8,156	1.22	1.32	$8,706	$6,776	$10,765
Manhole	2m depth	1800	$3,970	$3,018	$4,922	1.22	1.32	$5,042	$3,682	$6,497
Manhole	3m depth	1800	$5,220	$4,062	$6,379	1.22	1.32	$6,630	$4,956	$8,420
Manhole	4m depth	1800	$7,155	$5,777	$8,533	1.22	1.32	$9,087	$7,048	$11,263
Manhole	5m depth	1800	$8,560	$6,973	$10,147	1.22	1.32	$10,871	$8,507	$13,394
Manhole	2m depth	2100	$5,054	$3,949	$6,159	1.22	1.32	$6,419	$4,818	$8,130
Manhole	3m depth	2100	$6,463	$5,126	$7,800	1.22	1.32	$8,208	$6,254	$10,296
Manhole	4m depth	2100	$8,676	$7,092	$10,260	1.22	1.32	$11,018	$8,652	$13,543
Manhole	5m depth	2100	$10,262	$8,443	$12,082	1.22	1.32	$13,033	$10,300	$15,948

Catch Pit

Item	Length	Width	Height	Average	Min	Max	Oncost Range		Average	Min	Max
Catch Pit	900	675	<1.5 m depth	$2,044	$1,253	$2,997	1.22	1.32	$2,596	$1,529	$3,956
Catch Pit	900	675	>1.5 m depth	$2,512	$2,027	$3,054	1.22	1.32	$3,190	$2,473	$4,031

Pipes Benchmark Tables

Supply Costs Only

Supplier	300	375	450	525	600	750	825	900	1050	1200	1350	1500	1650	1800	1950	2100
Rocla (2004)	$34	$55	$79	$100	$123	$190	$236	$288	$375	$471	$576	$701	$828	$968	$1,176	$1,376
Humes (2004)	$41	$55	$79	$102	$121	$184	$237	$277	$360	$457	$556	$672	$792	$922	$1,197	$1,436
Humes (2007)	$51	$69	$102	$128	$158	$243	$317	$397	$518	$650	$794	$966	$1,142	$1,334	$1,693	$1,868
	25%	*25%*	*29%*	*26%*	*31%*	*32%*	*34%*	*43%*	*44%*	*42%*	*43%*	*44%*	*44%*	*45%*	*41%*	*30%*
Rawlinsons (2007)	$108	$132	$176	$205	$220	$315		$440		$720		$1,050				

Installation Ratio	65%	Pipe Supply	35%	Installation
Averge Escalation Humes Costs	36.19%			
Escalation	23.50%			

Supply & Installation Rate

Supplier	300	375	450	525	600	750	825	900	1050	1200	1350	1500	1650	1800	1950	2100
Rocla (2004)	$65	$105	$150	$191	$234	$362	$449	$547	$713	$896	$1,094	$1,331	$1,573	$1,838	$2,234	$2,614
Humes (2007)	$78	$106	$157	$197	$243	$374	$488	$611	$797	$1,000	$1,222	$1,486	$1,757	$2,052	$2,605	$2,874
Rawlinsons (2007)	$166	$203	$271	$315	$338	$485		$677		$1,108		$1,615				

						Size (Class 2)										
Supplier	**300**	**375**	**450**	**525**	**600**	**750**	**825**	**900**	**1050**	**1200**	**1350**	**1500**	**1650**	**1800**	**1950**	**2100**
Supplier 1		$186	$229	$383	$303	$384	$230	$311	$565	$675	$852			$1,375		
Supplier 2		$257	$290	$188	$179	$249	$212	$319	$712	$847	$997			$1,833		
Supplier 3		$120	$134	$216	$250	$249		$246	$372	$458	$613			$805		
Supplier 4		$108	$134	$273	$189	$254			$377	$678	$1,036			$1,330		
Supplier 5		$125	$150	$154	$182	$248			$527	$680	$722			$1,428		
Supplier 6		$145	$138	$167	$279	$233			$441	$645	$934			$1,407		
Supplier 7		$87	$110	$164	$257	$366			$374	$496	$1,409			$1,008		
Supplier 8		$186	$338	$156	$195	$248			$315	$578	$852					
Supplier 9		$114	$162	$188	$178				$323	$442	$579					
Supplier 10		$165	$151	$202	$152				$314	$773	$568					
Supplier 11		$119	$298	$164						$615	$1,068					
Supplier 12		$106	$215	$132						$654	$904					
Supplier 13		$142	$332							$528						
Supplier 14		$161	$118							$319						
Supplier 15		$231	$248							$681						
Supplier 16		$99	$190							$584						
Supplier 17		$211	$152							$808						
Supplier 18		$97	$119							$615						
Supplier 19		$188	$433							$570						
Supplier 20		$159	$362							$482						
Supplier 21		$110	$257													
Supplier 22		$116	$151													
Supplier 23		$459	$133													
Supplier 24		$110	$136													
Supplier 25		$113	$117													
Supplier 26		$103	$128													
Supplier 27		$96														
Supplier 28		$106														
Rocla	$65	$105	$150	$191	$234	$362	$449	$547	$713	$896	$1,094	$1,331	$1,573	$1,838	$2,234	$2,614
Rawlinsons (2007)	$166	$97	$129	$153	$184	$262		$372				$835				
Humes	$78	$106	$157	$197	$243	$374	$488	$611	$797	$1,000	$1,222	$1,486	$1,757	$2,052	$2,605	$2,874
Average	$103	$146	$195	$195	$217	$293	$345	$401	$486	$637	$918	$1,218	$1,665	$1,453	$2,419	$2,744
Minimum	$65	$87	$110	$132	$152	$233	$212	$246	$314	$319	$568	$835	$1,573	$805	$2,234	$2,614
Maximum	$166	$459	$433	$383	$303	$384	$488	$611	$797	$1,000	$1,409	$1,486	$1,757	$2,052	$2,605	$2,874
Median	$78	$116	$151	$188	$195	$254	$339	$345	$409	$630	$919	$1,331	$1,665	$1,407	$2,419	$2,744

Headwalls Benchmark Table

Installation Ratio	50%
Escalation	23.50%

Supplier Rates

Supplier	Size															
	300	375	450	525	600	750	825	900	1050	1200	1350	1500	1650	1800	1950	2100
Supplier 1	$776	$1,146	$1,207	$1,460	$1,504	$1,467			$2,470							
Supplier 2	$752	$924	$993	$951	$1,393											
Supplier 3		$848	$1,131	$2,243	$1,413											
Supplier 4		$742	$977	$2,019	$1,783											
Supplier 5		$1,243	$1,309		$1,665											
Supplier 6		$1,869	$2,029		$2,465											
Supplier 7		$918	$1,023		$1,410											
Supplier 8		$1,120	$1,157		$1,460											
Supplier 9		$579	$905		$1,344											
Supplier 10		$579	$1,422		$2,403											
Supplier 11		$841	$1,208		$1,203											
Supplier 12		$1,618	$904		$1,680											
Supplier 13		$798	$1,465		$1,235											
Supplier 14		$884	$958													
Supplier 15		$1,145	$1,368													
Supplier 16		$762	$1,056													
Supplier 17		$1,149	$752													
Supplier 18		$1,059	$1,351													
Supplier 19		$1,378	$1,112													
Supplier 20		$1,156														
Supplier 21		$1,235														
Supplier 22		$2,388														
Supplier 23		$762														
Humes	$384		$454		$646			$1,280		$2,766		$7,170		$10,050		$9,895
Average	$638	$1,093	$1,139	$1,668	$1,543	$1,467	#DIV/0!	$1,280	$2,470	$2,766	#DIV/0!	$7,170	#DIV/0!	$10,050	#DIV/0!	$9,895
Minimum	$384	$579	$454	$951	$646	$1,467	$0	$1,280	$2,470	$2,766	$0	$7,170	$0	$10,050	$0	$9,895
Maximum	$776	$2,388	$2,029	$2,243	$2,465	$1,467	$0	$1,280	$2,470	$2,766	$0	$7,170	$0	$10,050	$0	$9,895
Median	$752	$1,059	$1,121	$1,739	$1,436	$1,467	#NUM!	$1,280	$2,470	$2,766	#NUM!	$7,170	#NUM!	$10,050	#NUM!	$9,895

Boxculverts Benchmark Table

Installation Ratio	70%
Base Ratio	60%
Escalation	23.50%

Supplier Rates

		Supplier													Average	Minimum	Maximum	Median
Width	**Height**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**ROCLA**	**HUMES**				
1200	300													$1,277	$1,084	$1,181	$1,084	$1,277	$1,181
1200	450	$1,280	$959	$1,331	$1,114									$1,376		$1,212	$959	$1,376	$1,280
1200	600													$1,458	$1,177	$1,317	$1,177	$1,458	$1,317
1200	750													$1,540		$1,540	$1,540	$1,540	$1,540
1200	900	$1,932	$1,439	$995	$1,547	$1,373	$1,851	$1,207						$1,622	$1,283	$1,472	$995	$1,932	$1,439
1200	1200													$2,366		$2,366	$2,366	$2,366	$2,366
1500	450	$1,736												$1,558		$1,647	$1,558	$1,736	$1,647
1500	600													$1,663	$1,460	$1,561	$1,460	$1,663	$1,561
1500	750													$1,765		$1,765	$1,765	$1,765	$1,765
1500	900													$1,870	$1,723	$1,796	$1,723	$1,870	$1,796
1500	1200	$2,391	$1,943	$2,796	$1,550	$2,298	$2,688	$1,723	$2,266	$2,366	$2,653	$2,283	$2,281	$2,078	$1,830	$2,225	$1,550	$2,796	$2,282
1500	1500													$2,283	$1,909	$2,096	$1,909	$2,283	$2,096
1800	450													$1,883		$1,883	$1,883	$1,883	$1,883
1800	600													$1,920	$1,874	$1,897	$1,874	$1,920	$1,897
1800	750													$2,028		$2,028	$2,028	$2,028	$2,028
1800	900													$2,042	$1,987	$2,015	$1,987	$2,042	$2,015
1800	1200													$2,245	$2,034	$2,140	$2,034	$2,245	$2,140
1800	1500													$2,382	$2,125	$2,254	$2,125	$2,382	$2,254
1800	1800													$2,507	$2,205	$2,356	$2,205	$2,507	$2,356
2100	600													$2,253	$1,997	$2,125	$1,997	$2,253	$2,125
2100	750													$2,370		$2,370	$2,370	$2,370	$2,370
2100	900													$2,418	$2,131	$2,275	$2,131	$2,418	$2,275
2100	1200													$2,568		$2,568	$2,568	$2,568	$2,568
2100	1500	$2,745	$2,880	$3,630	$3,046	$1,592	$3,722							$2,791	$2,379	$2,848	$1,592	$3,722	$2,835
2100	1800													$3,014		$3,014	$3,014	$3,014	$3,014
2100	2100													$3,233	$2,686	$2,959	$2,686	$3,233	$2,959
2400	600													$2,626		$2,626	$2,626	$2,626	$2,626
2400	750													$2,759		$2,759	$2,759	$2,759	$2,759
2400	900													$2,807	$2,390	$2,599	$2,390	$2,807	$2,599
2400	1200													$2,976		$2,976	$2,976	$2,976	$2,976
2400	1500													$3,227	$2,627	$2,927	$2,627	$3,227	$2,927
2400	1800													$3,477	$2,757	$3,117	$2,757	$3,477	$3,117
2400	2100													$3,727	$2,963	$3,345	$2,963	$3,727	$3,345
2400	2400	$7,249	$4,864	$4,014	$6,049	$5,747	$6,885	$4,531						$3,976		$5,414	$3,976	$7,249	$5,306
2700	600													$2,988		$2,988	$2,988	$2,988	$2,988
2700	750													$3,111		$3,111	$3,111	$3,111	$3,111
2700	900													$3,255	$2,724	$2,990	$2,724	$3,255	$2,990
2700	1200													$3,319	$2,636	$2,977	$2,636	$3,319	$2,977
2700	1500	$5,595	$3,692	$3,488	$4,611	$4,799	$4,471	$3,904						$3,570		$4,266	$3,488	$5,595	$4,188
2700	1800													$3,819	$3,123	$3,471	$3,123	$3,819	$3,471
2700	2100													$4,069		$4,069	$4,069	$4,069	$4,069
2700	2400													$4,319		$4,319	$4,319	$4,319	$4,319
2700	2700													$4,570		$4,570	$4,570	$4,570	$4,570
3000	750															#DIV/0!	$0	$0	#NUM!
3000	900															#DIV/0!	$0	$0	#NUM!
3000	1200														$3,184	$3,184	$3,184	$3,184	$3,184
3000	1500	$5,916	$4,507	$4,105	$5,016	$5,568	$6,007	$4,575								$5,099	$4,105	$6,007	$5,016
3000	1800															#DIV/0!	$0	$0	#NUM!
3000	2100															#DIV/0!	$0	$0	#NUM!
3000	2400														$3,910	$3,910	$3,910	$3,910	$3,910
3000	2700															#DIV/0!	$0	$0	#NUM!
3000	3000															#DIV/0!	$0	$0	#NUM!

Manholes Benchmark Tables

Supply and excavation cost

	Depth	
Supplier	**<1.5m depth**	**>1.5m depth**
1	$2,080	$3,171
2	$2,158	$1,631
3	$1,300	$1,717
4	$2,271	$1,956
5	$1,450	$3,630
6		$3,381
7		$2,470
8		$2,403
9		$2,321
10		$1,700
11		$2,386
12		$1,920
Average	$1,852	$2,390
Min	$1,300	$1,631
Max	$2,271	$3,630

Other Dimensions and Depths			
		Min	**Max**
1050	1050:2m depth	$1,820	$3,013
1050	1050:3m depth	$2,487	$3,949
1050	1050:4m depth	$3,506	$5,250
1050	1050:5m depth	$4,258	$6,274
1200	1200:2m depth	$2,024	$3,333
1200	1200:3m depth	$2,753	$4,354
1200	1200:4m depth	$3,879	$5,789
1200	1200:5m depth	$4,703	$6,909
1500	1500:2m depth	$2,392	$3,946
1500	1500:3m depth	$3,243	$5,139
1500	1500:4m depth	$4,587	$6,843
1500	1500:5m depth	$5,554	$8,156
1800	1800:2m depth	$3,018	$4,922
1800	1800:3m depth	$4,062	$6,379
1800	1800:4m depth	$5,777	$8,533
1800	1800:5m depth	$6,973	$10,147
2100	2100:2m depth	$3,949	$6,159
2100	2100:3m depth	$5,126	$7,800
2100	2100:4m depth	$7,092	$10,260
2100	2100:5m depth	$8,443	$12,082

Catch Pit Benchmark Tables

Supply and excavation cost

	Depth	
Supplier	**<1.5m**	**>1.5m**
A	$2,875	$3,054
B	$2,997	$3,040
C	$2,850	$2,950
D	$1,866	$2,147
E	$2,036	$2,331
F	$1,659	$2,027
G	$1,253	$2,033
H	$1,918	
I	$1,694	
J	$1,293	
Average	$2,044	$2,512
Min	$1,253	$2,027
Max	$2,997	$3,054

PROJECT DELIVERY GROUP

Redland SHIRE COUNCIL

Job Title:		Carissa Street Drainage Improvements - RUSSELL ISLAND			
Description of Works:		Redirect overland runoff toward the proposed easements			
Works Program:		Drainage Program	**Construction:**	Internal	
Client:		Infrastructure Planning	**Date:**	6/06/2006	
Job Number:		45143	**Revision:**	A	
Allocation	$ 50,000.00	**Program Year:** 06/07	**Prepared By:**	M Heaton	

Task	Description	Qty	Unit	Rate	Amount
	Project Establishment				
6303	Site Establishment		Item		$5,000.00
6010	Provision for Traffic		Item		$500.00
6320	Service Locations		Item		$500.00
	Site Preparation				
6302	Remove Bitumen Invert		Item		$500.00
	Earthworks				
6052	Earthworks on Leads - loose quantity. Bulking factor from Compacted to Loose 133%.	49	m^3	27	$1,323.00
6326	Temporary Property Access	2	No.	275	$550.00
	Pavements				
6205	Base CBR60 (125mm Thick) supply & cart. Compacted quantity, no bulking factor applied.	33	m^3	53	$1,749.00
6205	Base CBR60 (125mm Thick) spread, compact & trim. Compacted quantity, no bulking factor applied.	33	m^3	47	$1,551.00
6209	Sub-base CBR35 (125mm thick) supply & cart. Compacted quantity, no bulking factor applied.	33	m^3	53	$1,749.00
6209	Sub-base CBR35 (125mm thick) spread, compact & trim. Compacted quantity, no bulking factor applied.	33	m^3	47	$1,551.00
	Surfacing				
6134	2 Coat bitumen surfacing including materials	267	m^2	7	$1,869.00
	Pipes, Culvert, Pits & Headwalls				
6302	Remove existng ø375 pipe and Headwalls		Item		$500.00
6408	Field Inlet - Raised Grate 900x600	1	No.	1700	$1,700.00
6422	Pipe supply & lay ø100mm uPVC	5	m	50	$250.00
6428	Pipe supply & lay ø375mm FRC '2'	30	m	145	$4,350.00
6442	Stone or rock pitching	15	m^2	52	$780.00
6443	Precast Headwall - supply & install	1	No.	350	$350.00
	Driveways				
6163	Concrete Driveways 125mm Thick - Fibre Reinforced	83	m^2	50	$4,150.00
	Furniture				
6077	Handrails	3	m	50	$150.00
	Landscaping				
6350	Turf Supply & Lay Incl. 1 Initial Watering	400	m^2	8	$3,200.00
6378	Turf Maintenance & Watering	4	Visit	500	$2,000.00
6300	Drainage Easement Permits & Administration		Item		$8,000.00
	Subtotal:				**$42,272.00**
6441	Sediment & Erosion Control		2%		$845.44
	Subtotal:				**$43,117.44**

PROJECT DELIVERY GROUP

Redland SHIRE COUNCIL

6300	Construction On Costs		11.0%	$4,742.92
		Subtotal:		**$47,860.36**
		Subtotal:		**$47,860.36**
6329	Contingencies		10.0%	$4,786.04
		Subtotal:		**$52,646.39**
		Job Cost Estimate:		**$52,646.39**
		Project Delivery Group Costs:	14.4%	**$7,570.50**
		Grand Total:		**$60,216.89**

Design Services Manager

Infrastructure Planning Manager

		Budget Deficit:	**$10,216.89**

	Project Delivery Group Costs:		
	Project Establishment		
6037	Detail Survey	2.7%	$1,421.45
6033	Detail Design	6.0%	$3,158.78
6335	Survey Fares & Charges - Bay Islands		$200.00
	Management and Administration		
6036	Project Management	2.3%	$1,210.87
6300	PDG Administration Overhead	2.0%	$1,052.93
6338	Corporate Overheads	1.0%	$526.46
	Variations to Work		
6033	Design Changes Expenses (DSU Team Leader to Advise Charge - 40998)	Item	$0.00

PROJECT DELIVERY GROUP

Redland SHIRE COUNCIL

Job Title:		HARDY ROAD - BIRKDALE			
Description of Works:		KERB & CHANNEL WEST SIDE FROM PAULINA STREET NORTH TO EXISTING			
Works Program:		Residential Street	**Construction:**	Internal	
Client:		Infrastructure Planning	**Date:**	22/06/2006	
Job Number:		45176	**Revision:**	A	
Allocation	$ 51,000.00	**Program Year:** 06/07	**Prepared By:**	P McGrath	

Task	Description	Qty	Unit	Rate	Amount
	Project Establishment				
6303	Site Establishment		Item		$1,000.00
6010	Provision for Traffic		Item		$2,000.00
6217	Soil Testing for Road Pavement Design		Item		$1,200.00
6320	Potholing/location of Existing Services		Item		$1,500.00
	Site Preparation				
6302	Removal of Guardrail		Item		$500.00
	Earthworks				
6052	Earthworks on Leads - loose quantity. Bulking factor from Compacted to Loose 133%.	9	m^3	32	$288.00
6054	Earthworks to Spoil - loose quantity. Bulking factor from Bank to Loose 120%.	80	m^3	35	$2,800.00
6326	Temporary Property Access	1	No.	275	$275.00
	Pavements				
6205	Base CBR60 (150mm Thick) supply & cart. Compacted quantity, no bulking factor applied.	24	m^3	40	$960.00
6205	Base CBR60 (150mm Thick) spread, compact & trim. Compacted quantity, no bulking factor applied.	24	m^3	50	$1,200.00
6209	Sub-base CBR35 (100mm thick) supply & cart. Compacted quantity, no bulking factor applied.	26	m^3	40	$1,040.00
6209	Sub-base CBR35 (100mm thick) spread, compact & trim. Compacted quantity, no bulking factor applied.	26	m^3	48	$1,248.00
	Surfacing				
6134	2 Coat bitumen surfacing including materials	159	m^2	6	$954.00
	Kerb and Channel				
6414	Kerb & Channel - Barrier Type B1	119	m	35.5	$4,224.50
6411	Subsoil Drains (100ø uPVC)	119	m	25	$2,975.00
	Pipes, Culvert, Pits & Headwalls				
6302	Take up and remove existing Pipes and Headwalls		Item		$750.00
6302	Cap pipe end and fill existing stormwater pit with concrete		Item		$500.00
6409	Box culverts – supply & install – 600x300	2.4	m	415	$996.00
6443	Provide 100mm FRC concrete to inlet of Box Culvert		Item		$350.00
	Driveways				
6165	Vehicle Invert Crossings - Install	3	m	55	$165.00
6244	Gravel Driveways - Reinstate 100mm Thick	8	m^2	15	$120.00
	Furniture				
6079	Guide Posts	4	No.	55	$220.00

PROJECT DELIVERY GROUP

Redland SHIRE COUNCIL

	Signage and Pavement Marking				
6002	Directional Traffic Signs - Install Additional Plates	2	No.	75	$150.00
6009	Linemarking		Item		$200.00
6013	Removal of Unwanted Pavement Markings		Item		$100.00
	Landscaping				
6181	Tree Pruning		Item		$250.00
6350	Turf Supply & Lay Incl. 1 Initial Watering	297	m^2	5	$1,485.00
6378	Turf Maintenance & Watering	6	Visit	100	$600.00
	Subtotal:				**$28,050.50**
6441	Sediment & Erosion Control		2%		$561.01
	Subtotal:				**$28,611.51**
6300	Construction On Costs		11.0%		$3,147.27
	Subtotal:				**$31,758.78**
6329	Contingencies		12.5%		$3,969.85
	Job Cost Estimate:				**$35,728.62**
	Project Delivery Group Costs:		14.3%		**$5,109.19**
	Grand Total:				**$40,837.82**

Design Services Manager _____

Infrastructure Planning Manager _____

Budget Surplus: **$10,162.18**

	Project Delivery Group Costs:		
	Project Establishment		
6037	Detail Survey	2.7%	$964.67
6033	Detail Design	6.3%	$2,250.90
6335	Survey Fares & Charges - Bay Islands		$0.00
	Management and Administration		
6036	Project Management	2.3%	$821.76
6300	PDG Administration Overhead	2.0%	$714.57
6338	Corporate Overheads	1.0%	$357.29
	Variations to Work		
6033	Design Changes Expenses (DSU Team Leader to Advise Charge - 40998)	Item	$0.00

PROJECT DELIVERY GROUP

Redland SHIRE COUNCIL

DESIGN ESTIMATE

Project:	45326 - KELSO STREET, WELLINGTON POINT		
Description of Works:	KERB AND CHANNEL BOTH SIDES - MAIN ROAD TO KEFFORD STREET		
Works Program:	Residential Street	**Prepared By:**	P McGrath
Client:	Infrastructure Planning	**Estimate Date:**	22/02/2007
Program Year:	07/08	**Revision:**	A - Construction Issue
Allocation / Budget:	$267,000	**Construction:**	Internal

Task	Description	Units	Qty	Rate	Total
	Preliminary Items				
6303	Site Establishment	Item	1	1000	$1,000.00
6010	Traffic Control & Public Safety	Item	1	1000	$1,000.00
6217	Soil Testing for Road Pavement Design	Item	3	600	$1,800.00
6320	Potholing of Existing Services	Item	1	750	$750.00
	Site Preparation				
6302	Sawcut & Remove Concrete Island	Item	1	1000	$1,000.00
6302	Sawcut & Remove Concrete Kerb & Channel & Driveways	Item	1	2500	$2,500.00
	Earthworks				
6052	Earthworks on Leads - loose quantity. Bulking factor from Compacted to Loose 133%.	m^3	371	32	$11,872.00
6326	Temporary Property Access	No.	31	275	$8,525.00
	Pavements				
6205	Base CBR60 (150mm Thick) supply & cart. Compacted quantity, no bulking factor applied.	m^3	109	37	$4,033.00
6205	Base CBR60 (150mm Thick) spread, compact & trim. Compacted quantity, no bulking factor applied.	m^3	109	45	$4,905.00
6209	Sub-base CBR35 (100mm thick) supply & cart. Compacted quantity, no bulking factor applied.	m^3	110	37	$4,070.00
6209	Sub-base CBR35 (100mm thick) spread, compact & trim. Compacted quantity, no bulking factor applied.	m^3	110	43	$4,730.00
	Surfacing				
6134	2 Coat Bitumen Surfacing	m^2	726	6.13	$4,450.38
	Kerb and Channel				
6415	Kerb & Channel - Mountable Type M1	m	532	30.5	$16,226.00
6411	Subsoil Drains (100ø uPVC)	m	560	25	$14,000.00
	Pipes, Culvert, Pits & Headwalls				
6302	Remove Stormwater Pipes and Associated Structures	Item	1	2000	$2,000.00
6405	Catchpit – Standard MR type (3.6m long)	No.	3	1900	$5,700.00
6406	Catchpit – Standard SL type (2.4m long)	No.	1	1700	$1,700.00
6445	Pipe supply & lay ø300mm FRC '2'	m	12	135	$1,620.00
6428	Pipe supply & lay ø375mm FRC '2'	m	78	145	$11,310.00
6429	Pipe supply & lay ø450mm FRC '2'	m	94	165	$15,510.00
6439	Roofwater Connections	m	180	55	$9,900.00
6440	Roofwater Kerb Adaptors	No.	30	35	$1,050.00
	Manholes				
6402	Break into existing Manhole to provide connection	No.	1	600	$600.00
	Pathways/Footpaths				
6166	Kerb Ramps - with Tactile Paving	No.	2	600	$1,200.00

Task	Description	Units	Qty	Rate	Total
	Driveways				
6163	Coloured Concrete Driveways 125mm Thick Fibre Reinforced	m^2	9	70	$630.00
6163	Concrete Driveways 125mm Thick Fibre Reinforced	m^2	47	45	$2,115.00
6165	Vehicle Invert Crossings - Install & Repair	m	152	55	$8,360.00
6244	Gravel Driveways - Reinstate 100mm Thick	m^2	285	8.5	$2,422.50
	Signage and Pavement Marking				
6011	Relocate Existing Signs	No.	1	110	$110.00
	Landscaping				
6350	Turf Supply & Lay Incl. 1 Initial Watering	m^2	1550	5	$7,750.00
6378	Turf Maintenance & Watering	Visit	6	100	$600.00
	Services Utilities				
6325	Alteration to Telstra Plant - Lower Conduit and Adjust Pits	Item			$5,000.00
	Subtotal:				**$158,438.88**
6441	Sediment & Erosion Control	%		2	$3,168.78
	Subtotal:				**$161,607.66**
6329	Contingencies	%		15	$24,241.15
	Subtotal:				**$185,848.81**
6300	RSC Operations & Maintenance Costs	%		15	$27,877.32
	Subtotal:				**$213,726.13**
6300	Project Delivery Group / Corporate Overhead Costs	%		11	$23,509.87
6330	Portable Long Service Leave Levy	%		0.35	$830.33
	Grand Total Construct:	**07/08**			**$238,066.33**

Design Services Manager

Infrastructure Planning Manager

PROJECT DELIVERY GROUP

Redland SHIRE COUNCIL

PROJECT :		Les Moore Park			- VICTORIA POINT
DESCRIPTION OF WORKS:		Reprofiling & Drainage Works Including Carparking			
Type of Program:		Drainage	**Date:**		2/09/05
Job Number:		41786	**Revision:**		Preliminary
Allocation:	$ 100,000.00	**Program Year:** 05/06	**Prepared By:**		M Heaton

Task	Description	Qty	Unit	Rate	Amount
	Project Establishment				
6303	Site Establishment		Item		$2,000.00
6010	Provision for Traffic		Item		$2,000.00
6217	Soil & Pavement Testing		Item		$500
6320	Location of Services		Item		$500
	Earthworks				
6441	Sediment & Erosion Control		2%		$13,251.22
6054	Earthworks on Leads including Compaction	149	m^3	25	$3,725.00
6054	Earthworks to Spoil - (Lead to Park)	109	m^3	25	$2,725.00
6051	Imported Fill To Park Incl Cartage	5932	m^3	25	$148,300.00
	Pavements				
6205	Base CBR60 (150mm Thick) supply & cart	106	m^3	37	$3,922.00
6205	Base CBR60 (150mm Thick) spread, compact & trim	106	m^3	45	$4,770.00
6209	Sub-base CBR35 (150mm thick) supply & cart	134	m^3	37	$4,958.00
6209	Sub-base CBR35 (150mm thick) spread, compact & trim	134	m^3	43	$5,762.00
	Surfacing				
6134	2 coat bitumen surfacing including materials	709	m^2	6	$4,254.00
	Culvert Pipes Pits & Headwalls				
6302	Remove Stormwater Pipes & RCBC's		Item		$5,000.00
6443	Precast Headwall - supply & install ø 750mm	1	No.	700	$700.00
6409	600x300 RCBC Incl Base Slab Supply & Install Incl GST	11	m	270	$2,970.00
6427	Pipe supply & lay ø 375mm FRC '2'	26	m	140	$3,640.00
6430	Pipe supply & lay ø 600mm FRC '2'	86	m	190	$16,340.00
6432	Pipe supply & lay ø 750mm FRC '2'	68	m	230	$15,640.00
	Manholes				
6419	Manhole – 1050ø	3	No.	1850	$5,550.00
	Kerb and Channel				
6414	Concrete Kerb & Channel - Barrier Type B1	244	m	28	$6,807.60
6417	Kerb Median - Type SM4	72	m	27	$1,915.20
	Subsoil Drains				
6411	Side Drains (100ø pvc) in Place	388	m	24	$9,312.00
	Pathways/Footpaths				
6164	Concrete Footpath 125mm Thick SL62 Mesh	1695	m^2	37	$62,715.00

	Driveways				
6244	Driveway Other - Reinstate, Gravel 100mm Thick		Item		$200.00
	Furniture				
6077	Dog of Leash Fence 2 x ped Gates & 1 x 4.5 access gate		Item		$12,240.00
6009	Linemarking		Item		$1,000.00
6073	Relocate Log Bollards	50	No.	55	$2,750.00
6166	Kerb Ramps - with Tactile Paving	2	No.	550	$1,100.00
6080	Install Litter Bin & Bag Combo		Item		$500.00
6364	Reinstate Table & Chairs		Item		$500.00
6364	Supply & Install 7 x Bench Seats		Item		$10,500.00
6364	Supply & Install Anti vandal Tap, Rubble Drain & Service		Item		$4,500.00
6364	Supply & Install Hybrid Unisex Toilet		Item		$100,000.00
	Landscaping				
6377	Topsoiling to Turf	2750	m^3	35	$96,250.00
6356	Fertiliser		Item		$500.00
6350	Lay New Couch Turf - Stolons.	23300	m^2	0.75	$17,475.00
6378	Turf Maintenance & Watering		Item		$10,000.00
6182	Tree Removal		Item		$500.00
6180	Tree Planting to Park		Item		$2,000.00
6180	Plant Buffer Zone	1900	m2	40	$76,000.00
6180	Shrubs & Plants to Traffic Islands		Item		$2,000.00
6180	Ground Cover Planting incl Mulch & Topsoil		Item		$10,000.00
6370	Mulching to Traffic Islands	4	m^3	25	$100.00
6377	Garden Soil Mix to Traffic Islands	11	m^3	40	$440.00
	Above Line				
	Management and Administration				
6300	Construction On Cost		11%		$74,339.32
	Variations to Work				
6329	Contingencies		10%		$75,015.13
	Subtotal Above Line				**$662,560.80**
	Above Line Percentages				**$162,605.67**
	Total Above Line				**$825,166.47**
	Below Line				
	Management and Administration				
6036	Project Management		1.0%		$8,251.66
6300	PDO Admin. Overhead		1.0%		$8,251.66
6338	Corporate Overheads		1.0%		$8,251.66
6330	Portable Long Service Leave Levy		0.4%		$2,888.08
	Project Establishment				
6033	Detail Design		6.0%		$49,509.99
6037	Detail Survey		2.3%		$18,978.83
6039	Survey Setout		2.3%		$18,978.83
	Water Services				
6333	Alteration to Water - Raise Tap Levels		Item		$500.00
	Totals				
	Total Below Line				**$115,610.72**
	Grand Total:				**$940,777.19**

Hume 2007 Prices

Box Culverts U Shell and Base

Span	Height	Culvert $/M	Base $/M
450	300	$204	$126
600	300	$253	$165
600	450	$286	$165
1200	300	$408	$351
1200	600	$473	$351
1200	900	$547	$351
1500	900	$766	$440
1500	1500	$896	$440
1800	600	$775	$537
1800	900	$854	$537
1800	1200	$887	$537
2100	600	$806	$592
2100	900	$900	$592
2100	1500	$1,073	$592
2100	2100	$1,288	$592
2400	900	$994	$679
2400	1500	$1,160	$679
2400	1800	$1,251	$679
2400	2100	$1,395	$679
2700	900	$1,126	$781
2700	1200	$1,064	$781
2700	1800	$1,405	$781
3000	1200	$1,294	$935
3000	2400	$1,802	$935
3600	1200	$1,610	$1,190
3600	1800	$1,902	$1,190
3600	2400	$2,134	$1,190

Headwalls

Size	$ Each	Size	$ Each
1x225	160	1x600x300	$314
1x300	192	1x1200x375	$685
1x450	227	1x1200x450	$712
1x600	323	1x1500x600	$750
1x900	640	1x2100x600	$4,030
1x1200	1383	1x2400x600	We can only supply Wingwalls
1x1500	3585	1x3300x2100	We can only supply Wingwalls
1x1800	5025		
1x2100	5937		
1x2400	9300		
1x3000	15400		

Min 20 elements

RCP Pipes

Class 2 Rubber Ring joint

Diameter	$/M
225	$46
250	N/A
300	$51
375	$69
450	$102
525	$128
600	$158
615	N/A
675	$210
750	$243
825	$317
900	$397
1050	$518
1200	$650
1350	$794
1500	$966
1650	$1,142
1800	$1,334
1950	$1,693
2100	$1,868

Box Culvert Pre-Cast and Delivery Costs

Span	Heigth	U Shell Cost	Platform Cost	Estimated Cost	Total Cost
1500	600		$440	$582	$1,022
1500	900	$766	$440		$1,206
1500	1200		$440	$841	$1,281
1500	1500	$896	$440		$1,336
1800	600	$775	$537		$1,312
1800	900	$854	$537		$1,391
1800	1200	$887	$537		$1,424
1800	1500		$537	$951	$1,488
1800	1800		$537	$1,007	$1,544
2100	600	$806	$592		$1,398
2100	900	$900	$592		$1,492
2100	1200		$592	$987	$1,579
2100	1500	$1,073	$592		$1,665
2100	1800		$592	$1,181	$1,773
2100	2100	$1,288	$592		$1,880
2400	900	$994	$679		$1,673
2400	1200		$679	$1,077	$1,756
2400	1500	$1,160	$679		$1,839
2400	1800	$1,251	$679		$1,930
2400	2100	$1,395	$679		$2,074
2400	2400		$679	$1,504	$2,183
2700	900	$1,126	$781		$1,907
2700	1200	$1,064	$781		$1,845
2700	1500	$1,235	$781	$1,235	$2,016
2700	1800	$1,405	$781		$2,186
2700	2100		$781	$1,459	$2,240
2700	2400		$781	$1,560	$2,341
2700	2700		$781	$1,661	$2,442
3000	1200	$1,294	$935		$2,229
3000	1500		$935	$1,412	$2,347
3000	1800		$935	$1,553	$2,488
3000	2100		$935	$1,694	$2,629
3000	2400	$1,802	$935		$2,737
3000	2700		$935	$1,977	$2,912
3000	3000		$935	$2,118	$3,053
3300	1200		$1,063	$1,433	$2,496
3300	1500		$1,063	$1,584	$2,647
3300	1800		$1,063	$1,735	$2,797
3300	2100		$1,063	$1,886	$2,948
3300	2400		$1,063	$2,037	$3,099
3300	2700		$1,063	$2,188	$3,250
3300	3000		$1,063	$2,338	$3,401
3300	3300		$1,063	$2,489	$3,552
3600	1200	$1,610	$1,190		$2,800
3600	1500	$1,756	$1,190	$1,756	$2,946

Box Culvert Pre-Cast and Delivery Costs

Span	Heigth	U Shell Cost	Platform Cost	Estimated Cost	Total Cost
3600	1800	$1,902	$1,190		$3,092
3600	2100	$2,018	$1,190	$2,018	$3,208
3600	2400	$2,134	$1,190		$3,324
3600	2700		$1,190	$2,277	$3,467
3600	3000		$1,190	$2,408	$3,598
3600	3300		$1,190	$2,539	$3,729
3600	3600		$1,190	$2,670	$3,860
300	300		$95	$175	$269
450	300	$204	$126		$330
450	450		$126	$262	$388
600	300	$253	$165		$418
600	450	$286	$165		$451
600	600		$165	$319	$484
900	300		$258	$302	$560
900	600		$258	$423	$681
900	900		$258	$544	$802
1200	300	$408	$351		$759
1200	600	$473	$351		$824
1200	900	$547	$351		$898
1200	1200		$351	$615	$966
525	525		$144	$332	$476
1500	1500	$896	$440		$1,336
2400	2400		$679	$1,504	$2,183

Headwall Pre-Cast and Delivery Costs

HW Dimension		HW Cost	Estimated Cost	Total Cost
100	100		$71	$71
150	150		$107	$107
225	225	$160		$160
300	300	$192		$192
375	375		$208	$208
400	400		$214	$214
450	450	$227		$227
525	525		$272	$272
600	600	$323		$323
675	675		$390	$390
750	750		$466	$466
825	825		$549	$549
900	900	$640		$640
1050	1050		$985	$985
1200	1200	$1,383		$1,383
1250	1250		$1,716	$1,716
1350	1350		$2,423	$2,423
1500	1500	$3,585		$3,585
1650	1650		$4,272	$4,272
1800	1800	$5,025		$5,025
2030	2030		$5,712	$5,712
2100	2100	$5,937		$5,937
2400	2400	$9,300		$9,300
3000	3000	$15,400		$15,400
5400	5400		$56,409	$56,409
450	300		$236	$236
525	375		$343	$343
525	450		$412	$412
600	300	$314		$314
600	375		$393	$393
750	600		$785	$785
825	375		$540	$540
1200	375	$685		$685
1200	450	$712		$712
1200	600		$731	$731
1200	600		$731	$731
1200	900		$769	$769
1500	600	$750		$750
2100	600	$4,030		$4,030
2100	750		$5,038	$5,038
2100	1200		$8,060	$8,060
2400	600		$4,606	$4,606
2400	1500		$11,514	$11,514
2700	900		$7,772	$7,772
3300	2100		$22,165	$22,165

Headwall Pre-Cast and Delivery Costs

HW Dimension		HW Cost	Estimated Cost	Total Cost

HW Dimension		HW Cost	Estimated Cost	Total Cost
100	100		$71	$71
150	150		$107	$107
225	225	$160		$160
300	300	$192		$192
375	375		$208	$208
400	400		$214	$214
450	300		$236	$236
450	450	$227		$227
525	375		$343	$343
525	450		$412	$412
525	525		$272	$272
600	300	$314		$314
600	375		$393	$393
600	600	$323		$323
675	675		$390	$390
750	600		$785	$785
750	750		$466	$466
825	375		$540	$540
825	825		$549	$549
900	900	$640		$640
1050	1050		$985	$985
1200	375	$685		$685
1200	450	$712		$712
1200	600		$731	$731
1200	600		$731	$731
1200	900		$769	$769
1200	1200	$1,383		$1,383
1250	1250		$1,716	$1,716
1350	1350		$2,423	$2,423
1500	600	$750		$750
1500	1500	$3,585		$3,585
1650	1650		$4,272	$4,272
1800	1800	$5,025		$5,025
2030	2030		$5,712	$5,712
2100	600	$4,030		$4,030
2100	750		$5,038	$5,038
2100	1200		$8,060	$8,060
2100	2100	$5,937		$5,937
2400	600		$4,606	$4,606
2400	1500		$11,514	$11,514
2400	2400	$9,300		$9,300
2700	900		$7,772	$7,772
3000	3000	$15,400		$15,400
3300	2100		$22,165	$22,165
5400	5400		$56,409	$56,409

Appendix C

Valuation Summary Tables

Manholes					
Unit Rate Code		Average Unit Rate	Count of Manholes		Replacement Cost
MH1050-2	$	2,605.41	6328	$	16,487,034.30
MH1500-2	$	4,319.89	1436	$	6,203,362.04
MH1200-2	$	3,581.33	479	$	1,715,457.94
MH1050-3	$	3,361.29	356	$	1,196,619.24
MH1500-3	$	5,594.62	153	$	855,976.86
MH2400x1500-2	$	6,458.91	78	$	503,795.30
MH1050-4	$	4,119.10	98	$	403,671.80
MH1800-2	$	5,448.00	51	$	277,848.00
MH1200-3	$	4,659.84	39	$	181,733.76
MHSPEC1500	$	7,549.27	23	$	173,633.25
MH1800-3	$	7,044.20	24	$	169,060.79
MH1500-4	$	6,871.87	24	$	164,924.88
MH2400x1500-3	$	8,335.04	16	$	133,360.64
MH2100-2	$	6,813.14	18	$	122,636.52
MH1050-5	$	4,878.85	24	$	117,092.40
GPT2000-2	$	9,030.25	7	$	63,211.77
GPT3650x1950-2	$	11,692.36	5	$	58,461.80
MH1200-4	$	5,740.57	9	$	51,665.12
MH1500-5	$	8,151.63	6	$	48,909.78
MH2400x1500-4	$	10,214.21	4	$	40,856.85
MHSPEC1200	$	12,012.45	3	$	36,037.34
MH2100-3	$	8,770.51	4	$	35,082.04
MHSPEC2815	$	28,871.69	1	$	28,871.69
MHSPEC4700	$	27,929.52	1	$	27,929.52
MHSPEC1400	$	11,187.13	2	$	22,374.26
MHSPEC2305	$	21,845.05	1	$	21,845.05
MH1200-5	$	6,823.52	3	$	20,470.56
GPT3000x1500-2	$	9,817.45	2	$	19,634.89
MHSPEC1650	$	15,990.24	1	$	15,990.24
MHSPEC2200	$	14,748.07	1	$	14,748.07
MHSPEC2550	$	14,191.53	1	$	14,191.53
MHSPEC1050	$	5,481.62	2	$	10,963.24
MH2100-4	$	10,731.07	1	$	10,731.07
MH1800-5	$	10,245.17	1	$	10,245.17
MHSPEC2500	$	9,744.08	1	$	9,744.08
MHSPEC2000	$	9,224.61	1	$	9,224.61
MH1800-4	$	8,643.25	1	$	8,643.25
MHSPEC1100	$	6,798.37	1	$	6,798.37
Grand Total	$	3,181.93	9206	$	29,292,838.02

Pipes					
Unit Rate Code	Average Unit Rate	Count of Pipes	Total Length	Replacement Cost	
375FRC	$ 277.20	8,341	161,604	$	44,796,574.11
450FRC	$ 311.11	2,888	79,347	$	24,685,705.64
300FRC	$ 233.53	8,334	95,913	$	22,398,655.04
600FRC	$ 436.14	1,400	43,910	$	19,150,964.17
525FRC	$ 369.69	1,658	50,068	$	18,509,743.63
1050RCP	$ 1,009.84	487	17,532	$	17,704,201.83
750FRC	$ 592.62	763	25,633	$	15,190,640.32
675FRC	$ 521.79	767	26,289	$	13,717,102.53
1200RCP	$ 1,234.09	326	10,752	$	13,268,947.59
900RCP	$ 802.30	462	15,607	$	12,521,671.81
1350RCP	$ 1,452.25	194	7,432	$	10,793,397.93
1800RCP	$ 2,556.21	88	4,023	$	10,282,789.28
1500RCP	$ 1,873.21	134	5,349	$	10,019,538.05
825RCP	$ 687.13	387	13,986	$	9,610,268.82
1650RCP	$ 2,225.40	73	3,132	$	6,970,575.91
1950RCP	$ 3,112.71	27	1,796	$	5,589,182.08
2100RCP	$ 3,469.18	5	249	$	862,854.45
225uPVC	$ 200.44	151	2,395	$	480,036.02
150uPVC	$ 146.95	168	2,785	$	409,209.09
100uPVC	$ 127.24	46	1,170	$	148,847.90
600RBC	$ 727.21	2	13	$	9,257.44
250uPVC	$ 225.34	2	15	$	3,269.68
Grand Total	$ 451.89	26,703	568,998	$	257,123,433.32

Box Culverts					
Unit Rate Code	Average Unit Rate		Count of Box Culverts	Total Length	Replacement Cost
BC3600x2400	$	5,442.96	6	1,245	$ 6,777,192.78
BC3000x1800	$	4,150.07	7	759	$ 3,149,153.56
BC2400x900	$	2,725.36	42	885	$ 2,412,951.19
BC2400x1800	$	3,428.00	16	413	$ 1,417,306.66
BC1200x600	$	1,428.60	48	986	$ 1,408,799.60
BC2100x2100	$	3,452.66	26	392	$ 1,355,031.06
BC2400x2400	$	3,989.51	7	316	$ 1,261,403.26
BC1200x450	$	1,323.50	56	902	$ 1,193,942.59
BC2400x2100	$	3,728.70	6	272	$ 1,013,497.95
BC3300x2100	$	4,845.32	2	208	$ 1,010,006.95
BC3600x1200	$	4,311.22	10	223	$ 963,428.33
BC2700x1800	$	3,769.45	8	246	$ 926,719.28
BC3600x1800	$	4,910.75	9	176	$ 865,519.58
BC2700x900	$	3,041.56	9	282	$ 856,320.23
BC3000x1200	$	3,583.70	12	233	$ 835,790.51
BC3000x2400	$	4,705.45	7	172	$ 808,255.15
BC2100x1500	$	2,935.21	15	234	$ 686,222.65
BC3600x2100	$	5,176.76	1	123	$ 636,120.27
BC2100x900	$	2,465.99	18	235	$ 580,641.92
BC1200x750	$	1,540.00	7	344	$ 529,790.80
BC1800x600	$	2,074.81	13	253	$ 525,839.85
BC2400x1500	$	3,187.57	7	135	$ 431,501.35
BC3600x3300	$	6,307.29	3	66	$ 415,335.05
BC1200x900	$	1,649.68	23	235	$ 386,948.94
BC2700x1200	$	3,108.24	7	124	$ 385,079.85
BC1800x1200	$	2,474.39	11	152	$ 376,255.61
BC3000x1500	$	3,853.62	3	95	$ 367,635.35
BC2100x750	$	2,345.00	9	157	$ 367,438.05
BC1800x1800	$	2,883.22	2	108	$ 312,050.90
BC2100x1200	$	2,700.52	6	110	$ 296,085.01
BC1500x900	$	2,039.98	7	144	$ 292,941.07
BC2100x600	$	2,223.10	8	131	$ 290,648.19
BC600x300	$	727.21	23	394	$ 286,521.50
BC1200x300	$	1,217.86	14	228	$ 277,696.47
BC1500x600	$	1,695.37	6	154	$ 261,493.87
BC1500x750	$	1,868.00	6	130	$ 241,943.36
BC1500x1200	$	2,261.18	1	96	$ 217,977.75
BC450x300	$	603.34	28	317	$ 191,416.30
BC900x450	$	1,079.00	11	163	$ 175,941.74
BC1800x900	$	2,300.61	5	68	$ 156,441.48
BC2400x1200	$	2,956.38	3	48	$ 141,906.24
BC3000x3000	$	5,337.68	1	22	$ 118,816.71
BC900x300	$	941.80	7	112	$ 105,293.28
BC1200x1200	$	1,864.08	3	51	$ 95,888.25
BC750x600	$	1,078.00	3	84	$ 90,034.56
BC3000x2700	$	5,040.50	1	17	$ 85,688.50
BC600x450	$	832.90	7	100	$ 83,106.63
BC2700x1500	$	3,438.75	2	19	$ 64,304.68
BC900x600	$	1,215.89	2	39	$ 47,018.47
BC375x225	$	555.50	7	71	$ 39,173.86
BC3600x1500	$	4,610.89	1	7	$ 33,198.41
BC750x375	$	834.50	2	39	$ 32,420.33
BC300x300	$	507.95	7	62	$ 31,421.76
BC750x300	$	835.50	4	35	$ 28,824.75

BC600x600	$	938.60	2	31	$	28,721.16
BC1800x750	$	2,188.00	1	13	$	27,700.08
BC900x750	$	1,353.00	2	18	$	24,827.55
BC750x450	$	1,079.00	1	20	$	21,062.08
BC1500x1500	$	2,460.06	1	4	$	8,831.62
BC750x225	$	834.50	1	9	$	7,860.99
BC900x900	$	1,490.08	1	5	$	7,495.10
BC375x300	$	555.50	1	13	$	7,327.05
BC450x450	$	737.77	1	8	$	6,160.42
BC375x150	$	555.50	1	5	$	3,044.14
Grand Total	$	2,832.80	567	12,738	$	36,085,412.61

Open Drains					
Unit Rate Code	Average Unit Rate		Count of Open Drains	Total Length	Replacement Cost
L3000-1500	$	559.75	16	2,003	$ 1,121,000.13
PL5000-2000	$	1,007.16	3	1,052	$ 1,059,581.94
L5000-2000	$	889.59	7	1,074	$ 955,748.63
L2000-1000	$	343.75	46	2,349	$ 807,300.79
L1000-1000	$	276.12	30	1,052	$ 290,362.27
L5000-500	$	394.00	8	530	$ 208,997.30
PL4000-1500	$	668.79	5	239	$ 159,747.18
L5000-1500	$	711.82	1	9	$ 6,513.15
L500-500	$	128.30	1	33	$ 4,201.83
Grand Total	$	553.15	117	8,340	$ 4,613,453.22

Headwalls				
Unit Rate Code	Average Unit Rate		Count of Headwalls	Replacement Cost
HW375	$	727.05	825	$ 599,816.42
HW1200	$	3,442.72	113	$ 389,027.26
HW1800	$	9,220.29	41	$ 378,031.82
HW450	$	835.81	390	$ 325,965.84
HW600	$	1,140.88	265	$ 302,333.18
HW2400	$	16,321.84	17	$ 277,471.28
HW2100	$	11,301.92	21	$ 237,340.37
HW300	$	629.69	369	$ 232,355.61
HW1500	$	6,691.44	34	$ 227,508.93
HW525	$	980.69	226	$ 221,635.91
HW750	$	1,529.44	135	$ 206,474.33
HW1050	$	2,667.33	77	$ 205,384.38
HW900	$	1,985.44	102	$ 202,514.86
HW1350	$	4,980.14	33	$ 164,344.62
HW3000	$	26,157.53	6	$ 156,945.17
HW675	$	1,326.79	93	$ 123,391.41
HW825	$	1,748.95	51	$ 89,196.46
HW1650	$	7,900.26	10	$ 79,002.60
HW225	$	521.35	51	$ 26,588.89
HW150	$	395.75	53	$ 20,974.75
HW100	$	315.81	6	$ 1,894.86
HW1200x450	$	1,580.49	1	$ 1,580.49
HW400	$	762.05	2	$ 1,524.09
HW300x2	$	1,007.50	1	$ 1,007.50
HW450x300	$	711.50	1	$ 711.50
Grand Total	$	1,530.28	2,923	$ 4,473,022.53

Catchpits					
Unit Rate Code	Average Unit Rate		Count of Catchpits	Replacement Cost	
CP2400	$	2,525.03	13,733	$	34,676,236.99
FI	$	2,144.61	976	$	2,093,139.37
AP	$	1,919.82	593	$	1,138,453.26
CP3600	$	2,875.56	26	$	74,764.67
SP005	$	11,606.97	3	$	34,820.90
SP001	$	2,605.41	9	$	23,448.65
SP006	$	13,817.63	1	$	13,817.63
SP003	$	7,492.70	1	$	7,492.70
SP004	$	6,626.02	1	$	6,626.02
SP002	$	3,581.33	1	$	3,581.33
Grand Total	$	2,481.26	15,344	$	38,072,381.51

Stormwater Assets Value Distribution					
Unit Rate Code	Average Unit Rate	Count of Assets	Replacement Cost	%	Cum%
375FRC	$ 277.20	8,341	$ 44,796,574.11	12%	12%
CP2400	$ 2,525.03	13,733	$ 34,676,236.99	9%	21%
450FRC	$ 311.11	2,888	$ 24,685,705.64	7%	28%
300FRC	$ 233.53	8,334	$ 22,398,655.04	6%	34%
600FRC	$ 436.14	1,400	$ 19,150,964.17	5%	39%
525FRC	$ 369.69	1,658	$ 18,509,743.63	5%	44%
1050RCP	$ 1,009.84	487	$ 17,704,201.83	5%	49%
MH1050-2	$ 2,605.41	6,328	$ 16,487,034.30	4%	54%
750FRC	$ 592.62	763	$ 15,190,640.32	4%	58%
675FRC	$ 521.79	767	$ 13,717,102.53	4%	61%
1200RCP	$ 1,234.09	326	$ 13,268,947.59	4%	65%
900RCP	$ 802.30	462	$ 12,521,671.81	3%	68%
1350RCP	$ 1,452.25	194	$ 10,793,397.93	3%	71%
1800RCP	$ 2,556.21	88	$ 10,282,789.28	3%	74%
1500RCP	$ 1,873.21	134	$ 10,019,538.05	3%	77%
825RCP	$ 687.13	387	$ 9,610,268.82	3%	79%
1650RCP	$ 2,225.40	73	$ 6,970,575.91	2%	81%
BC3600x2400	$ 5,442.96	6	$ 6,777,192.78	2%	83%
MH1500-2	$ 4,319.89	1,436	$ 6,203,362.04	2%	85%
1950RCP	$ 3,112.71	27	$ 5,589,182.08	2%	86%
BC3000x1800	$ 4,150.07	7	$ 3,149,153.56	1%	87%
BC2400x900	$ 2,725.36	42	$ 2,412,951.19	1%	88%
FI	$ 2,144.61	976	$ 2,093,139.37	1%	88%
MH1200-2	$ 3,581.33	479	$ 1,715,457.94	0%	89%
BC2400x1800	$ 3,428.00	16	$ 1,417,306.66	0%	89%
BC1200x600	$ 1,428.60	48	$ 1,408,799.60	0%	90%
BC2100x2100	$ 3,452.66	26	$ 1,355,031.06	0%	90%
BC2400x2400	$ 3,989.51	7	$ 1,261,403.26	0%	90%
MH1050-3	$ 3,361.29	356	$ 1,196,619.24	0%	91%
BC1200x450	$ 1,323.50	56	$ 1,193,942.59	0%	91%
AP	$ 1,919.82	593	$ 1,138,453.26	0%	91%
L3000-1500	$ 559.75	16	$ 1,121,000.13	0%	92%
PL5000-2000	$ 1,007.16	3	$ 1,059,581.94	0%	92%
BC2400x2100	$ 3,728.70	6	$ 1,013,497.95	0%	92%
BC3300x2100	$ 4,845.32	2	$ 1,010,006.95	0%	92%
BC3600x1200	$ 4,311.22	10	$ 963,428.33	0%	93%
L5000-2000	$ 889.59	7	$ 955,748.63	0%	93%
BC2700x1800	$ 3,769.45	8	$ 926,719.28	0%	93%
BC3600x1800	$ 4,910.75	9	$ 865,519.58	0%	93%
2100RCP	$ 3,469.18	5	$ 862,854.45	0%	94%
BC2700x900	$ 3,041.56	9	$ 856,320.23	0%	94%
MH1500-3	$ 5,594.62	153	$ 855,976.86	0%	94%
BC3000x1200	$ 3,583.70	12	$ 835,790.51	0%	94%
BC3000x2400	$ 4,705.45	7	$ 808,255.15	0%	95%
L2000-1000	$ 343.75	46	$ 807,300.79	0%	95%
BC2100x1500	$ 2,935.21	15	$ 686,222.65	0%	95%
BC3600x2100	$ 5,176.76	1	$ 636,120.27	0%	95%
HW375	$ 727.05	825	$ 599,816.42	0%	95%
BC2100x900	$ 2,465.99	18	$ 580,641.92	0%	96%
BC1200x750	$ 1,540.00	7	$ 529,790.80	0%	96%
BC1800x600	$ 2,074.81	13	$ 525,839.85	0%	96%
MH2400x1500-2	$ 6,458.91	78	$ 503,795.30	0%	96%
225uPVC	$ 200.44	151	$ 480,036.02	0%	96%
BC2400x1500	$ 3,187.57	7	$ 431,501.35	0%	96%

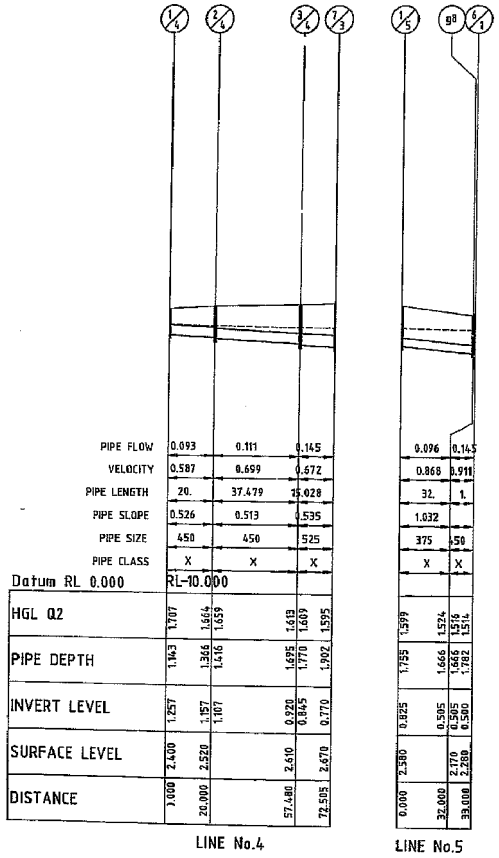
Stormwater Assets Value Distribution					
Unit Rate Code	Average Unit Rate	Count of Assets	Replacement Cost	%	Cum%
BC3600x3300	$ 6,307.29	3	$ 415,335.05	0%	96%
150uPVC	$ 146.95	168	$ 409,209.09	0%	96%
MH1050-4	$ 4,119.10	98	$ 403,671.80	0%	97%
HW1200	$ 3,442.72	113	$ 389,027.26	0%	97%
BC1200x900	$ 1,649.68	23	$ 386,948.94	0%	97%
BC2700x1200	$ 3,108.24	7	$ 385,079.85	0%	97%
HW1800	$ 9,220.29	41	$ 378,031.82	0%	97%
BC1800x1200	$ 2,474.39	11	$ 376,255.61	0%	97%
BC3000x1500	$ 3,853.62	3	$ 367,635.35	0%	97%
BC2100x750	$ 2,345.00	9	$ 367,438.05	0%	97%
HW450	$ 835.81	390	$ 325,965.84	0%	97%
BC1800x1800	$ 2,883.22	2	$ 312,050.90	0%	97%
HW600	$ 1,140.88	265	$ 302,333.18	0%	98%
BC2100x1200	$ 2,700.52	6	$ 296,085.01	0%	98%
BC1500x900	$ 2,039.98	7	$ 292,941.07	0%	98%
BC2100x600	$ 2,223.10	8	$ 290,648.19	0%	98%
L1000-1000	$ 276.12	30	$ 290,362.27	0%	98%
BC600x300	$ 727.21	23	$ 286,521.50	0%	98%
MH1800-2	$ 5,448.00	51	$ 277,848.00	0%	98%
BC1200x300	$ 1,217.86	14	$ 277,696.47	0%	98%
HW2400	$ 16,321.84	17	$ 277,471.28	0%	98%
BC1500x600	$ 1,695.37	6	$ 261,493.87	0%	98%
BC1500x750	$ 1,868.00	6	$ 241,943.36	0%	98%
HW2100	$ 11,301.92	21	$ 237,340.37	0%	98%
HW300	$ 629.69	369	$ 232,355.61	0%	98%
HW1500	$ 6,691.44	34	$ 227,508.93	0%	98%
HW525	$ 980.69	226	$ 221,635.91	0%	99%
BC1500x1200	$ 2,261.18	1	$ 217,977.75	0%	99%
L5000-500	$ 394.00	8	$ 208,997.30	0%	99%
HW750	$ 1,529.44	135	$ 206,474.33	0%	99%
HW1050	$ 2,667.33	77	$ 205,384.38	0%	99%
HW900	$ 1,985.44	102	$ 202,514.86	0%	99%
BC450x300	$ 603.34	28	$ 191,416.30	0%	99%
MH1200-3	$ 4,659.84	39	$ 181,733.76	0%	99%
BC900x450	$ 1,079.00	11	$ 175,941.74	0%	99%
MHSPEC1500	$ 7,549.27	23	$ 173,633.25	0%	99%
MH1800-3	$ 7,044.20	24	$ 169,060.79	0%	99%
MH1500-4	$ 6,871.87	24	$ 164,924.88	0%	99%
HW1350	$ 4,980.14	33	$ 164,344.62	0%	99%
PL4000-1500	$ 668.79	5	$ 159,747.18	0%	99%
HW3000	$ 26,157.53	6	$ 156,945.17	0%	99%
BC1800x900	$ 2,300.61	5	$ 156,441.48	0%	99%
100uPVC	$ 127.24	46	$ 148,847.90	0%	99%
BC2400x1200	$ 2,956.38	3	$ 141,906.24	0%	99%
MH2400x1500-3	$ 8,335.04	16	$ 133,360.64	0%	99%
HW675	$ 1,326.79	93	$ 123,391.41	0%	99%
MH2100-2	$ 6,813.14	18	$ 122,636.52	0%	99%
BC3000x3000	$ 5,337.68	1	$ 118,816.71	0%	99%
MH1050-5	$ 4,878.85	24	$ 117,092.40	0%	99%
BC900x300	$ 941.80	7	$ 105,293.28	0%	100%
BC1200x1200	$ 1,864.08	3	$ 95,888.25	0%	100%
BC750x600	$ 1,078.00	3	$ 90,034.56	0%	100%
HW825	$ 1,748.95	51	$ 89,196.46	0%	100%
BC3000x2700	$ 5,040.50	1	$ 85,688.50	0%	100%

Stormwater Assets Value Distribution					
Unit Rate Code	Average Unit Rate	Count of Assets	Replacement Cost	%	Cum%
BC600x450	$ 832.90	7	$ 83,106.63	0%	100%
HW1650	$ 7,900.26	10	$ 79,002.60	0%	100%
CP3600	$ 2,875.56	26	$ 74,764.67	0%	100%
BC2700x1500	$ 3,438.75	2	$ 64,304.68	0%	100%
GPT2000-2	$ 9,030.25	7	$ 63,211.77	0%	100%
GPT3650x1950-2	$ 11,692.36	5	$ 58,461.80	0%	100%
MH1200-4	$ 5,740.57	9	$ 51,665.12	0%	100%
MH1500-5	$ 8,151.63	6	$ 48,909.78	0%	100%
BC900x600	$ 1,215.89	2	$ 47,018.47	0%	100%
MH2400x1500-4	$ 10,214.21	4	$ 40,856.85	0%	100%
BC375x225	$ 555.50	7	$ 39,173.86	0%	100%
MHSPEC1200	$ 12,012.45	3	$ 36,037.34	0%	100%
MH2100-3	$ 8,770.51	4	$ 35,082.04	0%	100%
SP005	$ 11,606.97	3	$ 34,820.90	0%	100%
BC3600x1500	$ 4,610.89	1	$ 33,198.41	0%	100%
BC750x375	$ 834.50	2	$ 32,420.33	0%	100%
BC300x300	$ 507.95	7	$ 31,421.76	0%	100%
MHSPEC2815	$ 28,871.69	1	$ 28,871.69	0%	100%
BC750x300	$ 835.50	4	$ 28,824.75	0%	100%
BC600x600	$ 938.60	2	$ 28,721.16	0%	100%
MHSPEC4700	$ 27,929.52	1	$ 27,929.52	0%	100%
BC1800x750	$ 2,188.00	1	$ 27,700.08	0%	100%
HW225	$ 521.35	51	$ 26,588.89	0%	100%
BC900x750	$ 1,353.00	2	$ 24,827.55	0%	100%
SP001	$ 2,605.41	9	$ 23,448.65	0%	100%
MHSPEC1400	$ 11,187.13	2	$ 22,374.26	0%	100%
MHSPEC2305	$ 21,845.05	1	$ 21,845.05	0%	100%
BC750x450	$ 1,079.00	1	$ 21,062.08	0%	100%
HW150	$ 395.75	53	$ 20,974.75	0%	100%
MH1200-5	$ 6,823.52	3	$ 20,470.56	0%	100%
GPT3000x1500-2	$ 9,817.45	2	$ 19,634.89	0%	100%
MHSPEC1650	$ 15,990.24	1	$ 15,990.24	0%	100%
MHSPEC2200	$ 14,748.07	1	$ 14,748.07	0%	100%
MHSPEC2550	$ 14,191.53	1	$ 14,191.53	0%	100%
SP006	$ 13,817.63	1	$ 13,817.63	0%	100%
MHSPEC1050	$ 5,481.62	2	$ 10,963.24	0%	100%
MH2100-4	$ 10,731.07	1	$ 10,731.07	0%	100%
MH1800-5	$ 10,245.17	1	$ 10,245.17	0%	100%
MHSPEC2500	$ 9,744.08	1	$ 9,744.08	0%	100%
600RBC	$ 727.21	2	$ 9,257.44	0%	100%
MHSPEC2000	$ 9,224.61	1	$ 9,224.61	0%	100%
BC1500x1500	$ 2,460.06	1	$ 8,831.62	0%	100%
MH1800-4	$ 8,643.25	1	$ 8,643.25	0%	100%
BC750x225	$ 834.50	1	$ 7,860.99	0%	100%
BC900x900	$ 1,490.08	1	$ 7,495.10	0%	100%
SP003	$ 7,492.70	1	$ 7,492.70	0%	100%
BC375x300	$ 555.50	1	$ 7,327.05	0%	100%
MHSPEC1100	$ 6,798.37	1	$ 6,798.37	0%	100%
SP004	$ 6,626.02	1	$ 6,626.02	0%	100%
L5000-1500	$ 711.82	1	$ 6,513.15	0%	100%
BC450x450	$ 737.77	1	$ 6,160.42	0%	100%
L500-500	$ 128.30	1	$ 4,201.83	0%	100%
SP002	$ 3,581.33	1	$ 3,581.33	0%	100%
250uPVC	$ 225.34	2	$ 3,269.68	0%	100%

Stormwater Assets Value Distribution						
Unit Rate Code	Average Unit Rate		Count of Assets	Replacement Cost	%	Cum%
BC375x150	$	555.50	1	$ 3,044.14	0%	100%
HW100	$	315.81	6	$ 1,894.86	0%	100%
HW1200x450	$	1,580.49	1	$ 1,580.49	0%	100%
HW400	$	762.05	2	$ 1,524.09	0%	100%
HW300x2	$	1,007.50	1	$ 1,007.50	0%	100%
HW450x300	$	711.50	1	$ 711.50	0%	100%
TOTAL	$	706,970.79	54,860	$ 369,660,541.21	100%	100%

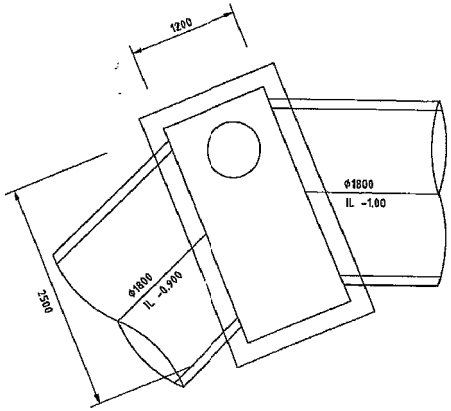
Appendix D

Standard Drawings

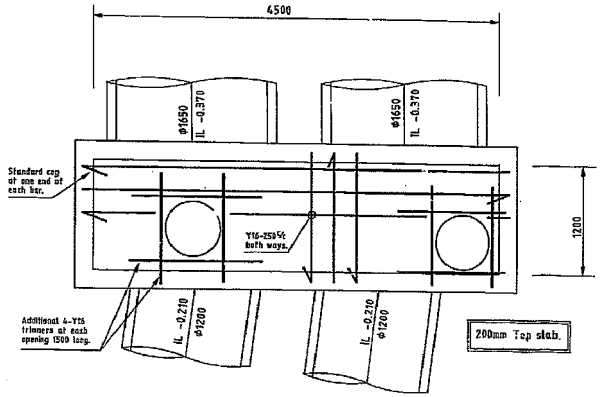


PIPE FLOW	0.093	0.111	0.145	0.096	0.145	
VELOCITY	0.587	0.699	0.672	0.868	0.911	
PIPE LENGTH	20.	37.479	15.028	32.	1.	
PIPE SLOPE	0.526	0.513	0.535	1.032		
PIPE SIZE	450	450	525	375	450	
PIPE CLASS	X	X	X	X	X	
Datum RL 0.000	RL-10.000					
HGL Q2	1.707	1.664 1.659	1.618 1.609	1.599	1.524	1.516 1.514
PIPE DEPTH	1.143	1.366 1.416	1.695 1.770	1.755	1.666	1.666 1.782
INVERT LEVEL	1.257	1.157 1.107	0.920 0.845	0.825	0.505	0.505 0.580
SURFACE LEVEL	2.400	2.520	2.610	2.580	2.170	2.280
DISTANCE	0.000	20.000	57.480	0.000	32.000	33.000

LINE No.4 LINE No.5

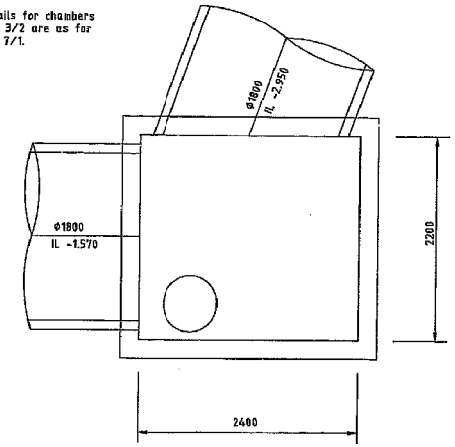


CHAMBER 2/2 DETAIL
Scale 1:25

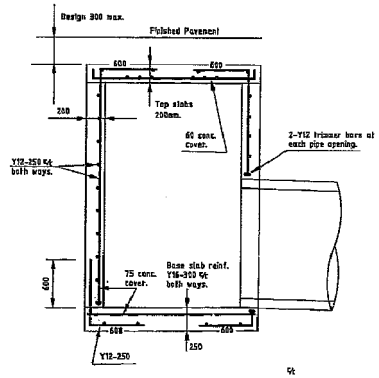


CHAMBER 7/1 DETAIL
Scale 1:25

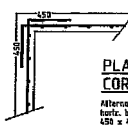
NOTE
Top details for chambers 2/2 and 3/2 are as for chamber 7/1.



CHAMBER 3/2 DETAIL
Scale 1:25



TYPICAL CHAMBER SECTION



PLAN - WALL CORNER DETAIL
Alternative- Provide straight horiz. bars with separate 450 x 450 bars - 250 ctrs

AS CONSTRUCTED
DATE 16/3/93

HORIZ. 20 10 0 20 40 60 80 m 1:1000
VERT. 2 1 0 2 4 6 8 m 1:100
Full Size A1

D001945

TYPICAL BASE AND WALL DETAILS
Scale 1:25

Project: RIVER CITY DEVELOPMENTS — AQUATIC MEWS ESTATE, GALLEY WAY, BIRKDALE

Title: STORMWATER DRAINAGE LONGITUDINAL SECTIONS LINES 3,4 & 5

No.	Date	Amendments
A	SEP.'92	REDESIGN

Design	P.J.B.
Drawn	L.L.
Checked	
Approved	
Date	JUNE '92
Datum	AHD
Scale	as shown

M.D.Arnold & Assoc. P/L
Consulting Surveyors
115 Bloomfield Street
CLEVELAND Q. 4163
Phone (07) 821 1044
Sheet of Sheets

DEVELOPMENT CONSULTING Pty.Ltd.
Harbour Village Place
25 Cambridge Pde., Manly, Q. 4179

Consulting Civil Engineers.
Development Consultants.
Project Managers.
P.O. Box 197
Wynnum 4178
Ph: (07) 393 5555
Fax: (07) 393 4181

Drawing No. 8927-09 A

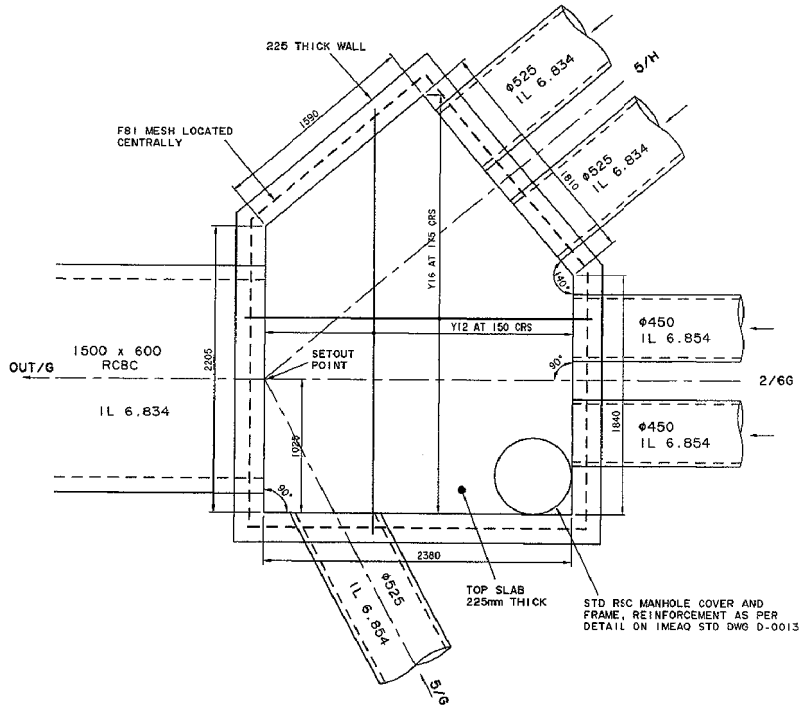
R1 - 2/14 - 83

I, TOM Mc KINNEY
HEREBY CERTIFY THAT THE
DESIGN OF THE NON-STANDARD
DRAINAGE STRUCTURES COMPLIES
WITH ALL REQUIRED DESIGN CRITERIA.

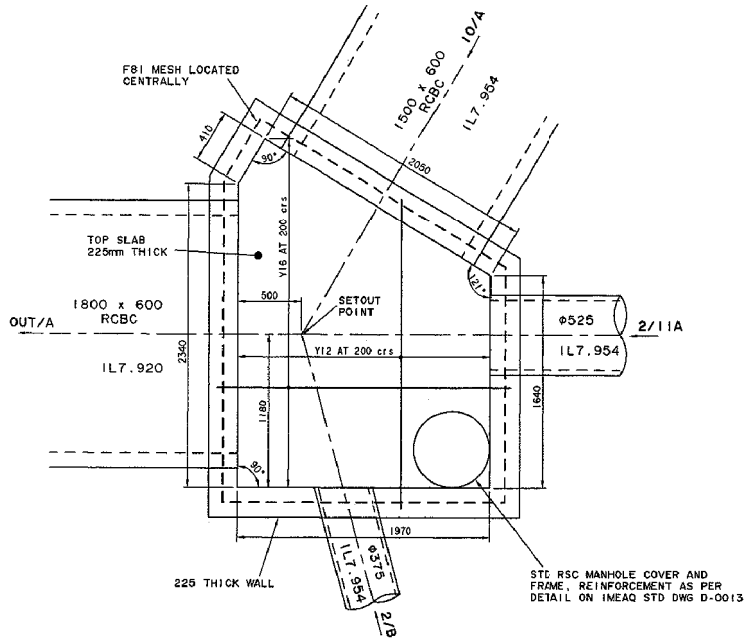
SIGNATURE _____ RPEQ 5087

DATE 22-10-2003

FOR AND ON BEHALF OF
JF&P CONSULTING ENGINEERS PTY.LTD.



STRUCTURE 6/G
SCALE 1:20



STRUCTURE 11/A
SCALE 1:20

NOTES:

1. ALL REINFORCEMENT IS TO COMPLY WITH TYPICAL DETAILS AND SECTIONS ON IMEAQ STD DWG No. D-0013 .
2. CONCRETE TO BE CONSTRUCTED IN ACCORDANCE WITH AS.3600.
3. FORMWORK SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH AS.3610.
4. ALL CONCRETE TO BE GRADE N32, 80mm SLUMP AND NOMINAL AGGREGATE SIZE OF 20mm
5. ALL LAPS IN REINFORCEMENT SHALL BE 300mm-Y12, 400mm-Y16
6. MINIMUM CLEAR COVER TO REINFORCEMENT SHALL BE 45mm
7. COVER TO REINFORCEMENT SHALL BE MAINTAINED DURING POURING BY THE USE OF APPROVED PLASTIC CHAIRS.
8. DESIGNED TO "AUSTROADS - BRIDGE DESIGN CODE 1992"

JF&P Consulting Engineers Pty. Ltd.

I....TOM McKINNEY.....being a certified/registered engineer
hereby, for and on behalf of JF&P Consulting Engineers Pty.Ltd
- x certify the "as constructed" information contained in the drawing is accurate
- x accept responsibility for the "as constructed" information contained in this drawing.
- x acknowledge the "as constructed" information contained in the drawing may be relied on by Council and others.

SIGNED: _____ DATE: 18-09-2003

(CONSTRUCTED 2002)

WORK AS CONSTRUCTED
T. McKINNEY RPEQ No. 5087
DATE 18-09-2003

I Mark Thomas Fitzgerald, Licensed Surveyor of JONES FLINT & PIKE PTY. LTD. hereby certify that the "as constructed" information shown is accurate and in accordance with the Design Standard for Developments.

SIGNED: _____ DATE: 26/9/03

D015560
R1-9/41-32

JF&P Consulting Engineers civil and structural engineers
JF&P Consulting Engineers Pty. Ltd. A.C.N. 050 414 036

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E-Mail brisbane@jfp.com.au

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59 Goondoon Street,
Gladstone, Queensland. 4680
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GOLD COAST
17A Margaret Street,
Southport, Queensland. 4215
telephone (07) 5591 6311

SUNSHINE COAST
Maroochydore -
231-239 Bradman Avenue
Maroochydore, Queensland. 4558
Telephone (07) 5443 2500
Fax (07) 5443 4799
E-Mail maroochydore@jfp.com.au

0 0.2 0.4 0.6 0.8 1 1:20 2 Metres
0 1 2 3 4 5 1:100 10

designed	GRC	datum AHD
drawn	GRC	Origin (B.M.)
checked	TM	
approved	T.McKINNEY	RPEQ 5087

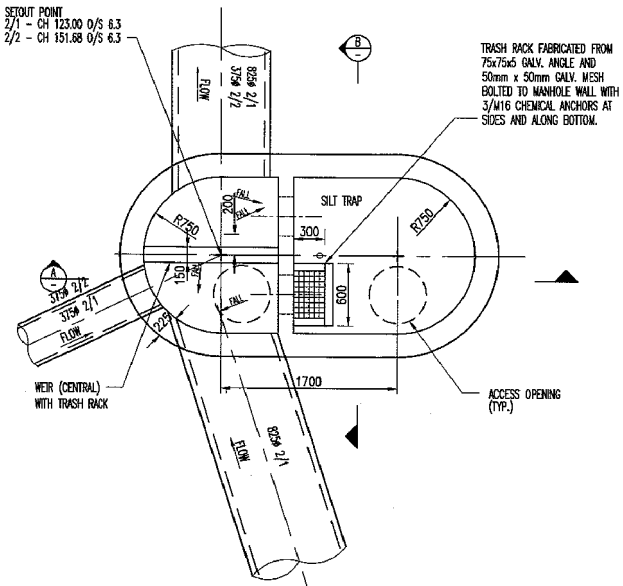
scale 1:20 — SCALE SHOWN IS ORIGINAL DRAWING SCALE DO NOT SCALE FROM THIS DRAWING USE ONLY DIMENSIONS PROVIDED IF IN DOUBT PLEASE ENQUIRE — A1

issue	revision details	date	init
A	Original issue FOR COUNCIL APPROVAL	6/01	GRC
B	ADD INVERT LEVELS	27/9/01	GRC
C	WORK AS CONSTRUCTED	5/4/02	SKB

R.S.C. REF: SB435201

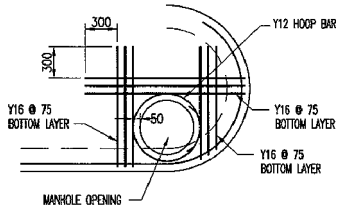
PROJECT MORETON SHORES - STAGE 1
THORNLANDS ROAD, THORNLANDS
CLIENT CORNISH GROUP PTY LTD
TITLE DRAINAGE MANHOLE DETAILS - SHEET 1

Sheet X of X sheets
drawing number B2207/1 D13 C
drawing file:mh_dets
date JUNE 2001

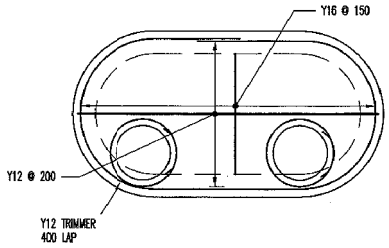


GROSS POLLUTANT TRAP MANHOLE (2/1) AND (2/2)
SCALE 1:25

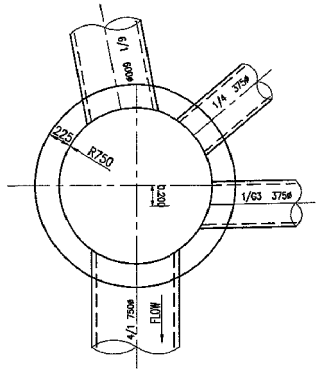
NOTE
DRAWN FOR 2/1 – 2/2 SIMILAR.



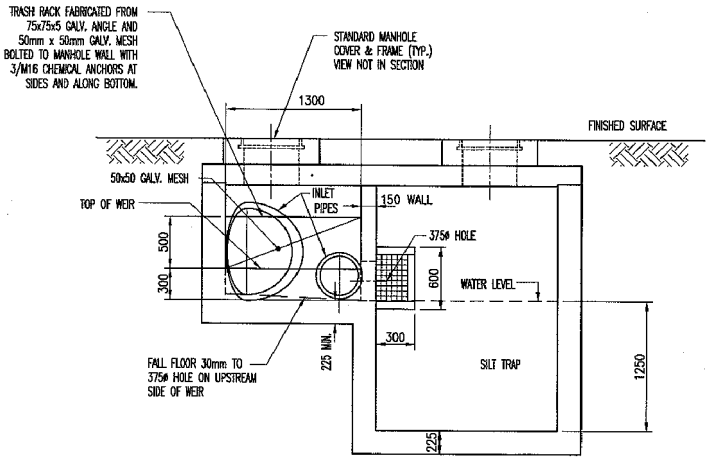
REINFORCEMENT AROUND ACCESS OPENINGS
SCALE 1:25



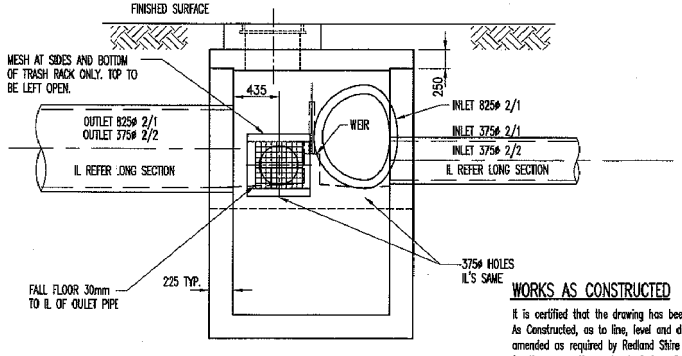
EXPANDED M.H. CHAMBER – LID RIENFORCEMENT
SCALE 1:25



5/1 – 1500 dia



SECTION (A)
SCALE 1:25



SECTION (B)
SCALE 1:25

NOTES

1. 1050 DIA AND 1500 DIA MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH REDLAND SHIRE COUNCIL STD DRG. NO. 1023

CONCRETE NOTES

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF AS. 3600 . ANY MATTER IN DOUBT MUST BE REFERRED TO THE ENGINEER.
2. CONCRETE QUALITY

ELEMENT	STRENGTH GRADE DESIGNATION	MAX AGG. SIZE	SLUMP	TYPE OF CONTROL TESTING
BASE AND WALLS	20	20	100	REFER AS.3600
TOP SLAB	20	20	75	

WORKS AS CONSTRUCTED

It is certified that the drawing has been carefully compared with the works As Constructed, as to line, level and dimensions and it has been accurately amended as required by Redland Shire Council's Design Standards For Development for the preparation and submission of As Constructed Drawings for Subdivisional Works so as to constitute a true record of the works As Constructed.

Signature ..... RPEQ No. 2131

Date of Practical Completion 16/06/2005

(Company Title) CLINKER CONSULTING PTY. LTD.

R1-12/45-24

D0421598 RSC FILE REF: EC004584.1

REF.	ZONE	REVISION	DATE	APPD.
G		AS CONSTRUCTED AMENDMENTS	15.06.06	LWN
F		FILE REF.S SHOWN	27.07.05	LWN
E		AS CONSTRUCTED INFO ADDED	30.03.05	LWN
D		GROSS POLLUTANT TRAP AMENDED	29.07.04	LWN
C		FILE REF, STRUCTURE SIZE CHANGED	23.01.04	LWN

CLINKER CONSULTING PTY LTD
A.C.N. 010 881 277
CIVIL ENGINEERING DESIGN & CONSTRUCTION
1 Flinders View, 247 Springwood Rd, Springwood, Qld 4127
Telephone: (07) 3208 8527

DRAWN	DF
DESIGNED	RB
CHECKED	LWN
PASSED	
DATE	

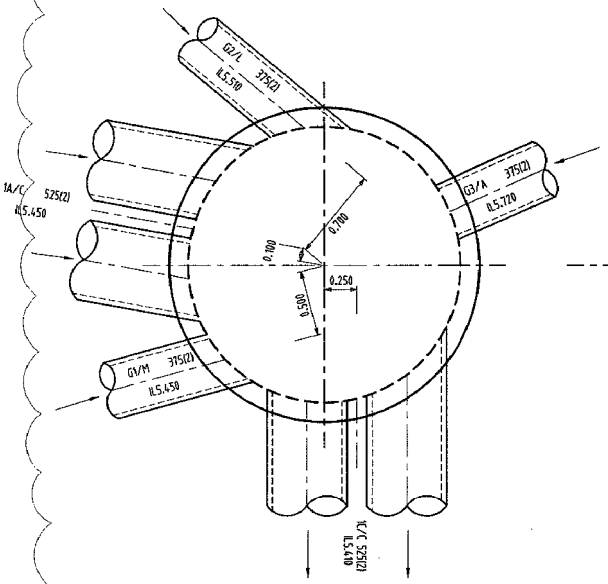
GORDON ROAD SUBDIVISION – STAGE 1
STORMWATER DRAINAGE DETAILS

D0421598

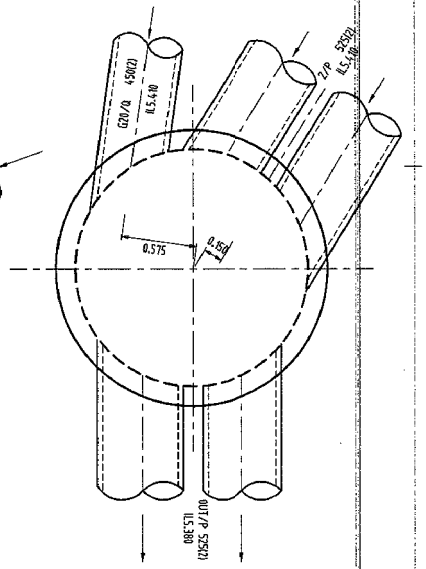
SCALE	AS SHOWN
LEVEL DATUM	A.H.D.
SHEET	20 OF 29
DRAWING No.	1180/1/20 G

REFERENCE POINT LOCATION FOR DRAINAGE STRUCTURES

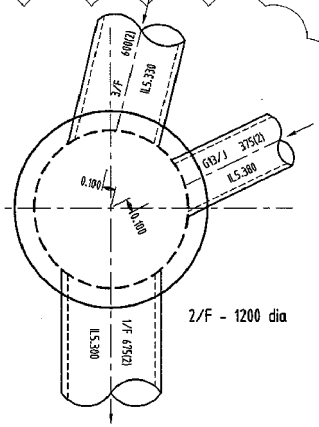
STRUCTURE TYPE	HORIZONTAL CONTROL (REFERENCE POINT LOCATION)	VERTICAL CONTROL (REFERENCE LEVEL)
MANHOLE	℄ MAIN SHAFT	FINISHED SURFACE LEVEL
GULLY PIT	INTERSECTION OF ℄ PIT AND LIP OF KERB	LIP LEVEL
HEADWALL	INTERSECTION OF HEADWALL FACE & PIPE CENTRE LINE	INVERT LEVEL



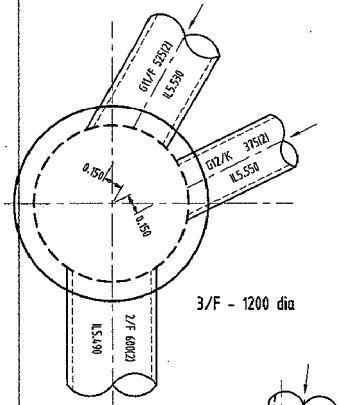
1B/C - 2100 dia



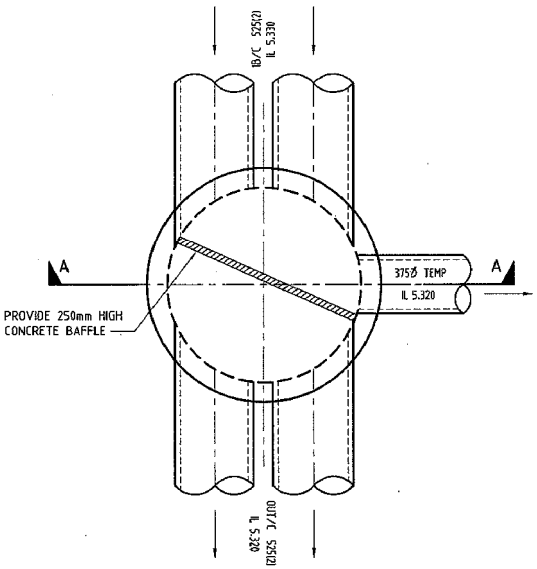
1/P - 1800 dia



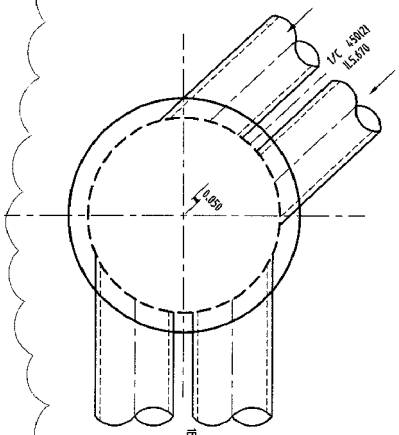
2/F - 1200 dia



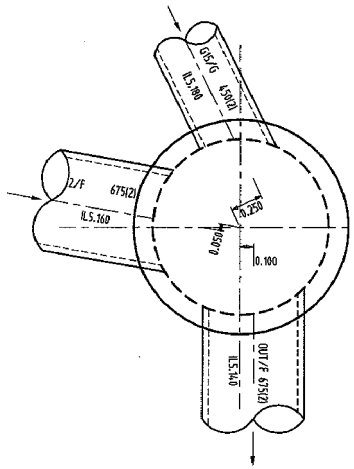
3/F - 1200 dia



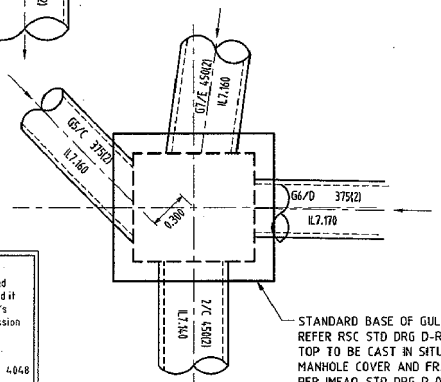
1C/C - 1500 dia



1A/C - 1500 dia

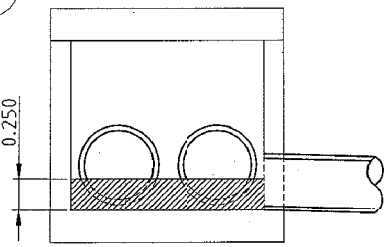


1/F - 1350 dia



STANDARD BASE OF GULLY PIT. REFER RSC STD DRG D-RSC-3. TOP TO BE CAST IN SITU. MANHOLE COVER AND FRAME AS PER IMEAQ STD DRG D-0014

SPECIAL 3/C



SECTION A - A

WORKS AS CONSTRUCTED

It is certified that the original drawing has been carefully compared with the works As Constructed, as to line, level and dimensions and it has been accurately amended as required by Redland Shire Council's Design Standards For Development for the preparation and submission of As Constructed Drawings for Subdivisional Works so as to constitute a true and correct record of the works As Constructed.

Signature ..... Terence Chan 4048
Jeff Griffiths 4115

Date of Practical Completion 05/03/2004
For and on behalf of WP BROWN & PARTNERS PTY LTD RPEU 2026

* The original issue or last amendment of this drawing contained the original signature.

R1-9143-24
D0370218

RSC REF:- EC 461201

FEE: B02031-22.dwg DATE: 05-04-2004 TIME: 10:48
Xref's: B0203111 USR: Gary

ISSUE	CALC	DRAWN	DATE	AMENDMENT DETAILS
A	TR	AG	7.05.03	COUNCIL AMENDMENTS
B	TR	AG	29.07.03	STORMWATER AMENDED
C	DS	JW	05.04.04	AS CONSTRUCTED DETAILS
D	AH	KP	15.03.05	LEVELS AMENDED, AS CONSTRUCTED REVISED
E				
F				

AMENDMENT ISSUE

DESIGN CHECK

DRAWN CHECK

SCALE (METRES)

1:20 0.2 0 0.2 0.4 0.6 0.8 1 A1
1:40 A3

MICROFILM No.

PROJECT No. B02031

ASSOCIATED CONSULTANTS
SURVEYOR: Wolter Consulting Group
Level 12, 97 Creek St Brisbane Q 4000
Ph (07) 3211 3133 Fax (07) 3211 3492

APPROVED T CHAN*
FOR & ON BEHALF OF W.P. BROWN & PARTNERS PTY LTD RPEU 2026
TERENCE CHAN RPEQ 4048
JEFF GRIFFITHS RPEQ 4115

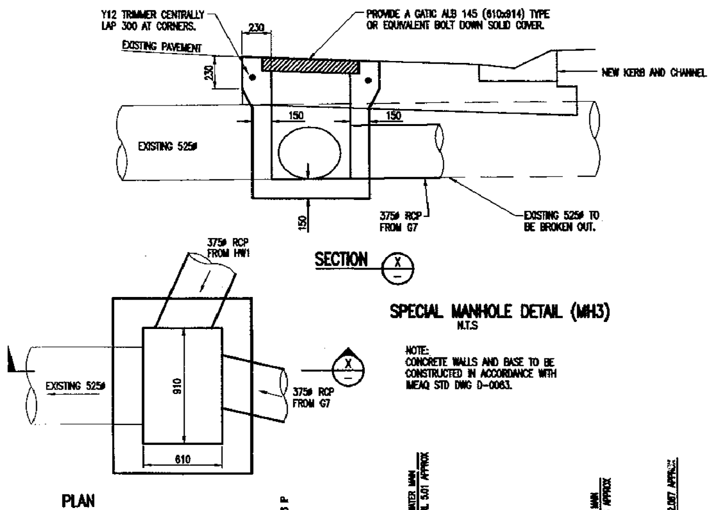
CLIENT: CHALTARA PTY LTD

PROJECT: SOVEREIGN HEIGHTS ESTATE STAGE 4

W P BROWN & PARTNERS PTY LTD
ENGINEERS AND MANAGERS
Level 3, 410 Queen St Brisbane Q 4000
Telephone (07) 3231 5555
Facsimile (07) 3231 5500
email brisbane@wpbrown.com.au
BRISBANE CANBERRA MELBOURNE
SYDNEY SUNSHINE COAST SINGAPORE

DRAWING TITLE: STORMWATER DRAINAGE MANHOLE DETAILS

DRAWING NUMBER: B02031-22 ISSUE: D

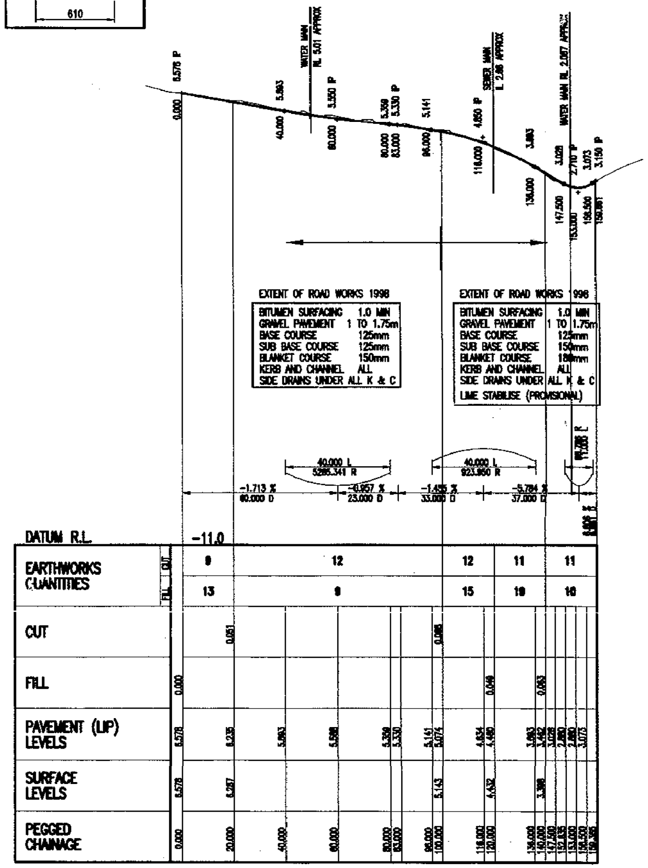


SECTION X

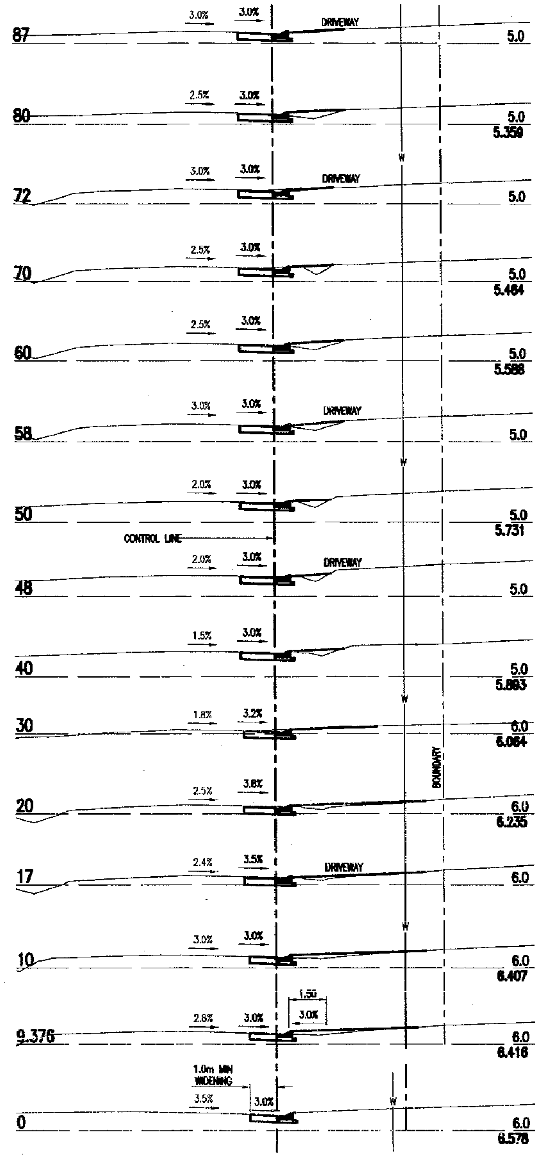
SPECIAL MANHOLE DETAIL (MH3)
N.T.S

NOTE:
CONCRETE WALLS AND BASE TO BE CONSTRUCTED IN ACCORDANCE WITH MEAQ STD DWG D-0063.

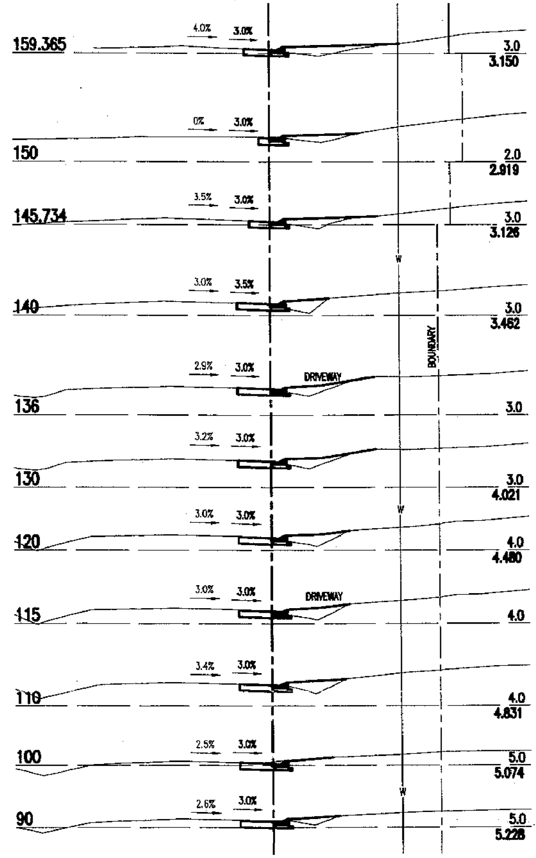
PLAN



KERB AND CHANNEL - C
SCALE B



CROSS SECTIONS
SCALE A



1:100 (UNREDUCED)
SCALE A

1:100 VERT (UNREDUCED)
1:1000 HORIZ (UNREDUCED)
SCALE B

20517

P020517

REV.	DATE	AMENDMENT / ISSUE	DWN	DES	CHK	APPROVED
A	27/4/98	ISSUE TO COUNCIL	MH	MH	KB	

BORNHORST + WARD
CONSULTING ENGINEERS
CIVIL AND STRUCTURAL

Bornhorst & Ward Pty Ltd
Brisbane Australia
Phone (07) 3831 4899
Facsimile (07) 3832 4804
A.C.N. 010 151 354

CLIENT
REDLAND SHIRE COUNCIL
DIRECTOR OF ENGINEERING SERVICES
MANAGER DESIGN

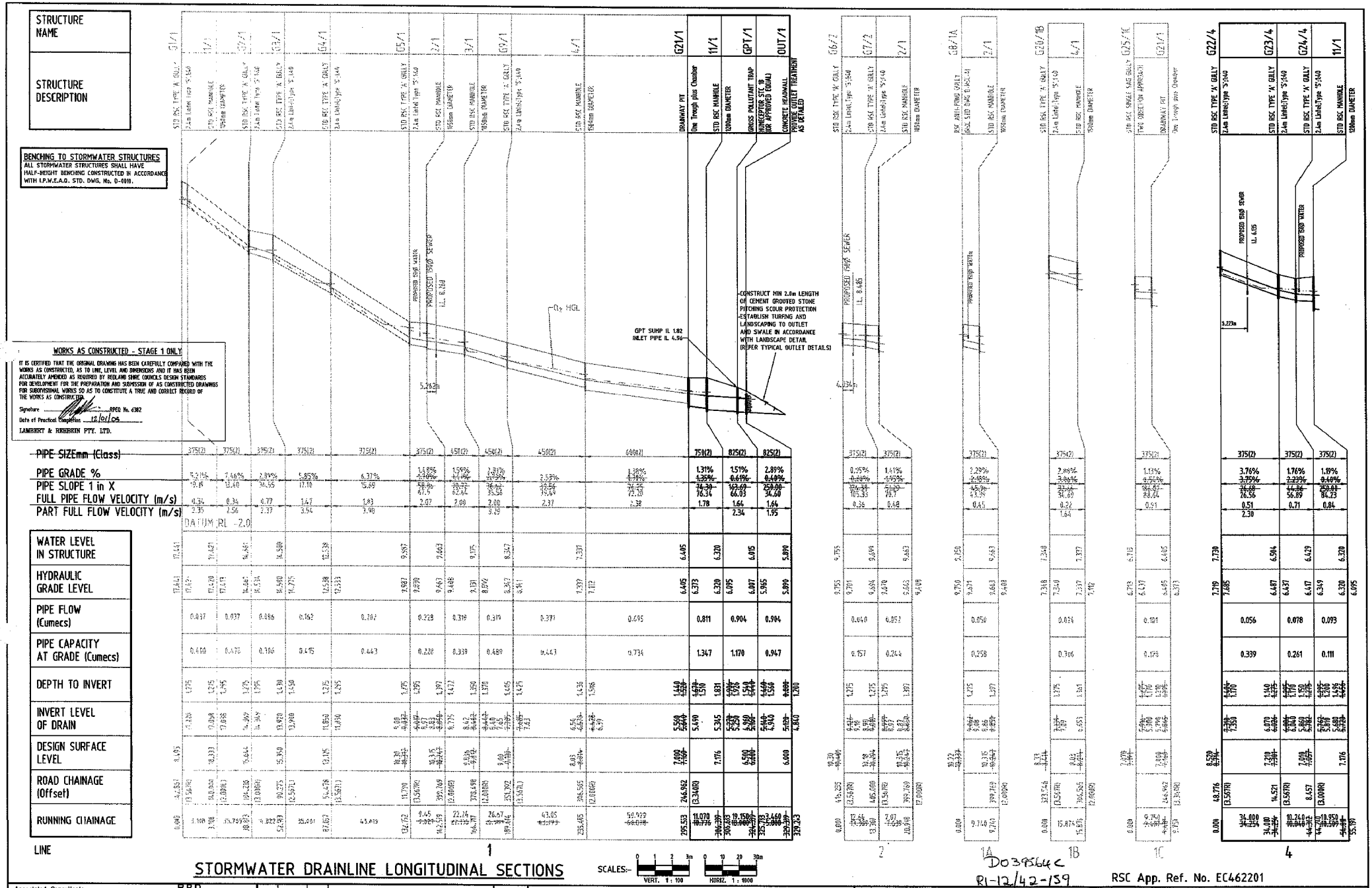
PROJECT
ROAD WORKS 1998
THORNESIDE ROAD
QUEENS ESP. TO JEAN ST.

SUBJECT
KERB C
LONGITUDINAL AND CROSS SECTIONS

RT7-10-3

SCALE AS NOTED
JOB No 97589
DRAWING No. 3
REVISION A

100mm BEFORE REDUCTION



STORMWATER DRAINLINE LONGITUDINAL SECTIONS

SCALES:- VERT. 1 : 100 HORIZ. 1 : 1000

D03956C

RI-12/42-159

RSC App. Ref. No. EC462201

Associated Consultants:
PIKE MIRLS McKNOULTY
Land Surveyors & Town Planners
21 Buchanan Street Phone: (07) 3846 3344
West End Qld 4101 Fax: (07) 3846 7844

R.P.D.
Lot 2
S.P. 153871
Parish of REDLAND
County of STANLEY
LEVEL DATUM
A.H.D. Derived
P.M. 93269
R.L. 9.268

No.	Date	By	Amendment	Checked
G	31-05-06	A.J.	REVISED STAGE 1 AS CONSTRUCTED	
F	16-11-05	SD	REVISED AS CONSTRUCTED AS PER COUNCIL REQUIREMENTS	

LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS
580 STANLEY STREET SOUTH BRISBANE QLD 4101
P.O. BOX 6409 WOOLLOONGABBA QLD 4102
A.C.N. 010 451 902
TELEPHONE (07) 3846 3355
FACSIMILE (07) 3846 3300
EMAIL mail@lar.net.au
The Association of Consulting Engineers Australia

Project: "THE SANCTUARY" SUBDIVISION
39 - 93 SERPENTINE CREEK ROAD
REDLAND BAY

Title: STORMWATER DRAINAGE LONGITUDINAL SECTIONS (Sheet 1)

Client: *Cosmopolitan Developments*

Draftsperson: S.A.D.	Checked: D.S.M.	Sheet Size: A1	Drawing No.: B02116-C17
Designer: D.L.	Approved: A.PEZZUTTI RPEQ No. 6382		
Scale: AS SHOWN	Date: 23-06-2003	F	G

D03956C

NOTES :-

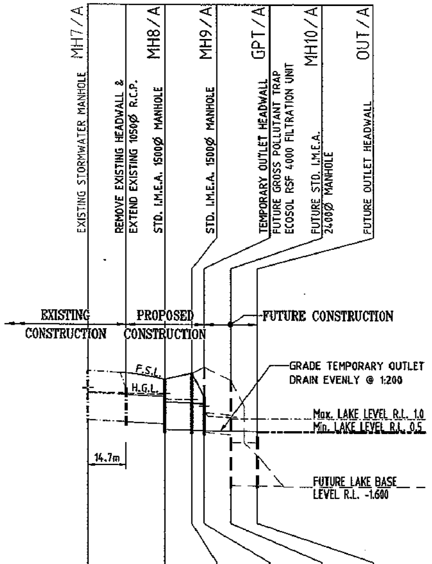
1) ALL STORMWATER PIPES WITH AN INVERT LEVEL BELOW R.L. 2.0 MUST BE CONSTRUCTED WITH SALTWATER RESISTANT CLASS PIPES.
2) RUBBER RINGED SPIGOT & SOCKET JOINTS TO BE USED ON ALL STORMWATER PIPES IN UNSTABLE GROUND CONDITIONS & WHERE THE NORMAL GROUND WATER LEVEL IS ABOVE THE PIPE OBVERTS.
3) ALL CONCRETE (other than in pipes) WHICH IS IN CONTACT WITH SALT WATER SHALL BE OF STRENGTH 30MPa.
4) COVER TO REINFORCING STEEL (other than pipes) SHALL NOT BE LESS THAN 85mm FOR ALL CONCRETE IN CONTACT WITH SALT WATER.
5) SERVICE CROSSING OVER STORMWATER PIPES WHICH DO NOT SATISFY THE MINIMUM COVER TO BE ENCASED IN LEAN MIX CONCRETE.

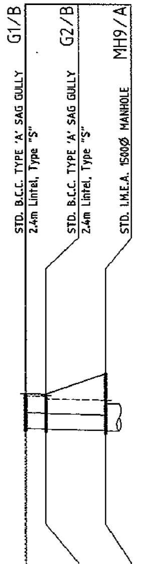
STORMWATER DRAINAGE MINIMUM PIPE GRADES

PIPE DIAMETER (mm)	MIN GRADE (%)
300	0.50
375	0.40
450	0.30
525	0.25
600	0.20
675	0.18
750	0.15
900	0.12
1050 or GREATER	0.10

LEGEND :-

F.S.L. = FINISHED SURFACE LEVEL
H.G.L. = HYDRAULIC GRADE LEVEL





LINE A – pipes

	MH7/A–MH8/A	MH8/A–MH9/A	MH9/A–GPT/A	GPT/A–MH10/A	MH10/A–OUT/A
PIPE SIZE(mm)	1050	1050	1050	2x750	1650
PIPE CLASS	2	2	2	2	2
PIPE GRADE %	0.48%	0.20% ~~0.10%~~	0.62% ~~0.10%~~	1.00%	0.10%
PIPE SLOPE 1 in X	208.33	~~1000.00~~ 510.85	~~1000.00~~ 161.63	100.00	1000.00
FULL PIPE FLOW VELOCITY	1.63	1.63	1.95	1.91	0.95
PART FULL PIPE FLOW VELOCITY				2.79	
DESIGN DISCHARGE (Cumecs)	1.450	1.450	1.738	1.738	1.738
PIPE CAPACITY AT GRADE (Cumecs)	1.967	0.898	0.898	2.321	2.331
RUNNING CHAINAGE	29.524	10.217	4.849	10.249	10.000

DATUM RL -10.0

LINE A – structures

	MH7/A	MH8/A	MH9/A	GPT/A	MH10/A	OUT/A
WATER LEVEL IN STRUCTURE	2.206	1.990	1.748	1.502	1.076	1.000
HYDRAULIC GRADE LEVEL	2.174 / 2.030	1.953 / 1.775	1.748 / 1.620	1.602 / 1.252	1.058 / 1.006	1.000
DEPTH TO INVERT	1.900	1.709 / ~~1.940~~ 1.727	1.870 ~~2.188~~ / ~~2.208~~ 1.870	1.400 ~~2.448~~ / 2.498	2.100 / 4.040	1.900
INVERT LEVEL OF DRAIN	0.960	0.818 / ~~0.587~~ 0.800	0.780 ~~0.577~~ / ~~0.557~~ 0.780	0.750 ~~0.552~~ / 0.502	0.400 / -1.540	-1.550
DESIGN SURFACE LEVEL	2.860	2.527	2.650 ~~2.765~~	2.150 ~~3.000~~	2.500	0.350
ROAD CHAINAGE (OFFSET)	12.773 / 2.250L	42.363 / 1.712L	REFER INTERSECTION PLAN	REFER INTERSECTION PLAN	REFER INTERSECTION PLAN	REFER INTERSECTION PLAN

LINE A

LINE B – pipes

	G1/B–G2/B	G2/B–MH9/A
PIPE SIZE(mm)	600	600
PIPE CLASS	2	2
PIPE GRADE %	0.56% ~~0.20%~~	0.20%
PIPE SLOPE 1 in X	~~500.00~~ 177.00	~~500.00~~ 506.58
FULL PIPE FLOW VELOCITY	0.53	1.02
DESIGN DISCHARGE (Cumecs)	0.156	0.297
PIPE CAPACITY AT GRADE (Cumecs)	0.286	0.286
RUNNING CHAINAGE	8.850	20.263

LINE B – structures

	G1/B	G2/B	MH9/A
WATER LEVEL IN STRUCTURE	1.984	1.919	1.748
HYDRAULIC GRADE LEVEL	1.984 / 1.900	1.895 / 1.797	1.748 / 1.620
DEPTH TO INVERT	~~1.320~~ 1.074	1.114 ~~1.336~~ / ~~1.356~~ 1.144	1.860 ~~2.188~~ / ~~2.208~~ 1.870
INVERT LEVEL OF DRAIN	~~0.656~~ 0.910	0.860 ~~0.638~~ / ~~0.648~~ 0.830	0.790 ~~0.577~~ / ~~0.557~~ 0.780
DESIGN SURFACE LEVEL	1.984	1.974	2.650 ~~2.765~~
ROAD CHAINAGE (OFFSET)	67.548 / 3.541L	67.982 / 2.826R	REFER INTERSECTION PLAN

LINE B

WORK AS CONSTRUCTED

Signed........[signature]........ Date..10/99........
DEVELOPMENT CONSULTING PTY. LTD R.P.E.C.Q. 235

Horiz. :- 20 10 0 20 40 60 80 meters 1:1000
Vert. :- 2.0 1.0 0 2.0 4.0 6.0 8.0 meters 1:100
(Full Size A1)

D020517

DEVELOPMENT CONSULTING Pty. Ltd.
Harbour Village Place 25 Cambridge Pde., Manly, Q. 4179
Consulting Civil Engineers
Development Consultants.
Project Managers & Planners
P.O. Box 187 Wynnum 4178
Ph: (07) 3893 1811 Fax: (07) 3893 4181
AS 9001 SGS

KENNETH MATHESON SURVEYS
Licensed Surveyors
Mapping, Planning and Development Consultants
Suite 9, 3374 Pacific Highway
Springwood QLD. 4127
Ph. (07) 3209 1088 Fax. (07) 3808 0017

Design	G.C.
Drawn	G.C.
Checked	J.M.
Approved	[signature]
RPEQ No.	1907
Date	JUNE '99
Datum	A.H.D.
Scale	as shown

No.	Date	Amendments
C	10/99	AS CONSTRUCTED
B	08/99	STORMWATER LONGITUDINAL SECTION LINE "B" AMENDED
A	06/99	ORIGINAL ISSUE

Project PROPOSED SUBDIVISION for WELLINGTON POINT DEVELOPMENT PTY. LTD. at BIRKDALE - WELLIGNTON POINT ROAD WELLINGTON POINT - STAGE 4

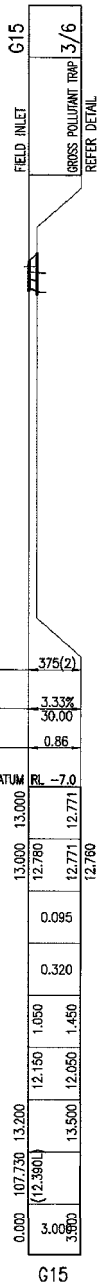
Title STORMWATER LONGITUDINAL SECTIONS D023579

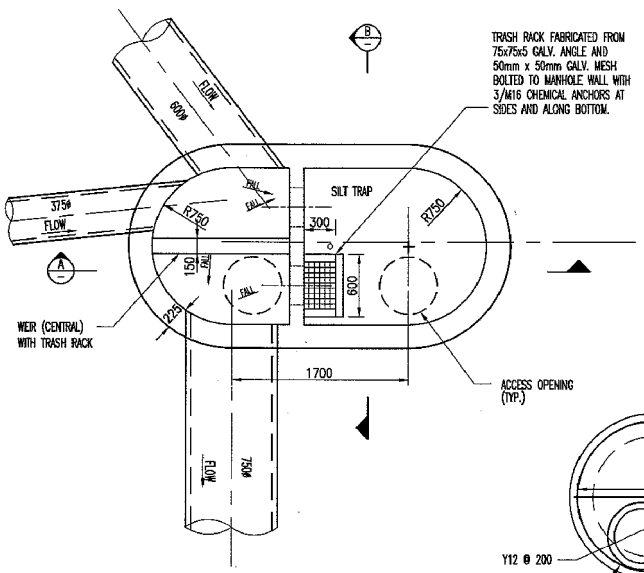
Drawing No. 9840-11 C

9840SWL1

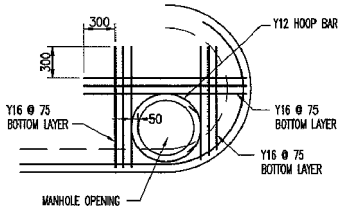
R1-3/4-46

STRUCTURE NAME
STRUCTURE DESCRIPTION





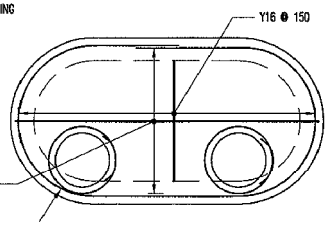
GROSS POLLUTANT TRAP MANHOLE (3/6)
SCALE 1:25



REINFORCEMENT AROUND ACCESS OPENINGS
SCALE 1:25

NOTES

1. CONFIRM INVERT LEVELS OF EXISTING PIPES PRIOR TO CONSTRUCTION.
2. ALL PIPES TO BE REINFORCED CONCRETE CLASS '2' UNLESS SHOWN OTHERWISE.
   PIPES UP TO AND INCLUDING 600 DIA. SHALL BE SPIGOT AND SOCKET RUBBER RING JOINTED.
   PIPES GREATER THAN 600 DIA. SHALL BE FLUSH JOINT WITH EXTERNAL BAND.
3. BACKFILLING UNDER ROADWAYS TO BE MIN. CBR 15 MATERIAL COMPACTED TO 95 % MOD. A.A.S.H.O. OR EQUIVALENT.
4. PIPE BEDDING MATERIAL SHALL BE 10 mm. AGGREGATE.
5. OFFSETS SHOWN TO GULLY PITS ARE TO LIP OF CHANNEL AND DESIGN SURFACE LEVELS ARE LIP LEVELS.



EXPANDED M.H. CHAMBER – LID REINFORCEMENT
SCALE 1:25

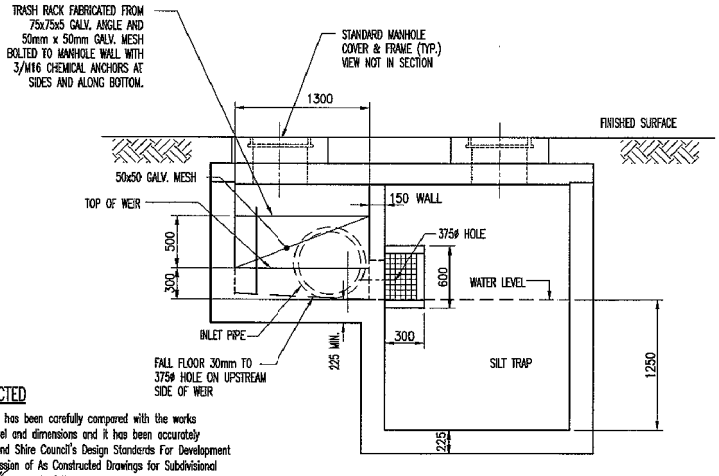
NOTES

1. 1050 DIA AND 1500 DIA MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH REDLAND SHIRE COUNCIL STD DRG. NO. 1023

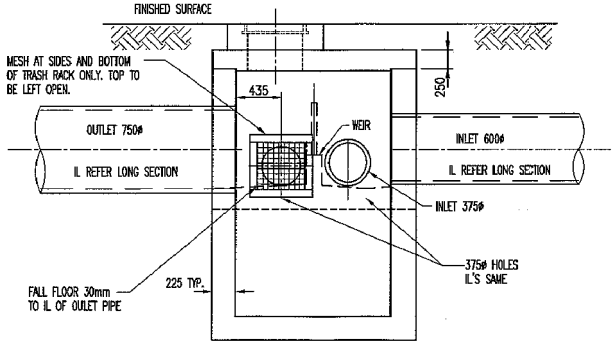
CONCRETE NOTES

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF AS. 3600 . ANY MATTER IN DOUBT MUST BE REFERRED TO THE ENGINEER.
2. CONCRETE QUALITY

ELEMENT	STRENGTH GRADE DESIGNATION	MAX. AGG SIZE	SLUMP	TYPE OF CONTROL TESTING
BASE AND WALLS	20	20	100	REFER AS.3600
TOP SLAB	20	20	75	



SECTION A
SCALE 1:25



SECTION B
SCALE 1:25

WORKS AS CONSTRUCTED

It is certified that the drawing has been carefully compared with the works As Constructed, as to line, level and dimensions and it has been accurately amended as required by Redland Shire Council's Design Standards For Development for the preparation and submission of As Constructed Drawings for Subdivisional Works so as to constitute a true record of the works As Constructed.

Signature ..... RPEQ No. 2131

Date of Practical Completion 12/06/2006

(Company Title) CLINKER CONSULTING PTY. LTD.

RSC FILE REF: EC004710.1 & .2

REF.	ZONE	REVISION	DATE	APPD.
G		AS CONSTRUCTED INFO ADDED	16.06.06	LWN
F		MINOR AMENDMENTS	05.09.05	LWN
E		LONG SECTION LEVELS CHANGED	07.04.05	LWN
D		COUNCIL AMENDMENTS	09.03.05	LWN
C		COUNCIL AMENDMENTS	19.01.05	LWN

SCALE
VERTICAL 1 0 1 2 3 4 5m — 1:100 FULL SIZE A1
HORIZONTAL 10 0 10 20 30 40 50m — 1:1000 FULL SIZE A1

CLINKER CONSULTING PTY LTD
A.C.N. 010 901 977
CIVIL ENGINEERING DESIGN & CONSTRUCTION
1 Flinders View, 247 Springwood Rd, Springwood, Qld 4127
Telephone: (07) 3206 8527

DRAWN	DF
DESIGNED	RB
CHECKED	LWN
PASSED	
DATE	

GORDON ROAD SUBDIVISION – STAGE 2
STORMWATER DRAINAGE LONGITUDINAL SECTIONS & DETAILS
SHEET 2 OF 2

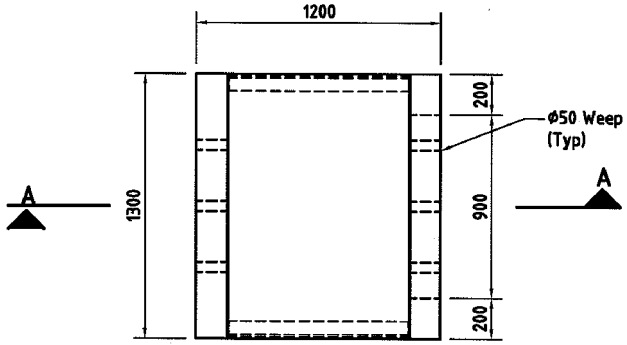
RPEQ 2131

D044356B
R1-12/47-30

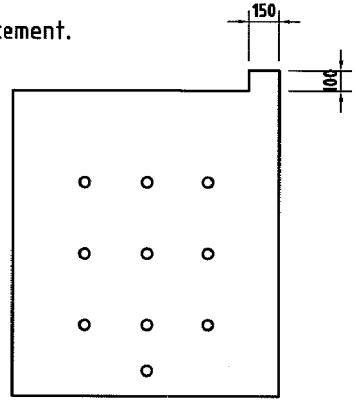
SCALE	AS SHOWN
LEVEL DATUM	A.H.D.
SHEET	15 OF 28
DRAWING No.	1180/2/15 G

NOTES

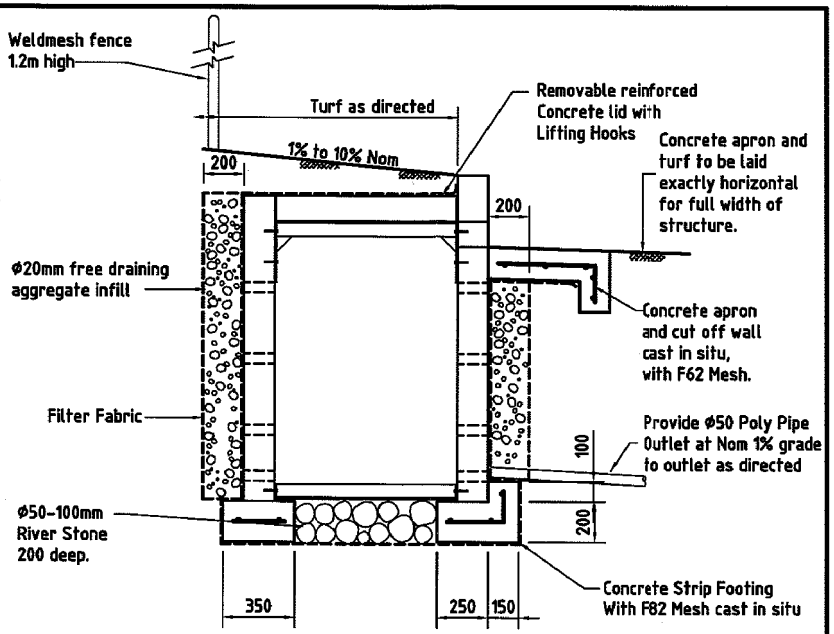
1. Refer also standard drawings D-RSC-8 and D-RSC-10
2. All steel to be hot dip galvanised.
3. All concrete to be N40, with a minimum cover of 50mm to all reinforcement.



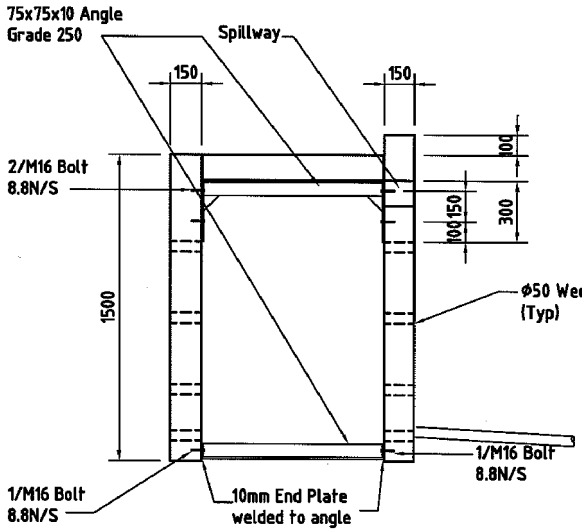
PLAN
Scale 1:25



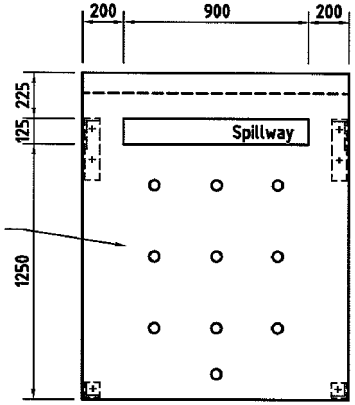
END WALL ELEVATION
Scale 1:25



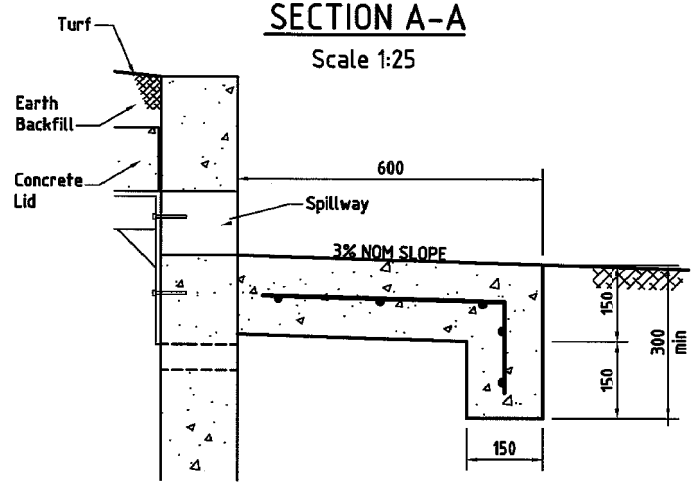
SECTION A-A
Scale 1:25



LHS ELEVATION
Scale 1:25



FRONT ELEVATION
Scale 1:25



APRON DETAIL
Scale 1:25

A	ORIGINIAL ISSUE	6/04	SM
	REVISIONS	DATE	APPROVED

REDLAND SHIRE COUNCIL

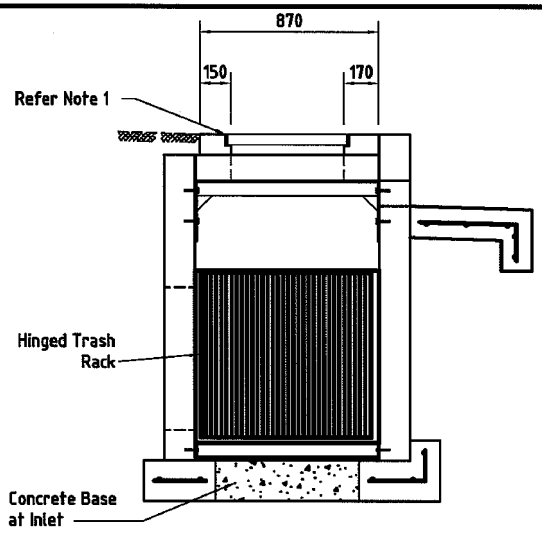
DISCLAIMER: The authors shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.

Redland

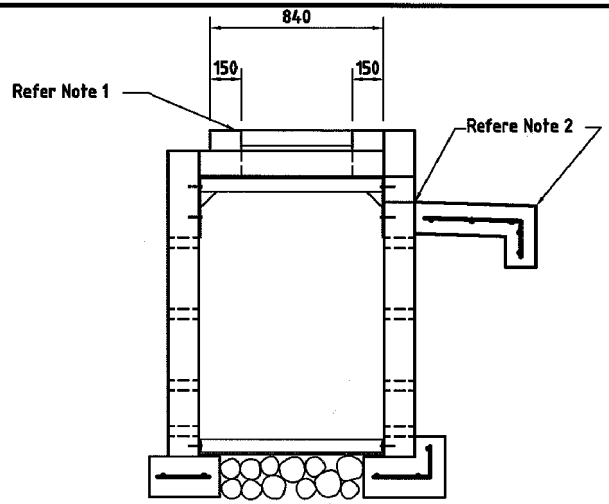
STORMWATER FLOW DISSIPATOR UNIT STRUCTURE DETAILS

SHEET 2 OF 3

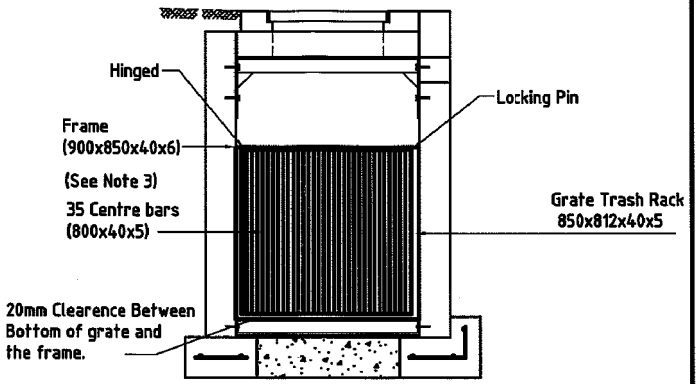
DRAINAGE
Standard Drawing
D-RSC-9
A



SECTION A-A
(Refer Sheet 1)

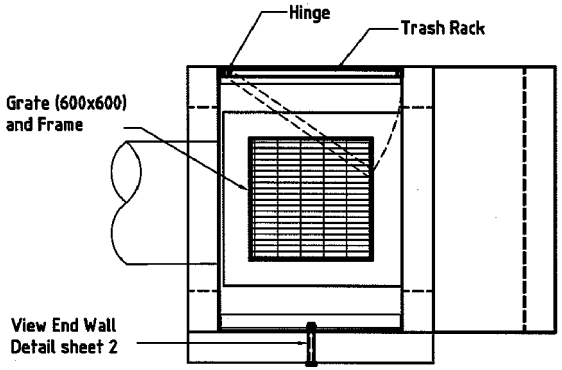


SECTION OF ACCESS UNIT

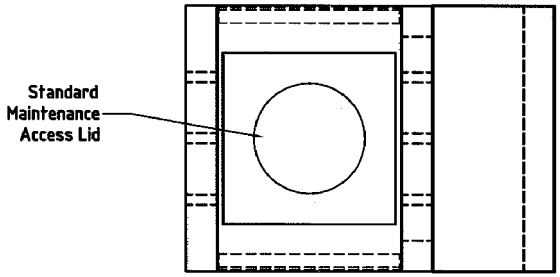


TRASH RACK DETAIL

GPT



PLAN OF GRATE UNIT



PLAN OF ACCESS UNIT

NOTES

1. Refer also standard drawings D-RSC-8 ans D-RSC-9
2. Access lid and grate to be installed at same level and grade as ground profile.
3. Lip of spillway outlet and lip of apron to be constructed exactly level for the full width of the structure.
4. The height of the trash rack may be varied to match the depth of the dissipator as required

Scale 1:25

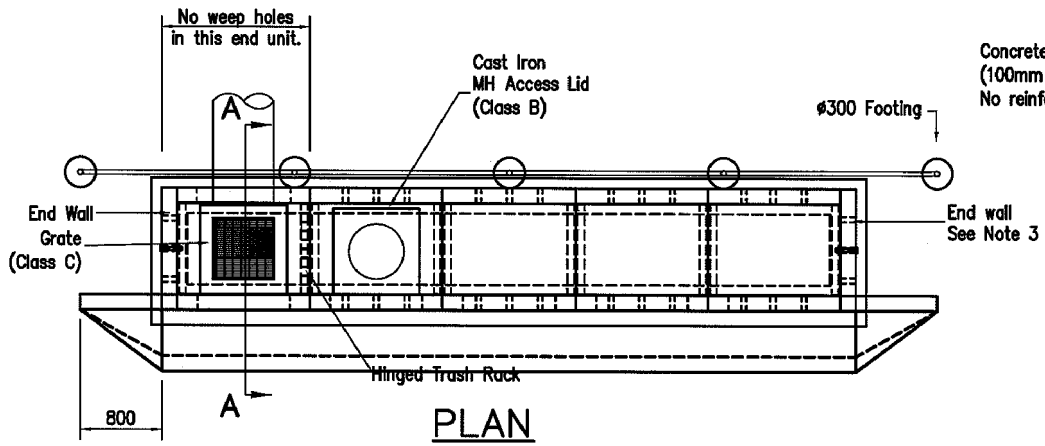
A	ORIGNIAL ISSUE	6/04	
	REVISIONS	DATE	AI

Redland

STORMWATER FLOW DISSIPATOR GATE, TRASH RACK & ACCESS UNIT DETAILS

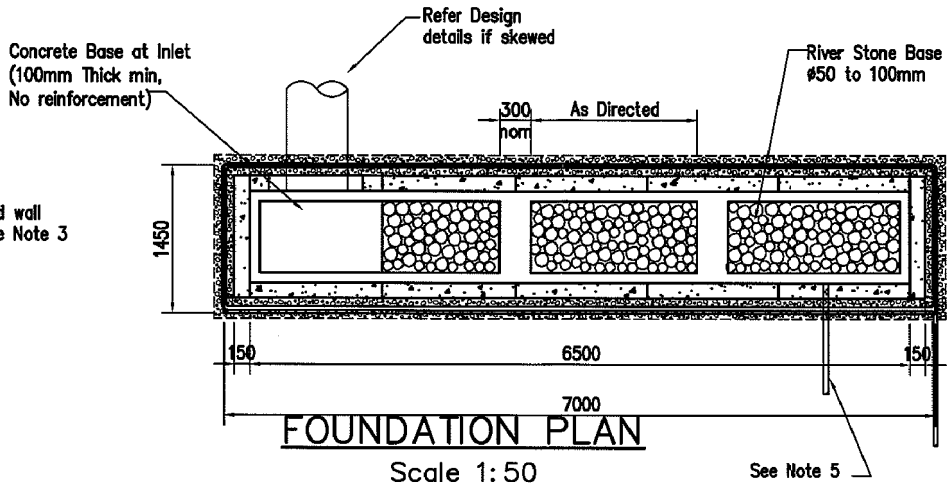
SHEET 3 OF 3

DRAINAGE
Standard Drawing
D-RSC-10
A



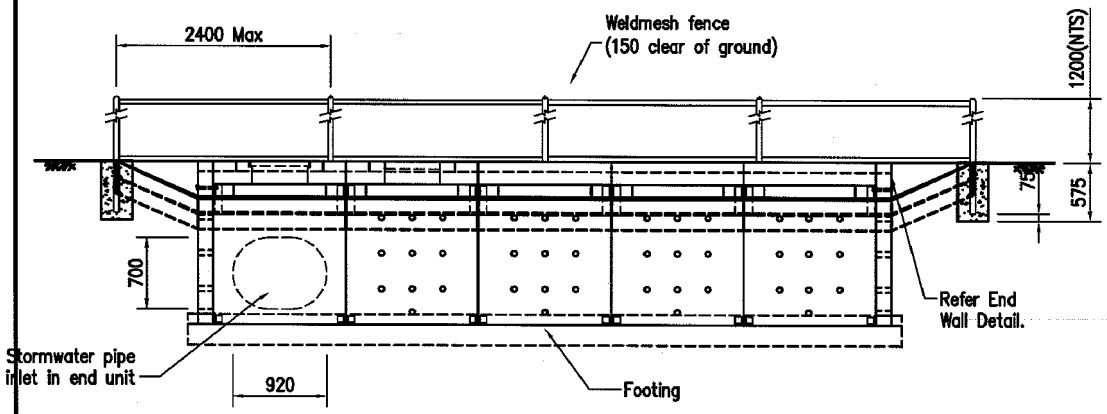
PLAN

Scale 1:50



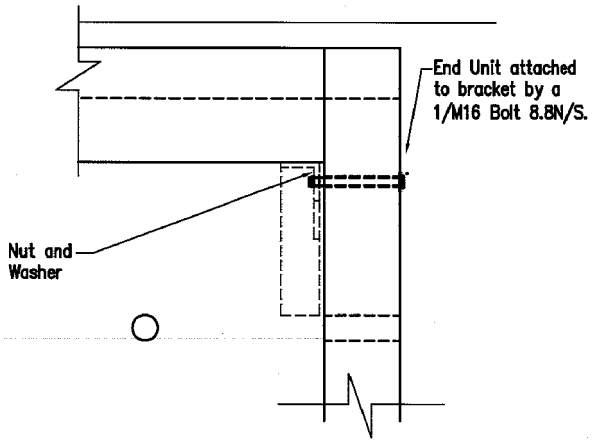
FOUNDATION PLAN

Scale 1:50



FRONT ELEVATION

Scale 1:50



ENDWALL DETAIL

Scale 1:10

NOTES

1. Refer also standard drawings D-RSC-9 and D-RSC-10
2. Pre-cast concrete to be minimum grade N40 in accordance with AS1379 and AS3600
3. Reinforcing fabric to be in accordance with AS4671.
   All steel flats Grade 250 to AS3678
4. Both ends of assembled units to be enclosed by precast concrete end walls 150mm thick.
5. Provide 50mm dia (Nom) poly pipe outlet at approx 1% grade to outlet as directed on site

The number of units and length of the dissapator is determined by the outlet flow capacity from the units for the design storm required (usually 50% AEP) and the available width of outlet to create a wide sheet flow.

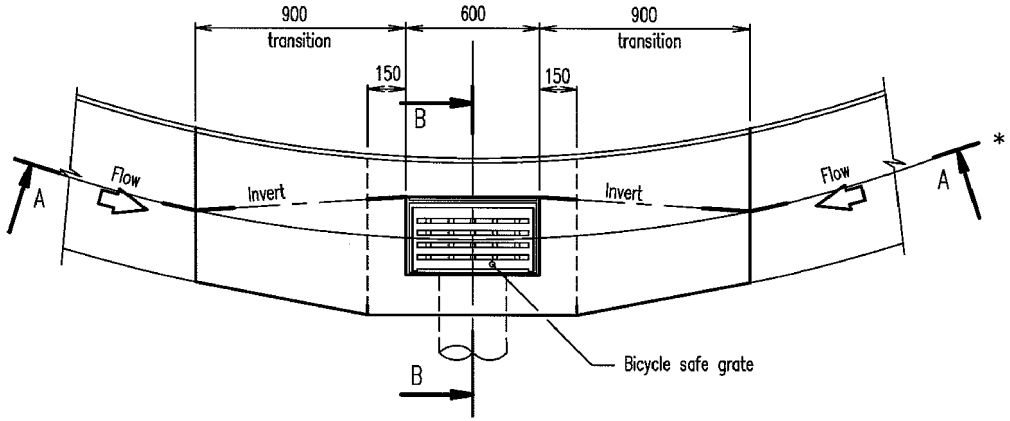
A	ORIGINAL ISSUE	6/04	SM
REVISIONS		DATE	APPROVED

Redland

STORMWATER FLOW DISSIPATOR TYPICAL LAYOUT DETAILS

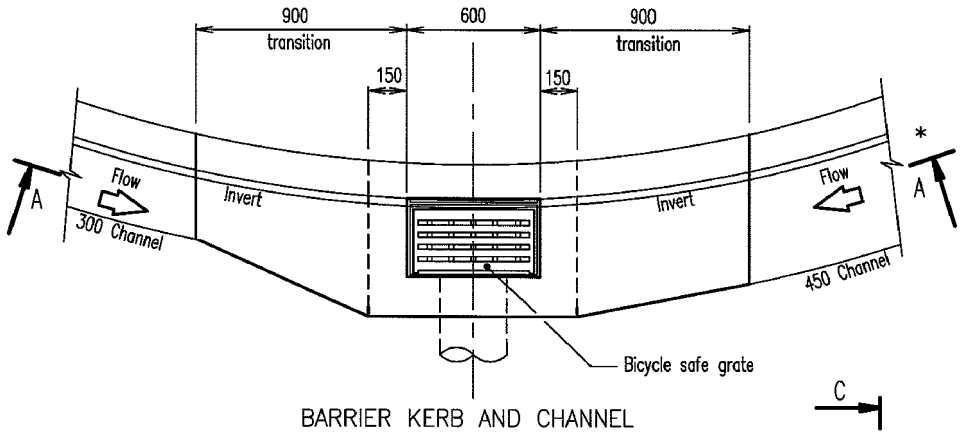
SHEET 1 OF 3

Standard Drawing
D-RSC-8
A



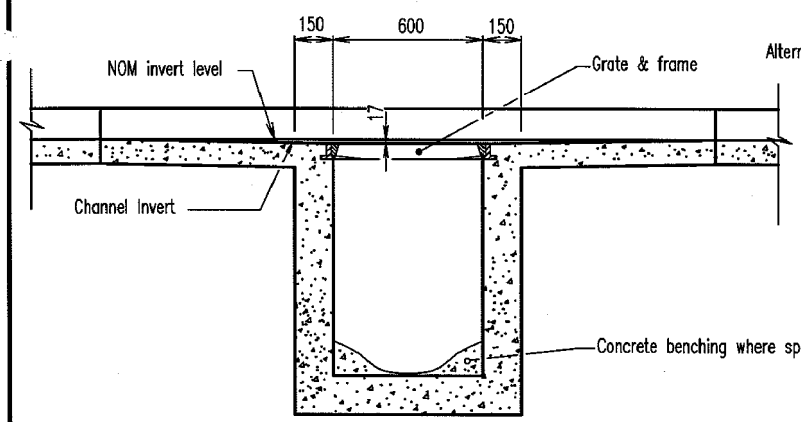
MOUNTABLE KERB AND CHANNEL

PLAN

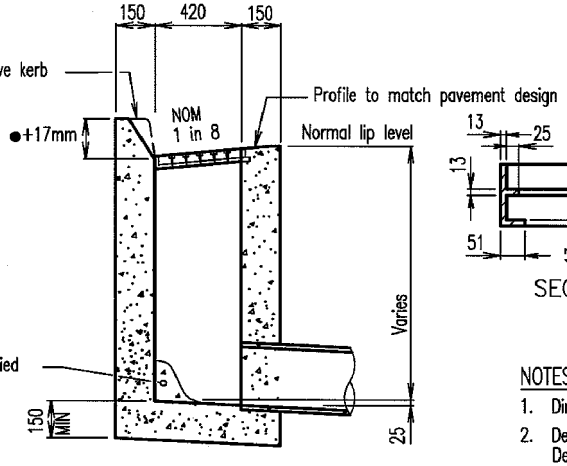


BARRIER KERB AND CHANNEL

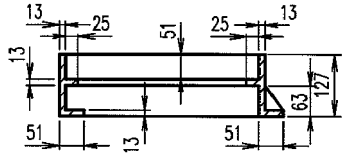
PLAN



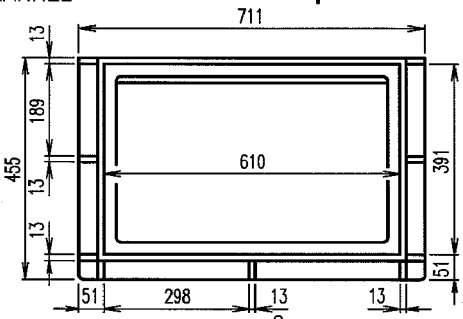
SECTION A – A



SECTION B – B



SECTION C–C



PLAN

C.I. FRAME OR FABRICATED GALV. STEEL

ANTI–PONDING GULLY

LEGEND

* NOM kerb line

● NOMINAL kerb height, see note 6.

NOTES

1. Dimensions of grate and frame may be varied subject to approval.
2. Design load for grate and frame shall be in accordance with AUSTROADS Bridge Design Specification, W7 wheel load.
3. All grates bicycle safe to AS 3996.
4. Grate and frame, grey cast iron Grade ≥ T220 to AS 1830 or alternatively fabricated steel Grade 250 to AS 3678 / 3679 and hot dip galvanized to AS 1650 may be used when approved.
5. Concrete : Benching N10, Structural N20 in accordance with AS 1379 and AS 3600.
6. Examples indicates M1 and B1 Kerb and channel types. Refer Standard Drawing R–0080, adjust for other alternatives.
7. Bitumen paint C.I. cover and frame to AS/NZS 3750.4.
8. An alternative precast concrete gully, kerb inlet, apron and pit surround may be provided subject to the approval of the superintendent. Refer Std. Dwg. D–0070 for basic dimensions.
9. Grate hinges and locking device must conform to AS 3996.
10. All dimensions in millimetres.

REVISIONS		DATE
B	Note 8 added, Note 9 revised	16/1/97
A	ORIGINAL ISSUE	8/12/95

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

GULLY – ANTI–PONDING DEPRESSED 17mm

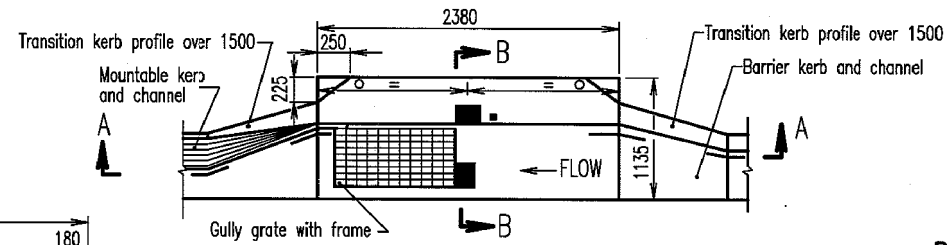
DRAINAGE
Standard Drawing
D–0068

A | B

JWP – CADENZA 113327–D–0068

COMPONENT	PRECAST GULLY
Proof Load	50 kN
Ultimate Load	75 kN

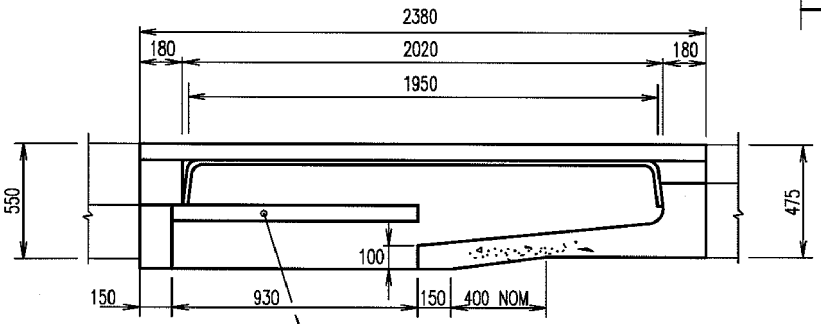
TABLE A
LOADING CRITERIA



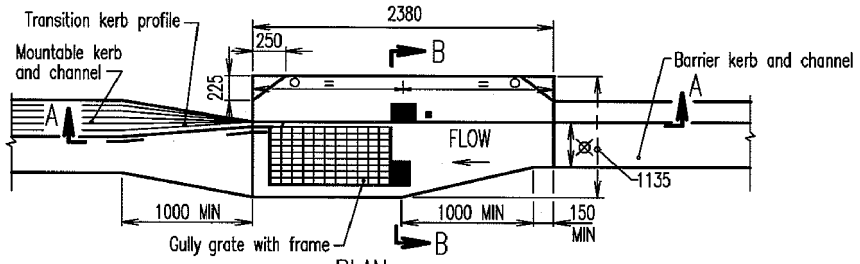
PLAN

CHANNEL LIP IN LINE

Manufacture opposite hand for flow left to right



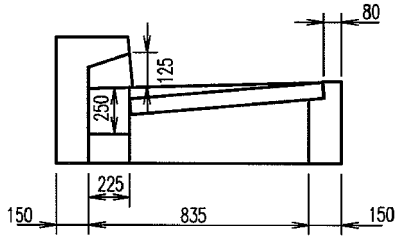
SECTION A – A



PLAN

KERB IN LINE

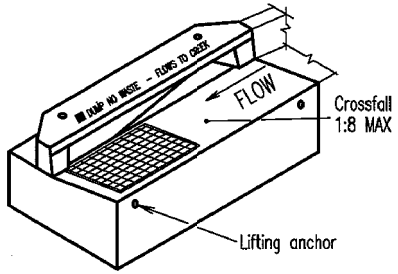
Manufacture opposite hand for flow left to right



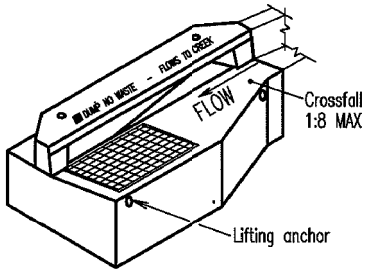
SECTION B–B

LEGEND

- ■ Text 'DUMP NO WASTE – FLOWS TO CREEK' (40mm high letters, imprinted 5mm into concrete.)
- ■ Load test area (200 x 150), refer note 3.
- ⊠ Width of channel to suit project drawings/specifications



PERSPECTIVE VIEW – CHANNEL LIP IN LINE



PERSPECTIVE VIEW – KERB IN LINE

NOTES

1. Concrete N40 in accordance with AS 3902, Castings to AS 1830.
2. Each lifting anchor to be "swiftlift" or equivalent 1.3 tonne, galvanized to AS 1650 and fitted to manufacturers' specification.
3. Reinforcement to AS 1302 shall be providec by the designer to obtain the strength required to pass the test criteria detailed on Std. Dwg. D–0066. The load detailed in Table A shall be applied to each location, seperate tests at each location.
4. All steel flats Grade 250 to AS 3678.
5. All welds to AS 1554.
6. H. Dr. wire to AS 1303.
7. Steel plate hot dip galvanized to AS 1650.
8. Grate and frame Class D to AS 3996.
9. Grate frame to be cast into concrete.
10. Refer Std. Dwg. D–0062 for grates and frame for sag location and D–0068 for anti–ponding location.
11. Refer project drawings for layout of gully inlets.
12. Precast concrete units and grate/frames must be approved by the Superintendent prior to use.
13. Provide 10mm mortar (1 cement : 3 fine sand) joint between gully pit and precast units.
14. All dimensions in millimeters.

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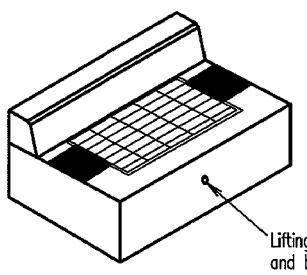
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

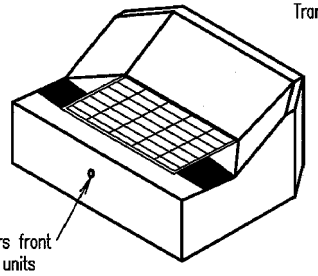
GULLY – ROADWAY TYPE PRECAST UNITS ON GRADE

DRAINAGE
Standard Drawing
D–0069
A

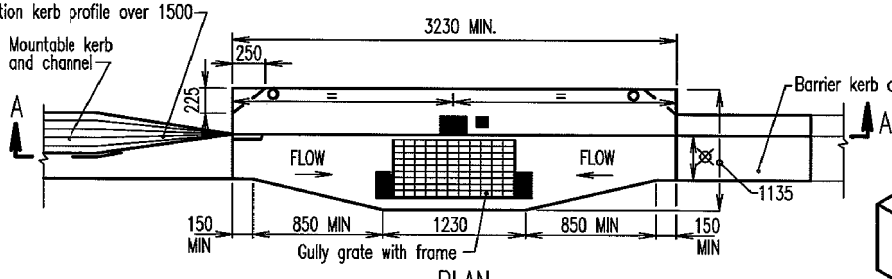
JWP – CADENZA 113327–D–0069



ISOMETRIC VIEW

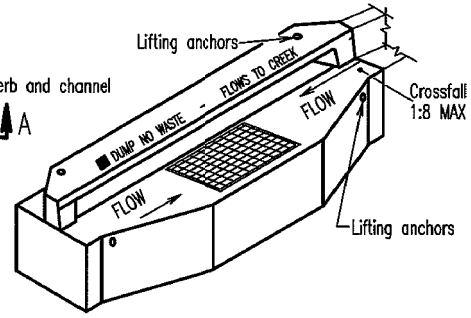


ISOMETRIC VIEW

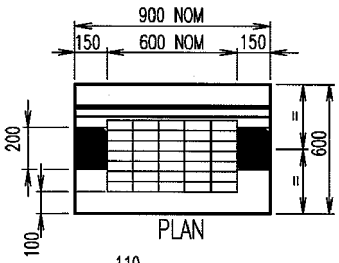


PLAN

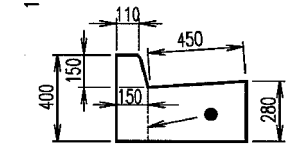
KERB IN LINE



PERSPECTIVE VIEW – KERB IN LINE

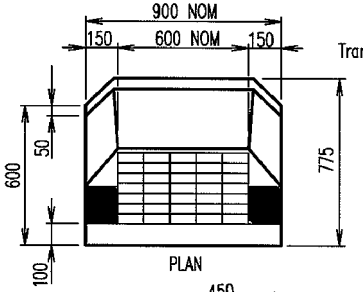


PLAN

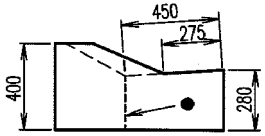


END ELEVATION

BARRIER KERB



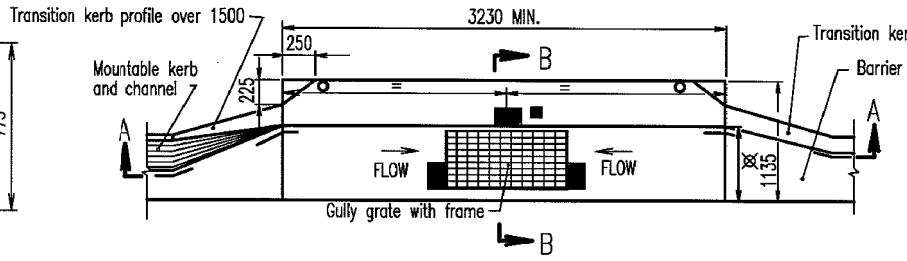
PLAN



END ELEVATION

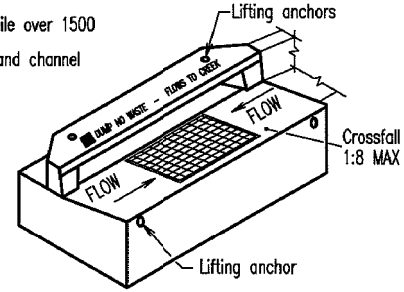
MOUNTABLE KERB

ANTI–PONDING GULLIES

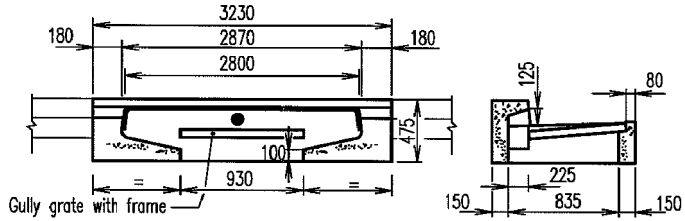


PLAN

CHANNEL LIP IN LINE



PERSPECTIVE VIEW – CHANNEL LIP IN LINE



SECTION A – A

SECTION B–B

SAG GULLIES

COMPONENT	PRECAST GULLY
Proof Load	50 kN
Ultimate Load	75 kN

TABLE A
LOADING CRITERIA

LEGEND

- ■ Text 'DUMP NO WASTE – FLOWS TO CREEK' (40mm high letters, imprinted 5mm into concrete.)
- ■ Load test area (200 x 150), refer note 3.
- ⊠ Width of channel to suit project drawings/specifications
- ● Manufacturers' identification to be shown on this face.

NOTES

1. Concrete N40 in accordance with AS 3902, Castings to AS 1830.
2. Each lifting anchor to be "swiftlift" or equivalent 1.3 tonne, galvanized to AS 1650 and fitted to manufacture's' specification.
3. Reinforcement to AS 1302 shall be provided by the designer to obtain the strength required to pass the test criteria detailed on Std. Dwg. D–0066. The load detailed in Table A shall be applied to each location, seperate tests at each location.
4. All steel flats Grade 250 to AS 3678.
5. All welds to AS 1554.
6. H. Dr. wire to AS 1303.
7. Steel plate hot dip galvanized to AS 1650.
8. Grate and frame Class D to AS 3996.
9. Grate frame to be cast into concrete.
10. Refer Std. Dwg. D–0062 for grates and frame for sag location and D–0068 for anti–ponding location.
11. Refer project drawings for layout of gully inlets.
12. Precast concrete units and grate/frames must be approved by the Superintendent prior to use.
13. Provide 10mm mortar (1 cement : 3 fine sand) joint between gully pit and precast units.
14. All dimensions in millimeters.

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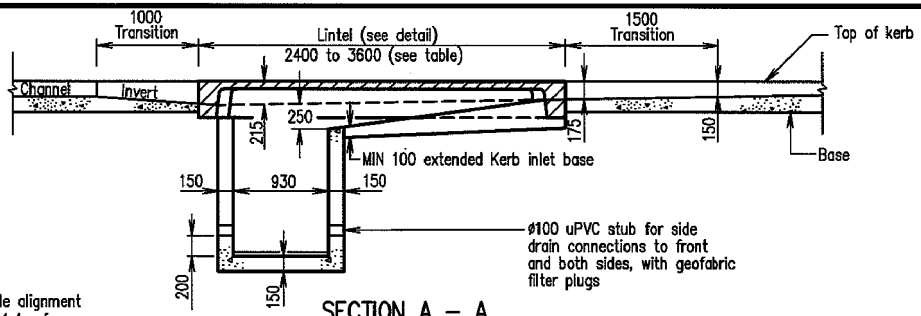
	REVISIONS	DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

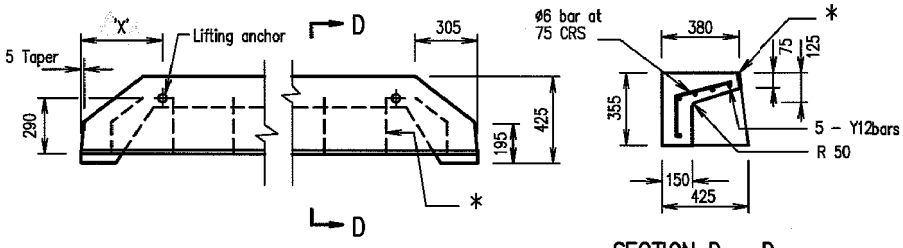
GULLY – ROADWAY TYPE PRECAST UNITS SAG AND ANTI–PONDING

DRAINAGE
Standard Drawing
D–0070
A

JWP – CADENZA 113327–D–0070



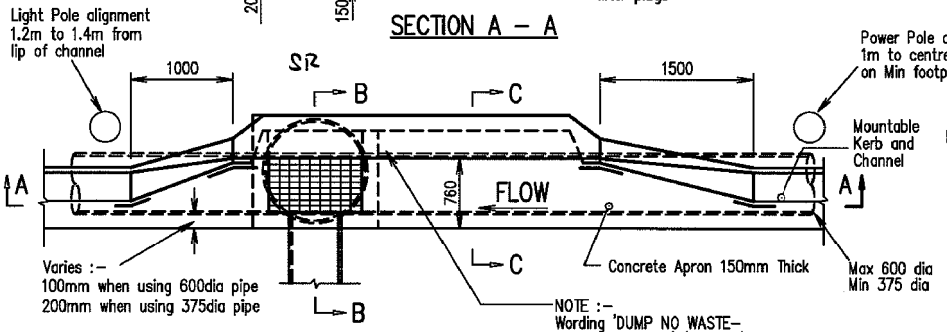
SECTION A – A



PLAN

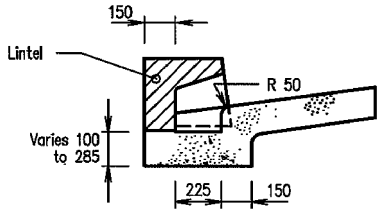
SECTION D – D

* 75 x 10 GALV. PL. with Ø10 studs 300 long, weld on 150 from the end, then at 300 centres. Bend end studs to maintain cover.

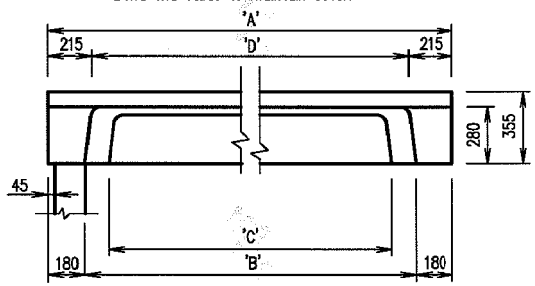


TYPICAL INLET ON GRADE

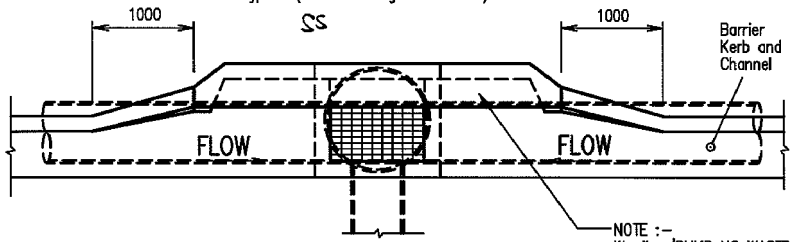
Type R (Flow from Right hand side)



SECTION C – C



ELEVATION

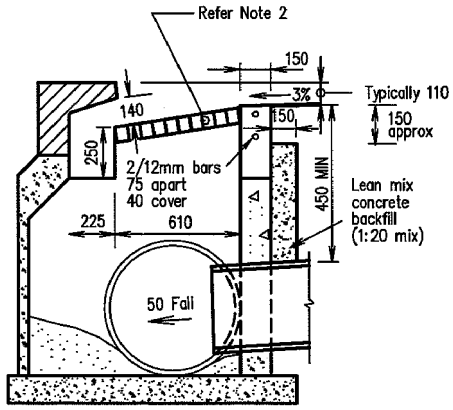


TYPICAL INLET IN SAG

PRECAST LINTEL DETAIL

TYPE	'A'mm	'B'mm	'C'mm	'D'mm	'X'mm	MASS(kg)
S (Small)	2400	2040	1800	1970	400	445
M (Medium)	3600	3240	3000	3170	690	550

When ordering specify as follows :– Type (length) and direction of flow.
e.g. Type SR (meaning 2400 long with flow from Right hand side)
Type MS (meaning 3600 long in Sag with flow from both directions)



SECTION B – B

NOTES

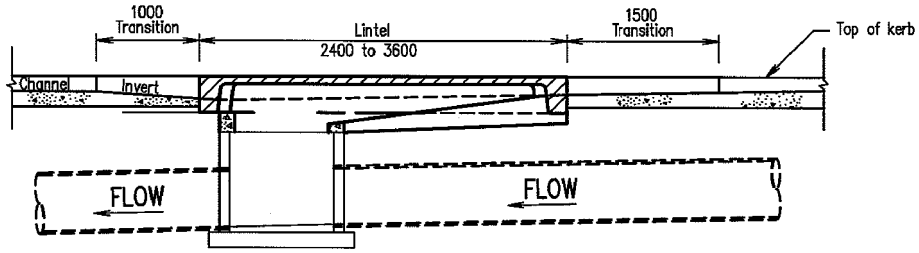
1. The catchpit may be cast–in–situ or precast. This drawing indicates a cast–in–situ catchpit with a precast lintel.
2. 900 x 600 clear opening gully grate frame to be cast into concrete. Gully grate and frame to be Class D to AS3996 and have Australian Standardsmark certification cleary shown.
3. Precast concrete to be minimum Grade N40 and conform to AS 3600 and 1379.
4. Each lifting anchor to be "Swiftlift" or equivalent 1.3 tonne Galvanized (Conforming to AS 1214) and fitted to manufacturers specification.
5. Reinforcing placed centrally, 40 MIN end cover.
6. Reinforcement steel grade 400 to conform to AS 4671.
7. Casting to conform to AS 1830 and AS 1831.
8. Catchpits on Queensland Transport Infrastructure shall be subject to Queensland Transport approval.
9. RSC approved gully pit capacity charts with 10% blockage factor applies for on grade pits.
10. All dimensions in mm.

C	AMENDED	1/02	
B	AMENDED	1/99	
A	ORIGINAL ISSUE	1/98	
	REVISIONS	DATE	APPROVED

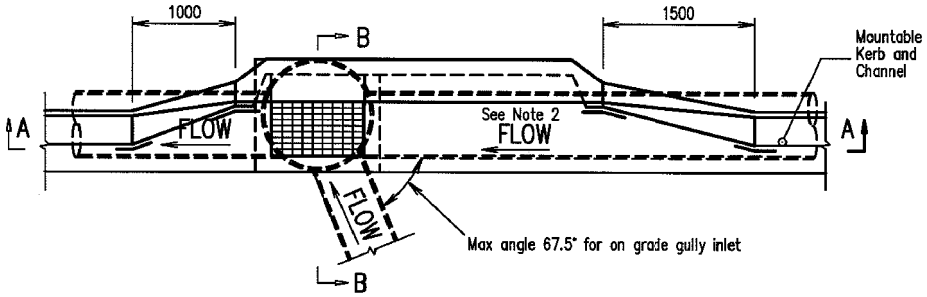
Redland

GULLY–ROADWAY TYPE CHANNEL LIP IN LINE

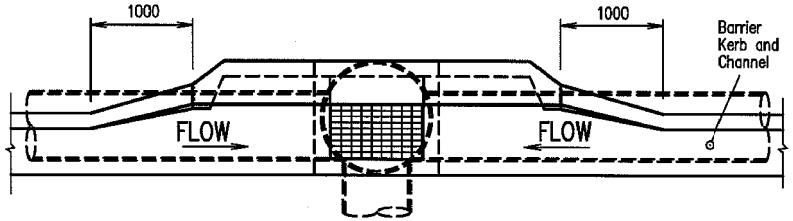
DRAINAGE
Standard Drawing
D–RSC–3
A | B | C



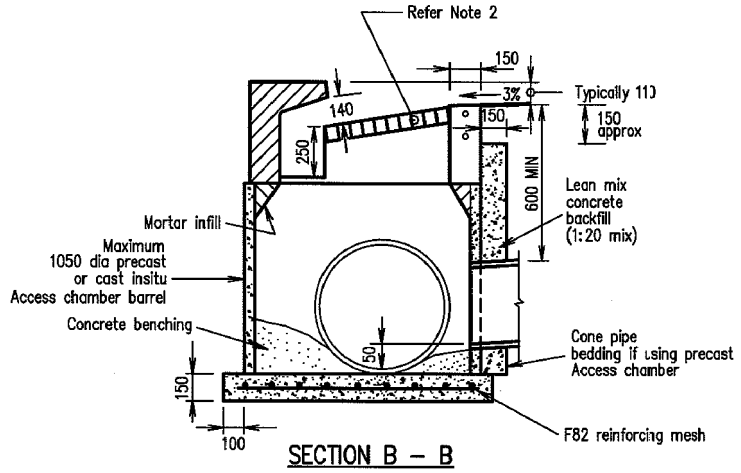
SECTION A – A



TYPICAL INLET ON GRADE



TYPICAL INLET IN SAG



SECTION B – B

Catchpit + manhole

NOTES

1. The catchpit and or the access chamber barrel may be cast-in-situ or precast.
2. The maximum size pipe connected to the chamber is 600 mm diameter
3. 900 x 600 clear opening gully grate frame to be cast into concrete. Gully grate and frame to be Class D to AS3996 and have Australian Standards mark certification clearly shown. (Refer standard drawing R-RSC-3)
4. Precast concrete to be minimum Grade N40 and conform to AS 3600 and AS 1379.
5. Each lifting anchor to be "Swiftlift" or equivalent 1.3 tonne Galvanized (Conforming to AS 1214) and fitted to manufacturers specification.
6. Reinforcing placed centrally, 40 MIN end cover.
7. Reinforcement steel grade 400 to conform to AS 4671.
8. Casting to conform to AS 1830 and AS 1831.
9. Catchpits on Queensland Transport Infrastructure are subject to Queensland Transport approval.
10. RSC approved gully pit capacity charts with 10% blockage factor applies
11. All dimensions in mm.

A	ORIGINAL ISSUE	6/04	SM
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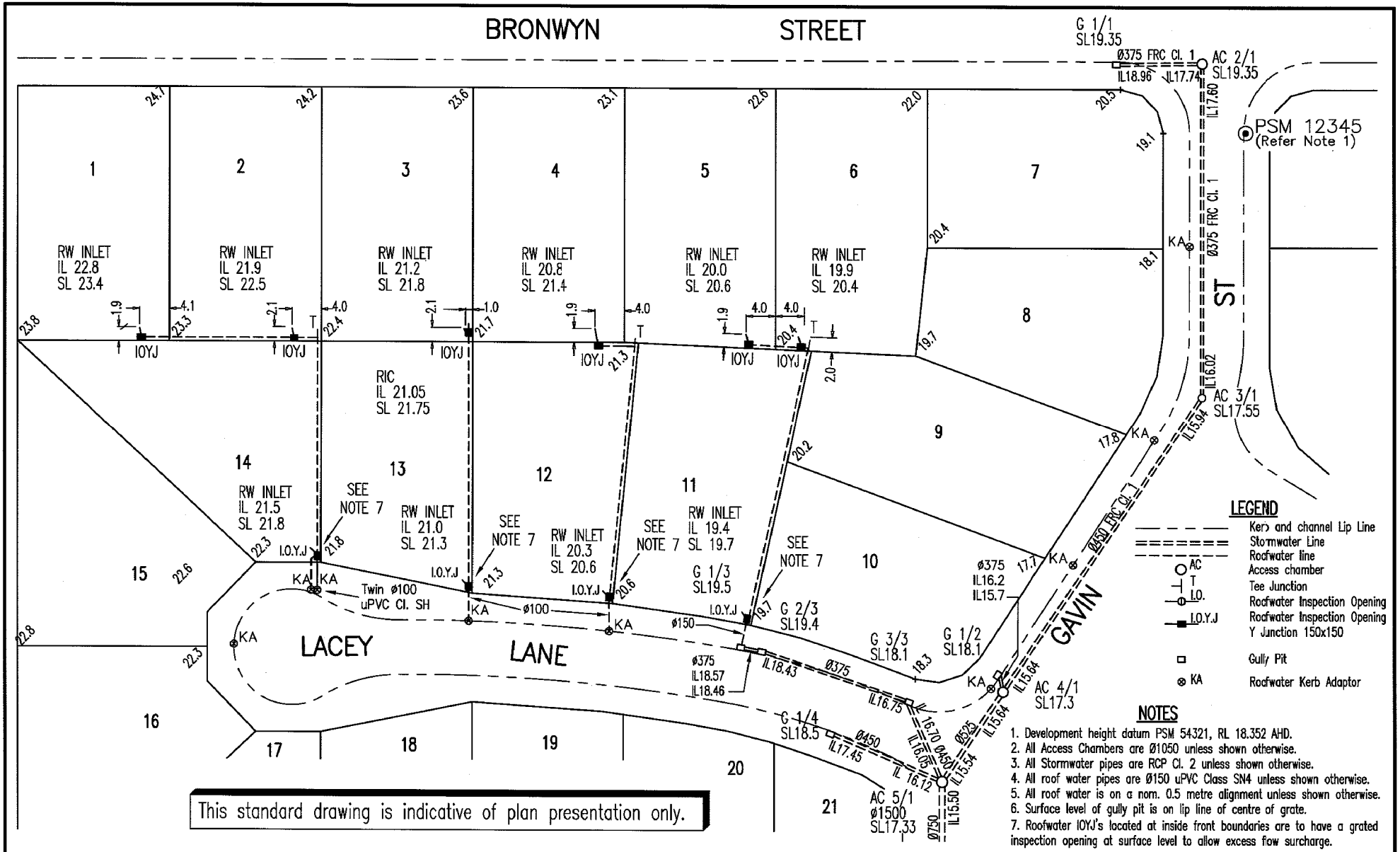
Redland

PRECAST GULLY INLET AND ACCESS CHAMBER COMBINATION

DRAINAGE
Standard Drawing
D-RSC-6
A



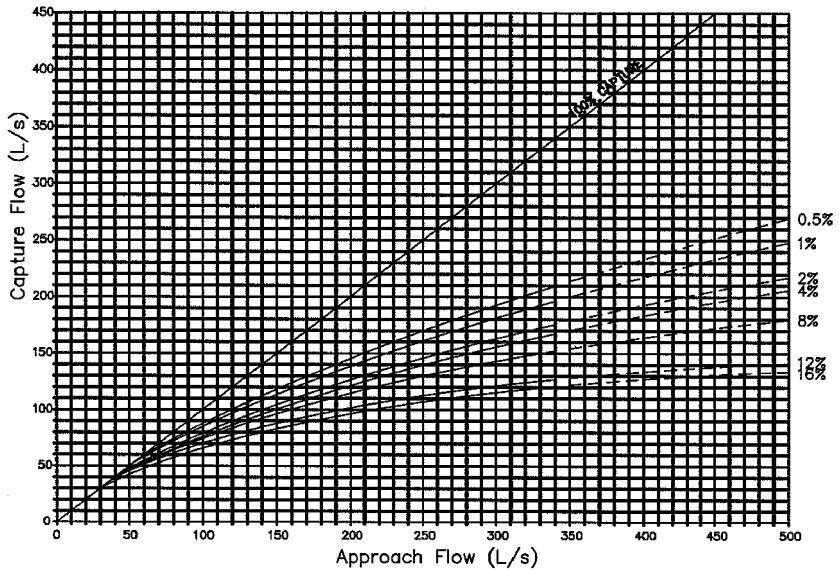
This standard drawing is indicative of plan presentation only.

B	AMENDED	6/04	SM
A	ORIGINAL ISSUE	1/02	
REVISIONS		DATE	APPROVED

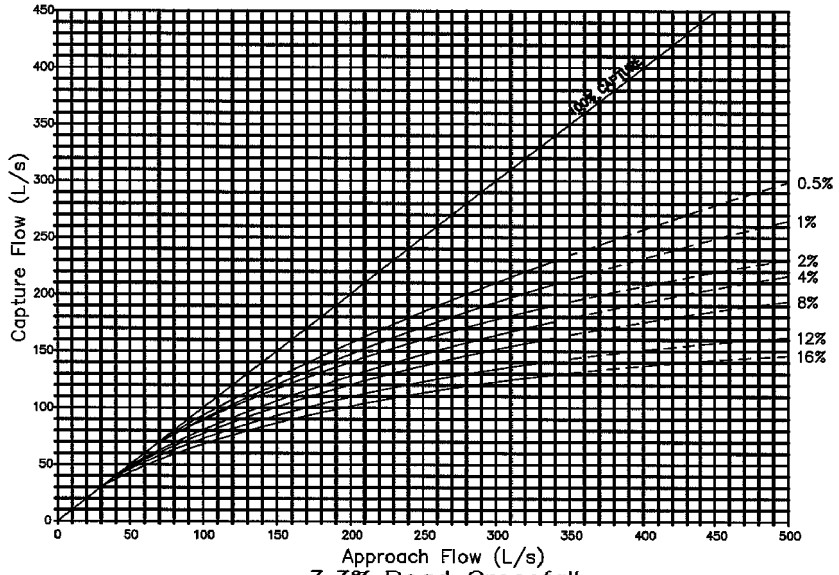
Redland

SAMPLE AS CONSTRUCTED PLAN
STORMWATER & ROOFWATER DRAINAGE

DRAINAGE
Standard Drawing
D-RSC-7
A | B



2.5% Road Crossfall



3.3% Road Crossfall

NOTES

1. CHARTS TO BE USED TO DETERMINE THE HYDRAULIC CAPTURE FOR RSC ROADWAY STORMWATER CATCHPITS. REFER STANDARD DRAWINGS D–RSC–3 AND D–RSC–6.
2. DATA BASED ON TESTING UNDERTAKEN AT URBAN WATER RESOURCE CENTRE, UNIVERSITY OF SOUTH AUSTRLALIA FOR BRISBANE CITY COUNCIL, GOLD COAST CITY COUNCIL AND QUEENSLAND DEPARTMENT OF MAIN ROADS, MARCH 2001 AND NOVEMBER 2002. (NO EXTRAPOLATION BEYOND THE LIMITS OF THE CHARTS SHOULD BE UNDERTAKEN.)
3. CAPTURE BASED ON MAXIMUM CHAMBER WATER LEVEL 150mm BELOW CHANNEL INVERT LEVEL.
4. 10% BLOCKAGE FACTOR APPLIED TO GRATE.

LEGEND

__%. KERB AND CHANNEL LONGITUDINAL SLOPE (S)

———— BASED ON ACTUAL DATA

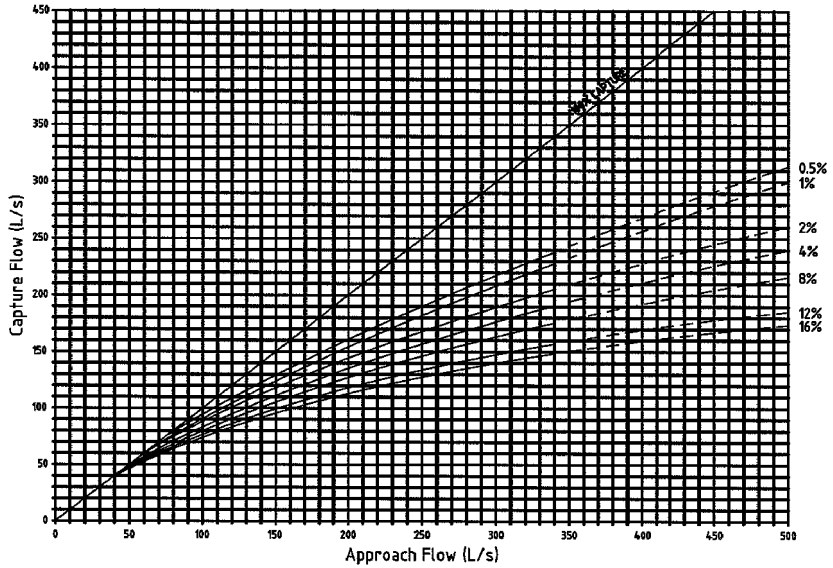
– – – – – EXTRAPOLATED DATA

A	ORIGINAL ISSUE	6/04	
REVISIONS		DATE	APPROVED

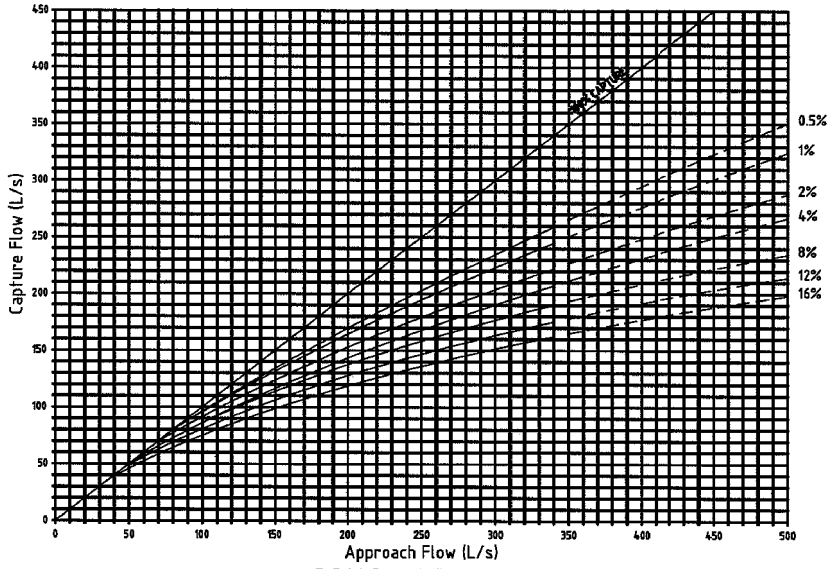
Redland

LIP IN LINE CATCHPITS HYDRAULIC CAPTURE CHARTS TYPE M1 KERB AND CHANNEL ON GRADE, 2400mm LINTEL

DRAINAGE
Standard Drawing
D–RSC–12
A



2.5% Road Crossfall



3.3% Road Crossfall

NOTES

1. CHARTS TO BE USED TO DETERMINE THE HYDRAULIC CAPTURE FOR RSC ROADWAY STORMWATER CATCHPITS. REFER STANDARD DRAWINGS D-RSC-3 AND D-RSC-6.
2. DATA BASED ON TESTING UNDERTAKEN AT URBAN WATER RESOURCE CENTRE, UNIVERSITY OF SOUTH AUSTRLALIA FOR BRISBANE CITY COUNCIL, GOLD COAST CITY COUNCIL AND QUEENSLAND DEPARTMENT OF MAIN ROADS, MARCH 2001 AND NOVEMBER 2002. (NO EXTRAPOLATION BEYOND THE LIMITS OF THE CHARTS SHOULD BE UNDERTAKEN.)
3. CAPTURE BASED ON MAXIMUM CHAMBER WATER LEVEL:
   150mm BELOW CHANNEL INVERT LEVEL FOR S_O = 0.5 TO 3%.
   350mm BELOW CHANNEL INVERT LEVEL FOR S_O > 3%
4. 10% BLOCKAGE FACTOR APPLIED TO GRATE.

LEGEND

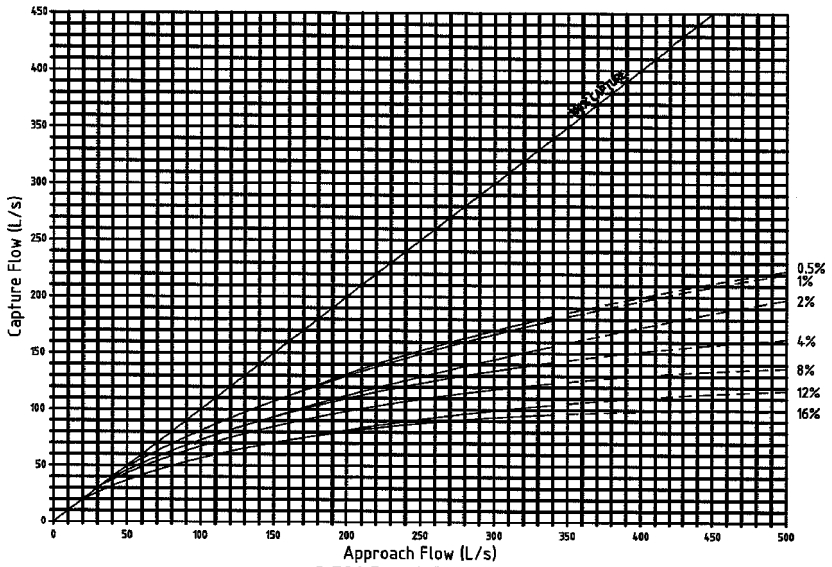
___%.	KERB AND CHANNEL LONGITUDINAL SLOPE (S_o)
————	BASED ON ACTUAL DATA
- - - - -	EXTRAPOLATED DATA

A	ORIGINAL ISSUE	6/04	SMM
	REVISIONS	DATE	APPROVED

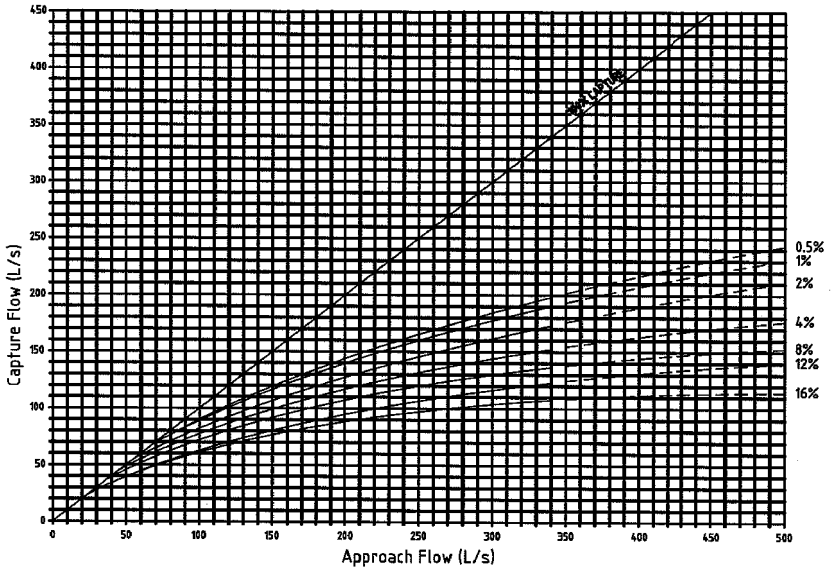
Redland

LIP IN LINE CATCHPITS HYDRAULIC CAPTURE CHARTS TYPE M1 KERB AND CHANNEL ON GRADE, 3600mm LINTEL

DRAINAGE
Standard Drawing
D-RSC-13
A



2.5% Road Crossfall



3.3% Road Crossfall

NOTES

1. CHARTS TO BE USED TO DETERMINE THE HYDRAULIC CAPTURE FOR RSC ROADWAY STORMWATER CATCHPITS. REFER STANDARD DRAWINGS D-RSC-3 AND D-RSC-6.
2. DATA BASED ON TESTING UNDERTAKEN AT URBAN WATER RESOURCE CENTRE, UNIVERSITY OF SOUTH AUSTRLALIA FOR BRISBANE CITY COUNCIL, GOLD COAST CITY COUNCIL AND QUEENSLAND DEPARTMENT OF MAIN ROADS, MARCH 2001 AND NOVEMBER 2002. (NO EXTRAPOLATION BEYOND THE LIMITS OF THE CHARTS SHOULD BE UNDERTAKEN.)
3. CAPTURE BASED ON MAXIMUM CHAMBER WATER LEVEL 150mm BELOW CHANNEL INVERT LEVEL.
4. 10% BLOCKAGE FACTOR APPLIED TO GRATE.

LEGEND

__%. KERB AND CHANNEL LONGITUDINAL SLOPE (S_o)

———— BASED ON ACTUAL DATA

– – – – – EXTRAPOLATED DATA

A	ORIGINAL ISSUE	6/04	SM
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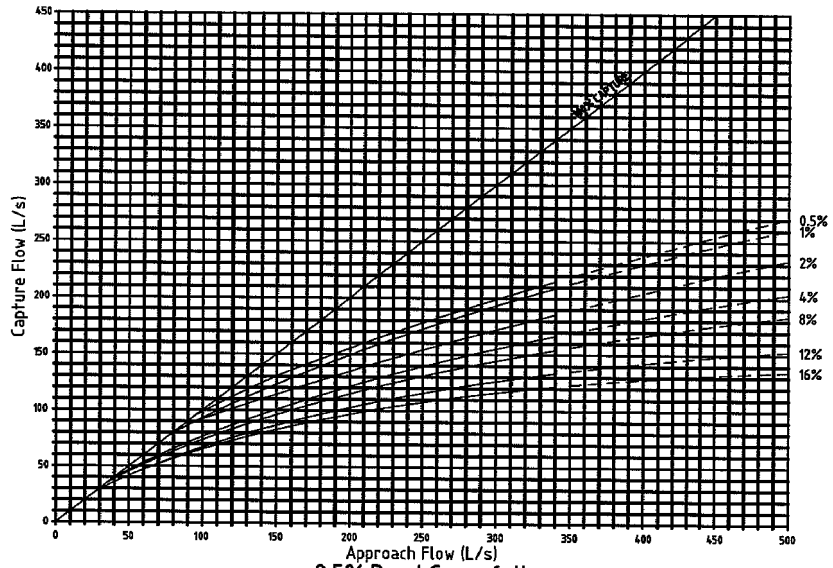
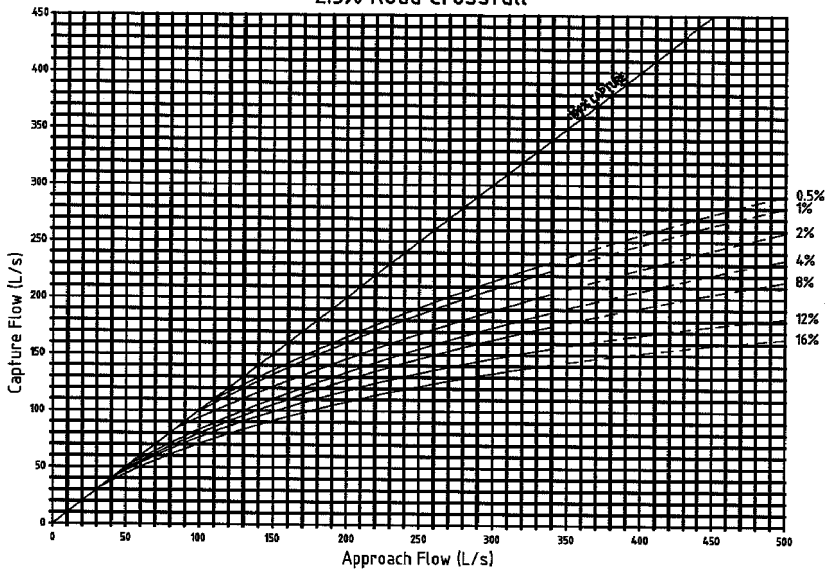
Redland

LIP IN LINE CATCHPITS HYDRAULIC CAPTURE CHARTS TYPE B1 KERB AND CHANNEL ON GRADE, 2400mm LINTEL

DRAINAGE
Standard Drawing
D-RSC-14
A



2.5% Road Crossfall



3.3% Road Crossfall

NOTES

1. CHARTS TO BE USED TO DETERMINE THE HYDRAULIC CAPTURE FOR RSC ROADWAY STORMWATER CATCHPITS. REFER STANDARD DRAWINGS D-RSC-3 AND D-RSC-6.
2. DATA BASED ON TESTING UNDERTAKEN AT URBAN WATER RESOURCE CENTRE, UNIVERSITY OF SOUTH AUSTRLALIA FOR BRISBANE CITY COUNCIL, GOLD COAST CITY COUNCIL AND QUEENSLAND DEPARTMENT OF MAIN ROADS, MARCH 2001 AND NOVEMBER 2002. (NO EXTRAPOLATION BEYOND THE LIMITS OF THE CHARTS SHOULD BE UNDERTAKEN.)
3. CAPTURE BASED ON MAXIMUM CHAMBER WATER LEVEL:
   150mm BELOW CHANNEL INVERT LEVEL FOR S_o = 0.5 TO 3%.
   350mm BELOW CHANNEL INVERT LEVEL FOR S_o > 3%
4. 10% BLOCKAGE FACTOR APPLIED TO GRATE.

LEGEND

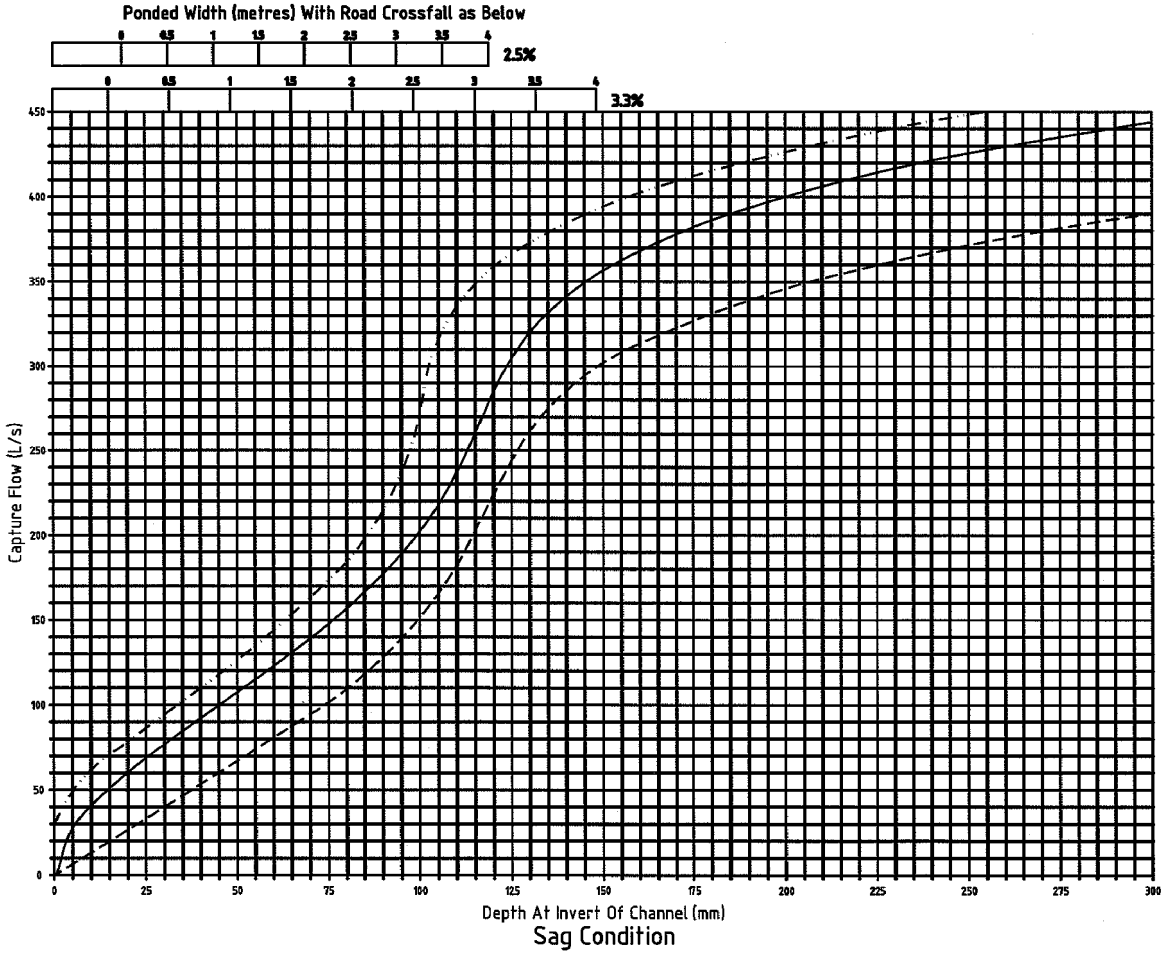
___%.	KERB AND CHANNEL LONGITUDINAL SLOPE (S_o)
————	BASED ON ACTUAL DATA
- - - - -	EXTRAPOLATED DATA

A	ORIGINAL ISSUE	6/04	SM
	REVISIONS	DATE	APPROVED

Redland

LIP IN LINE CATCHPITS HYDRAULIC CAPTURE CHARTS TYPE B1 KERB AND CHANNEL ON GRADE, 3600mm LINTEL

DRAINAGE
Standard Drawing
D-RSC-15
A



Sag Condition

NOTES

1. CHARTS TO BE USED TO DETERMINE THE HYDRAULIC CAPTURE FOR RSC ROADWAY STORMWATER CATCHPITS. REFER STANDARD DRAWINGS D-RSC-3 AND D-RSC-6.
2. DATA BASED ON TESTING UNDERTAKEN AT URBAN WATER RESOURCE CENTRE, UNIVERSITY OF SOUTH AUSTRLALIA FOR BRISBANE CITY COUNCIL, GOLD COAST CITY COUNCIL AND QUEENSLAND DEPARTMENT OF MAIN ROADS, MARCH 2001 AND NOVEMBER 2002. (NO EXTRAPOLATION BEYOND THE LIMITS OF THE CHARTS SHOULD BE UNDERTAKEN.)
3. CAPTURE BASED ON MAXIMUM CHAMBER WATER LEVEL 150mm BELOW CHANNEL INVERT LEVEL.
4. 100% BLOCKAGE FACTOR APPLIED TO GRATE.

LEGEND

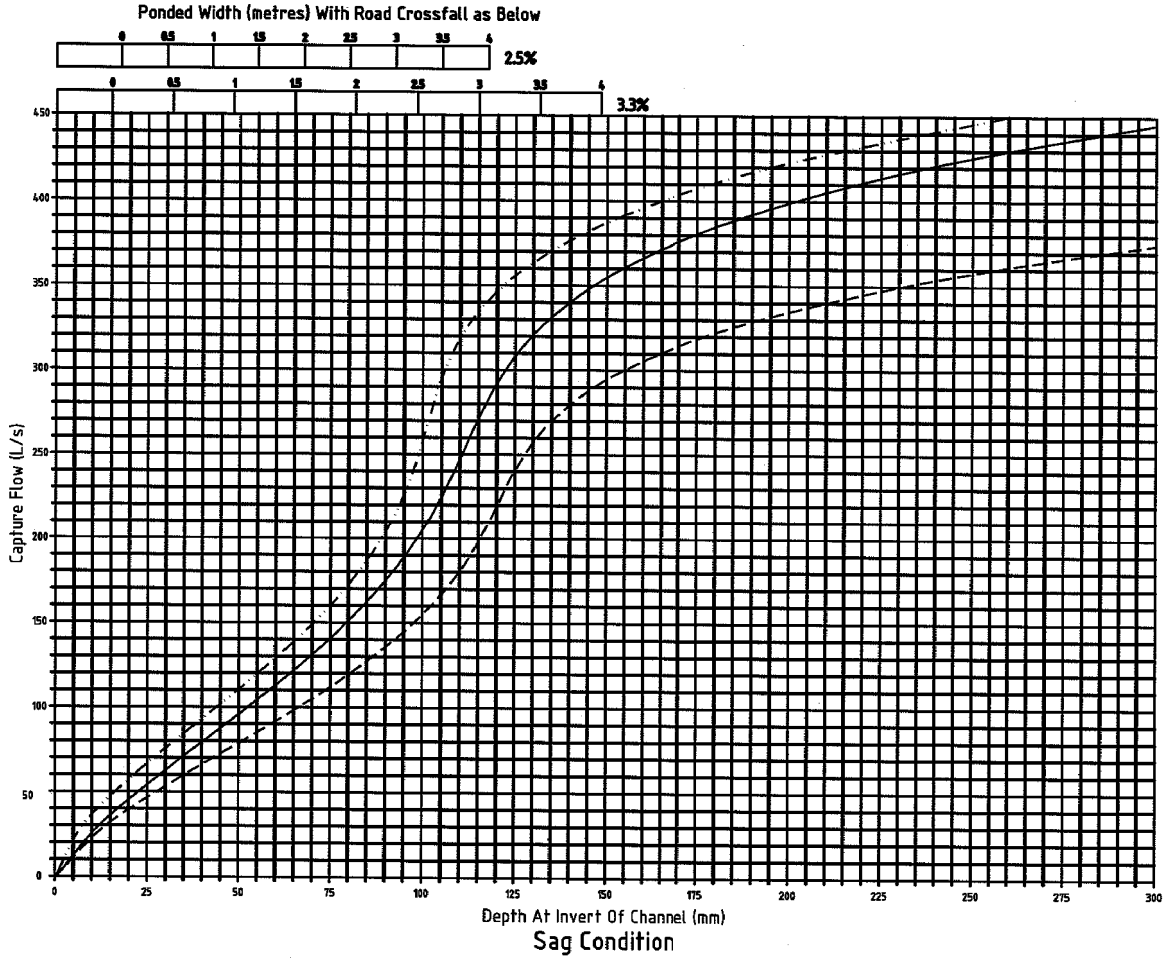
- 2400mm LINTEL
- 3600mm LINTEL
- 4800mm LINTEL

A	ORIGINAL ISSUE	6/04	SM
	REVISIONS	DATE	APPROVED

Redland

LIP IN LINE CATCHPITS HYDRAULIC CAPTURE CHARTS TYPE M1 KERB AND CHANNEL SAG CONDITIONS, ALL LINTELS

DRAINAGE
Standard Drawing
D-RSC-16
A



NOTES

1. CHARTS TO BE USED TO DETERMINE THE HYDRAULIC CAPTURE FOR RSC ROADWAY STORMWATER CATCHPITS. REFER STANDARD DRAWINGS D-RSC-3 AND D-RSC-6.
2. DATA BASED ON TESTING UNDERTAKEN AT URBAN WATER RESOURCE CENTRE, UNIVERSITY OF SOUTH AUSTRLALIA FOR BRISBANE CITY COUNCIL GOLD COAST CITY COUNCIL AND QUEENSLAND DEPARTMENT OF MAIN ROADS, MARCH 2001 AND NOVEMBER 2002. (NO EXTRAPOLATION BEYOND THE LIMITS OF THE CHARTS SHOULD BE UNDERTAKEN.)
3. CAPTURE BASED ON MAXIMUM CHAMBER WATER LEVEL 150mm BELOW CHANNEL INVERT LEVEL.
4. 100% BLOCKAGE FACTOR APPLIED TO GRATE.

LEGEND

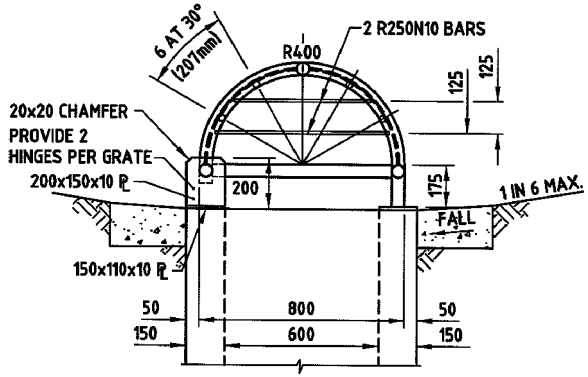
- 2400mm LINTEL
- 3600mm LINTEL
- 4800mm LINTEL

A	ORIGINAL ISSUE	6/04	SM
REVISIONS		DATE	APPROVED

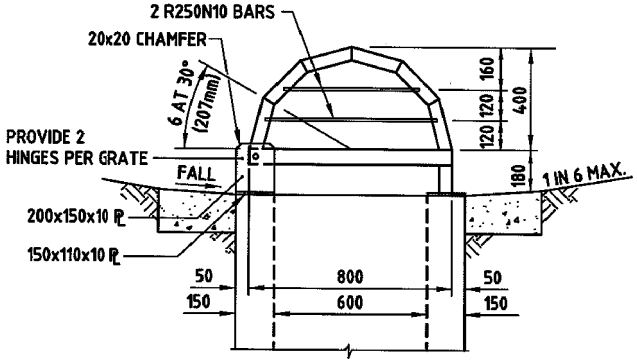
Redland

LIP IN LINE CATCHPITS HYDRAULIC CAPTURE CHARTS TYPE B1 KERB AND CHANNEL SAG CONDITIONS, ALL LINTELS

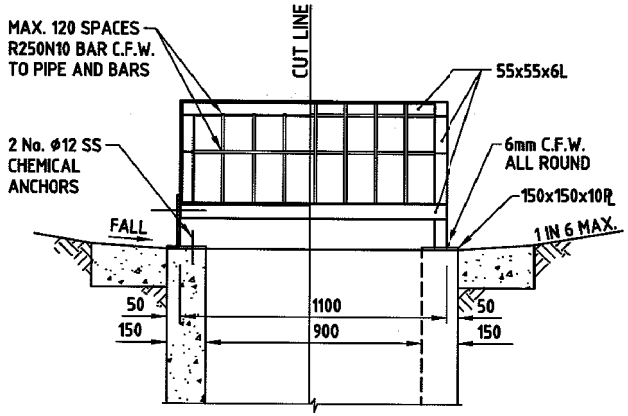
DRAINAGE
Standard Drawing
D-RSC-17
A



SECTION A–A



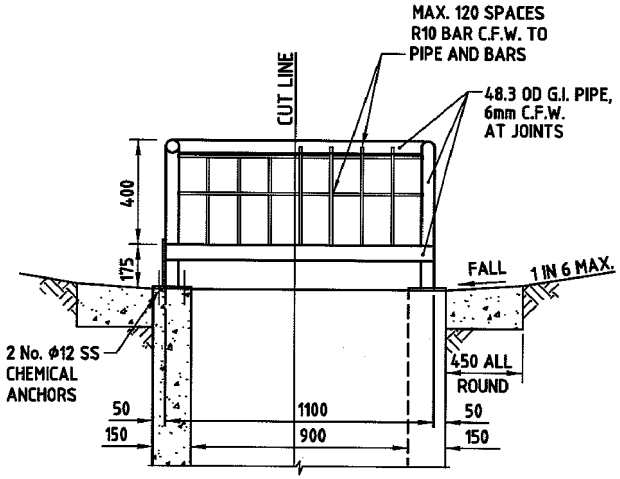
SECTION A–A



SECTION B–B

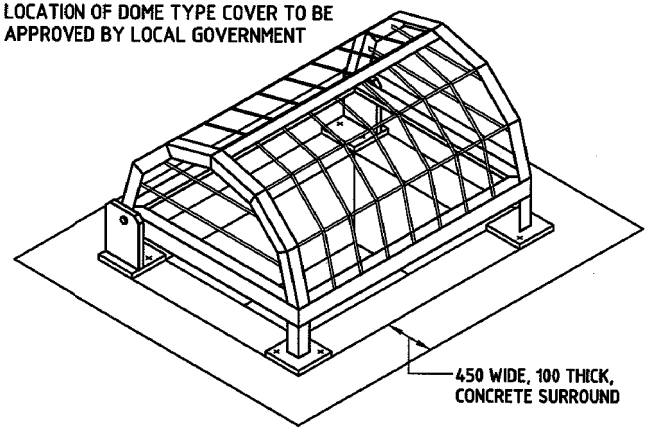
NOTES:

1. CONCRETE TO BE GRADE N25.
2. GRATE AND HINGES TO BE HOT DIPPED GALVANISED TO AS/NZS 4680 AFTER FABRICATION.
3. THE ISOMETRIC VIEW IS SIMILAR IN TYPE 1 AND TYPE 2.
4. PIPE INVERT LEVELS AS PER DRAINAGE DETAILS.
5. DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
6. LOCATION OF DOME TYPE COVER TO BE APPROVED BY LOCAL GOVERNMENT

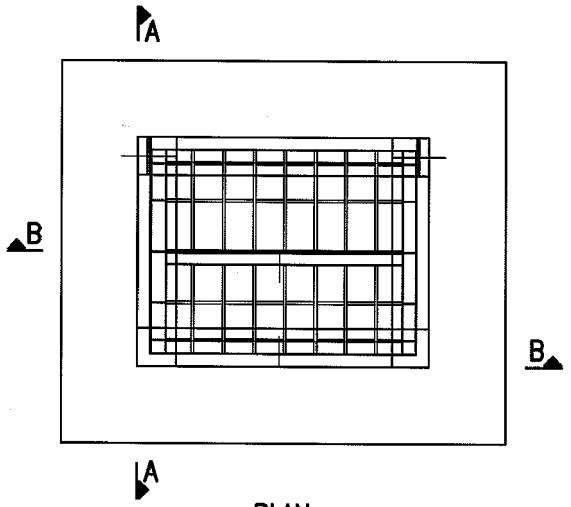


SECTION B–B

TYPE 1 – PIPE CONSTRUCTION



ISOMETRIC VIEW



PLAN

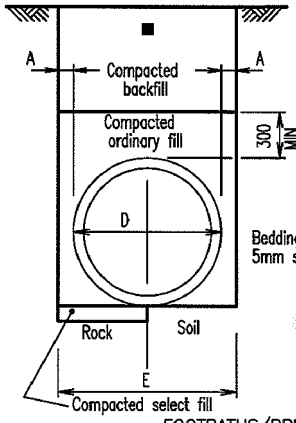
TYPE 2 – ANGLE CONSTRUCTION

A	ORIGINAL ISSUE	02/05	
	REVISIONS	DATE	APPROVED

Redland SHIRE COUNCIL

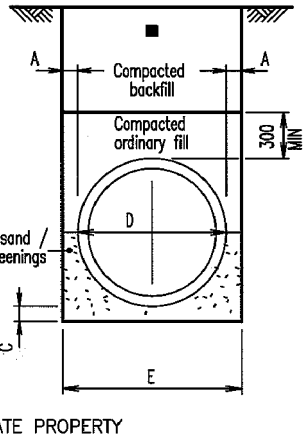
FIELD INLET PIT
DOME TYPE COVER
(NON PEDESTRIAN AREAS)

DRAINAGE
Standard Drawing
D–RSC–18
A

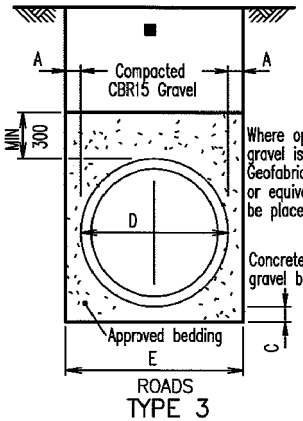


FOOTPATHS/PRIVATE PROPERTY

TYPE 1
Conforms to Support Type U AS 3725

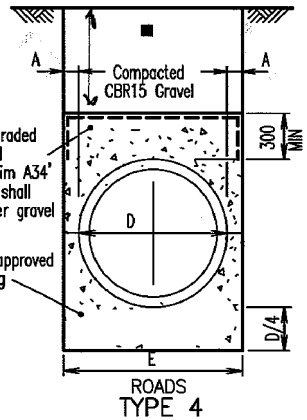


TYPE 2
Conforms to Support Type H1 AS 3725



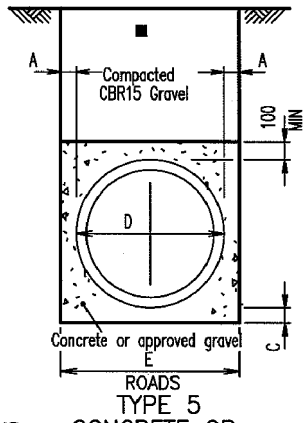
ROADS

TYPE 3
SAND SURROUND



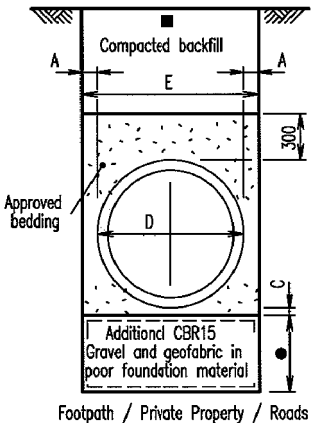
ROADS

TYPE 4
CONCRETE OR GRAVEL SURROUND



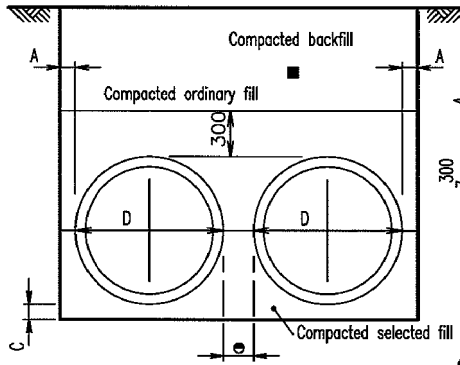
ROADS

TYPE 5
CONCRETE OR GRAVEL ENCASEMENT

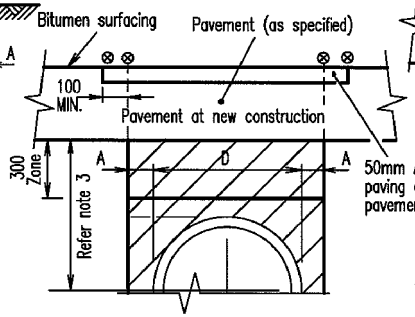


Footpath / Private Property / Roads

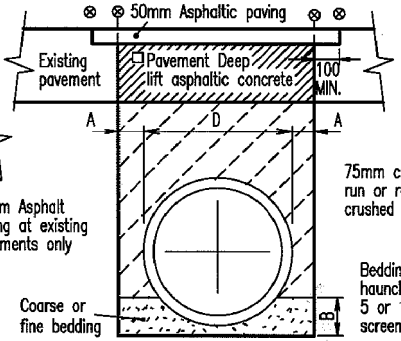
TYPE 6
BEDDING IN POOR GROUND



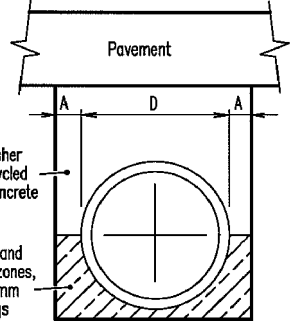
TYPE 7
BEDDING OF MULTIPLE PIPES
Conforms to Support Type H1



ALTERNATIVE A
AT NEW PAVEMENTS ON RESIDENTIAL STREETS & RURAL ROADS AND EXISTING SEALED PAVEMENTS



ALTERNATIVE B
AT EXISTING SURFACED PAVEMENTS ON INDUSTRIAL, TRUNK COLLECTOR, SUB-ARTERIAL & ARTERIAL STREETS / ROADS



ALTERNATIVE C

NOMINAL Ø culvert D(mm)	MINIMUM width A (mm)	HAUNCH depth B	Bedding depth C	Allowable width,E(m)	
				DES	MAX
300	300	36	100	1.0	1.1
375	300	45	100	1.1	1.2
450	300	53	100	1.1	1.3
525	300	61	100	1.2	1.5
600	300	69	100	1.3	1.6
750	300	85	100	1.5	1.8
900	300	103	100	1.6	1.9
1050	300	120	100	1.8	2.1
1200	300	135	100	2.0	2.2
1350	300	150	100	2.1	2.4
1500	300	169	100	2.3	2.7
1650	330	184	150	2.6	2.9
1800	360	200	150	2.8	3.1
1950	390	222	150	3.1	3.3
2100	420	239	150	3.4	3.5
2400	480	270	150	3.9	4.2
2700	540	303	150	4.3	4.6
3000	600	335	150	4.9	5.0

Bedding & Haunch material (Gravel, loam, sand or mixture) grading

AS Sieve Size	% Passing by mass	
	Type 1 – Pipes ≤ ø1200	Type 2 – Pipes > ø1350
19.0	100	98 – 100
9.5	–	35 – 50
4.75	–	5 – 10
2.36	40 – 100	0 – 2
0.425	15 – 70	0 – 1
0.075	3 – 30	0 – 1

LEGEND

- □ Pavement. Refer project documentation for detail
- ⊗ Saw cut at existing pavement
- ◓ Pipes : 300 when NOMINAL D < 600
  600 when NOMINAL D 600 – 1800
  900 when NOMINAL D > 1800
  Dimensions can be reduced to 150 MIN for non mechanical compaction of backfill
- ■ Refer Alternative A, B and C for backfill requirements at existing and new pavements.
- ● Depth to be approved by the Superintendent
- Gravel (MIN CBR15) backfill
- No fines concrete backfill (8 parts 10mm NOM size aggregate to 1 part cement).

NOTES:

1. Selected backfill in all cases shall be carried through to the wings and continued 300 thick for the length and height of wings.
2. Bedding compaction (Compacted selected fill / sand bedding)
   Cohesive material – 95% standard compaction
   Non-cohesive material – density index of 70 MIN, refer AS 1289.E5.1
   Sand – compact by flooding and use of vibrators.
3. Backfill compaction
   Compacted gravel layer under road pavement 95% standard compaction.
   Compacted CBR15 Gravel 90% standard compaction – below 300mm zone.
   Compacted backfill – at footpaths / private property 90% standard compaction.
   MAX. densities determined by standard compaction tests to AS 1289.5.1.1.
4. Refer project drawings for types and/or alternatives to be adopted.
5. Type U & Type H1 to conform to AS 3725.
6. Dimension A can be reduced to 150 MIN for non mechanical compaction of backfill
7. Pipes are to be designed to their correct strength class under all construction loads, dead loads and in-service loads.
8. All dimensions in millimetres.

A	ORIGINAL ISSUE	6/04	SM
REVISIONS		DATE	APPROVED

Redland

EXCAVATION, BEDDING AND BACKFILLING OF CONCRETE/ FIBRE REINFORCED DRAINAGE PIPES

DRAINAGE
Standard Drawing
D-RSC-11
A

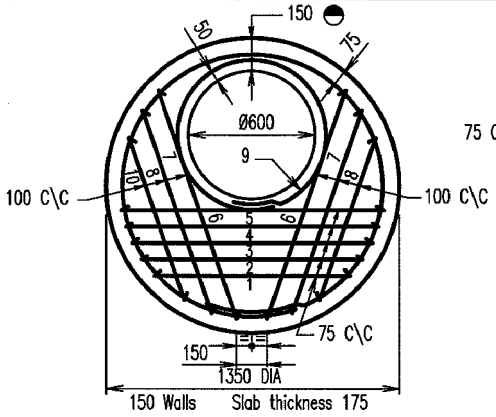
Std. Dwg. No.	Descriptions
	Redland Shire Council Approved Standard Drawings
	IPWEAQ Drawings
D-0010	Access Chamber Details Dia. 1050–2100
D-0011	Access Chamber Roof Slabs Dia. 1050–2100
D-0012	Access Chamber Roof Slabs Dia. 1500 Extended 600 & 900
D-0013	Access Chamber Roof Slab Rectangular Standard Reinforcement
D-0014	Access Chamber Cast Iron Cover and Frame; C.I. Concrete Filled Cover
D-0015	Access Chamber Cast Iron Cover and Frame Bolt Down
D-0016	Access Chamber Step Irons
D-0017	Access Chamber Roof Slab – Rectangular Fabric Reinforced
D-0031	Excavation, Bedding and Backfilling of Precast Box Culverts
D-0050	Field Inlet and Overflow Gully Type 1 and Type 2
D-0064	Drainway Stormwater Inlet Components
D-0065	Precast Concrete Side Inlet Gully Components
D-0066	Precast Stormwater Inlet, Test Load Procedure
D-0067	Precast Stormwater Inlet, Construction Setting Out, Barrier/Mountable Kerb and Channel
D-0080	Inlets and Outlets to Stormwater Drains (Concrete)
D-0081	Inlets and Outlets to Stormwater Drains (Stonepitched) } Head walls
D-0040	Sediment Control Devices, Sediment Fence, Entry/Exit Sediment Trap.
D-0041	Sediment Control Devices, Kerb and Field Inlets, Check Dams and Straw Bale Bank
	Redland Shire Council Drawings
D-RSC-2	Gully – Roadway Type – Precast Lintel Details
D-RSC-3	Gully – Roadway Type – Channel Lip in Line
D-RSC-4	Gully – Roadway Type – Precast Units; Anti – Ponding
D-RSC-6	Precast Gully and Access Chamber combination.
D-RSC-7	Sample As Constructed Plan – Stormwater & Roofwater Drainage
D-RSC-8	Stormwater Flow Dissipator – Typical Layout Details
D-RSC-9	Stormwater Flow Dissipator Unit Structure Details
D-RSC-10	Stormwater Flow Dissipator Gate, Trash Rack & Access Unit Details
D-RSC-11	Excavation, Bedding and Backfill
D-RSC-12	Lip in Line Catchpits – Hydraulic Capture Charts – Type M1 Kerb & Channel on Grade – 2400mm Lintel
D-RSC-13	Lip in Line Catchpits – Hydraulic Capture Charts – Type M1 Kerb & Channel on Grade – 3600mm Lintel
D-RSC-14	Lip in Line Catchpits – Hydraulic Capture Charts – Type B1 Kerb & Channel on Grade – 2400mm Lintel
D-RSC-15	Lip in Line Catchpits – Hydraulic Capture Charts – Type B1 Kerb & Channel on Grade – 3600mm Lintel
D-RSC-16	Lip in Line Catchpits – Hydraulic Capture Charts – Type M1 Kerb & Channel Sag Conditions – All Lintels
D-RSC-17	Lip in Line Catchpits – Hydraulic Capture Charts – Type B1 Kerb & Channel Sag Conditions – All Lintels
D-RSC-18	Field Inlet Pit Dome Type Cover (Non Pedestrian Areas)

REVISIONS	DATE	APPROVED
C AMENDED	2/05	
B AMENDED	1/02	
A ORIGINAL ISSUE	1/98	

Redland

INDEX
STANDARD DRAWINGS
DRAINAGE

DRAINAGE
Standard Drawing
D–RSC–1
A | B | C

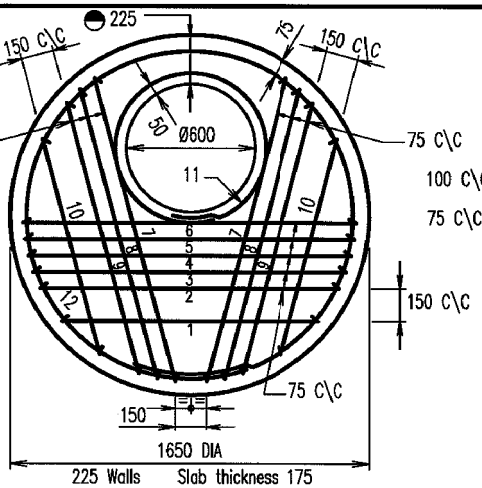


150 Walls Slab thickness 175

BAR No.	SHAPE	'a'/'b'	OVERALL LENGTH	No. OFF	TOTAL LENGTH
1		937	1175	1	1175
2		1030	1255	1	1255
3		1125	1350	1	1350
4	'a'	1175	1400	1	1400
5		1225	1450	1	1450
6		1125	1350	2	2700
7		1000	1225	2	2450
8		812	1050	2	2100
9	'b'	700	2600	1	2600
10		1200	4200	1	4200
				TOTAL	20680

STEEL MASS : 19kg
CONCRETE : 0.20m³
TOTAL MASS : 508kg

1050 DIA ACCESS CHAMBER

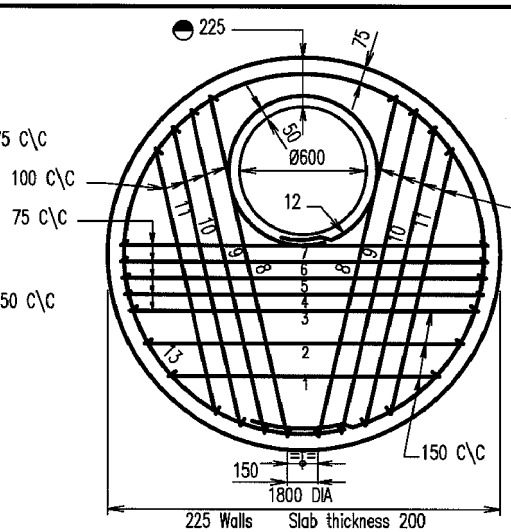


225 Walls Slab thickness 175

BAR No.	SHAPE	'a'/'b'	OVERALL LENGTH	No. OFF	TOTAL LENGTH
1		1200	1425	1	1425
2		1400	1625	1	1625
3		1450	1675	1	1675
4		1500	1725	1	1725
5	'a'	1520	1745	1	1745
6		1537	1775	1	1775
7		1450	1675	2	3350
8		1375	1600	2	3200
9		1300	1525	2	3050
10		1050	1275	2	2550
11	'b'	700	2600	1	2600
12		1500	5150	1	5150
				TOTAL	23250

STEEL MASS : 27kg
CONCRETE : 0.33m³
TOTAL MASS : 818kg

1200 DIA ACCESS CHAMBER

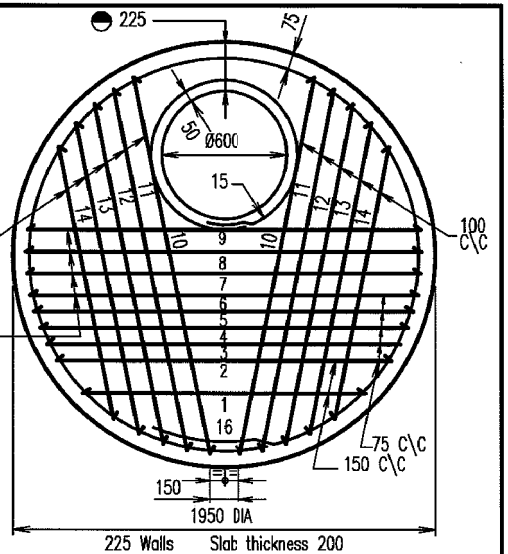


225 Walls Slab thickness 200

BAR No.	SHAPE	'a'/'b'	OVERALL LENGTH	No. OFF	TOTAL LENGTH
1		1275	1500	1	1500
2		1488	1725	1	1725
3		1612	1850	1	1850
4		1645	1870	1	1870
5	'a'	1675	1900	1	1900
6		1675	1900	1	1900
7		1675	1900	1	1900
8		1600	1825	2	3650
9		1525	1750	2	3500
10		1412	1650	2	3300
11		1262	1500	2	3000
12	'b'	700	2600	1	2600
13		1650	5625	1	5625
				TOTAL	34320

STEEL MASS : 31kg
CONCRETE : 0.45m³
TOTAL MASS : 1138kg

1350 DIA ACCESS CHAMBER

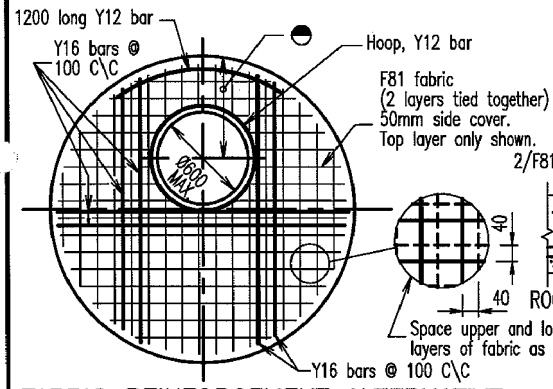


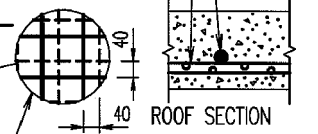
225 Walls Slab thickness 200

BAR No.	SHAPE	'a'/'b'	OVERALL LENGTH	No. OFF	TOTAL LENGTH
1		1337	1575	1	1575
2		1575	1800	1	1800
3		1645	1870	1	1870
4		1712	1950	1	1950
5	'a'	1756	1980	1	1980
6		1800	2025	1	2025
7		1825	2050	1	2050
8		1837	2075	1	2075
9		1825	2050	1	2050
10		1762	2000	2	4000
11		1700	1925	2	3850
12		1600	1825	2	3650
13		1462	1700	2	3400
14		1275	1500	2	3000
15	'b'	700	2600	1	2600
16		1800	6100	1	6100
				TOTAL	43975

STEEL MASS : 39kg
CONCRETE : 0.55m³
TOTAL MASS : 1360kg

1500 DIA ACCESS CHAMBER





FABRIC REINFORCEMENT ALTERNATIVE AND ø1800 AND ø2100 CHAMBERS

FABRIC REINFORCED SLAB

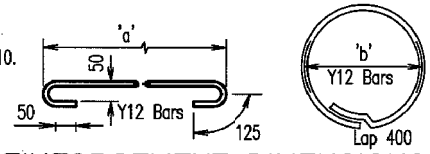
NOM CHAMBER DIA	ROOF THICKNESS
1050	175
1200	175
1350	200
1500	250
1800	250
2100	250

LEGEND

Offset to access hole varies :-
a) Hole in line with chamber wall, or
b) Hole offset from wall 460mm
(refer Alternative 2 on Standard Drawing D-0010).

NOTES

1. Concrete N40 in accordance with AS 1379 and AS 3600.
2. Reinforcement cover 30 MIN (bottom cover)
3. Reinforcement :- F81 Fabric to AS 1304
   Bars Y12 and Y16, Grade 400 to AS 1302.
4. For lifting anchor locations and details, refer Standard Drawing D-0010.
5. Roof design based on Austroads bridge code, W7 wheel load, dynamic factor 0.4.
6. All dimensions in millimetres.



REINFORCEMENT DIMENSIONS

REVISIONS		DATE
C	Opening Diameter 600	3/4/00
B	ø1800 and ø2100 Chamber roofs added	3/2/97
A	ORIGINAL ISSUE	8/12/95

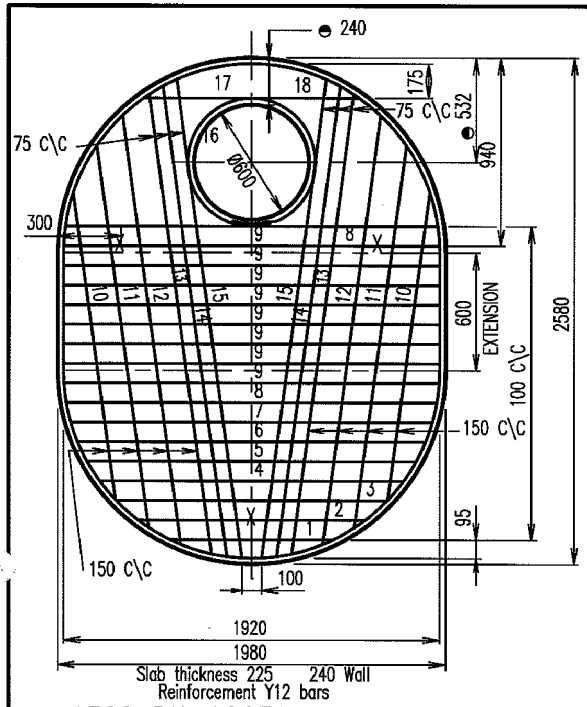
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

ACCESS CHAMBER ROOF SLABS DIA 1050 - 2100

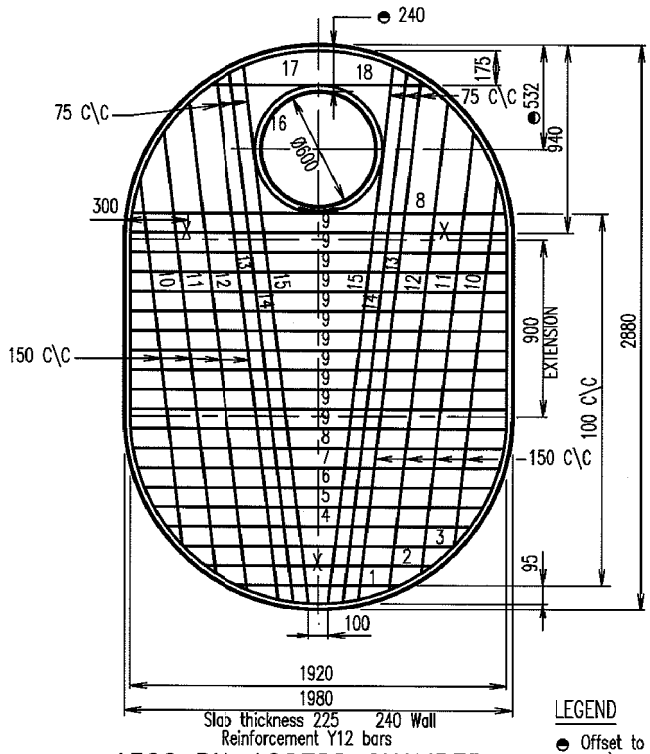
DRAINAGE
Standard Drawing
D-0011

A B C

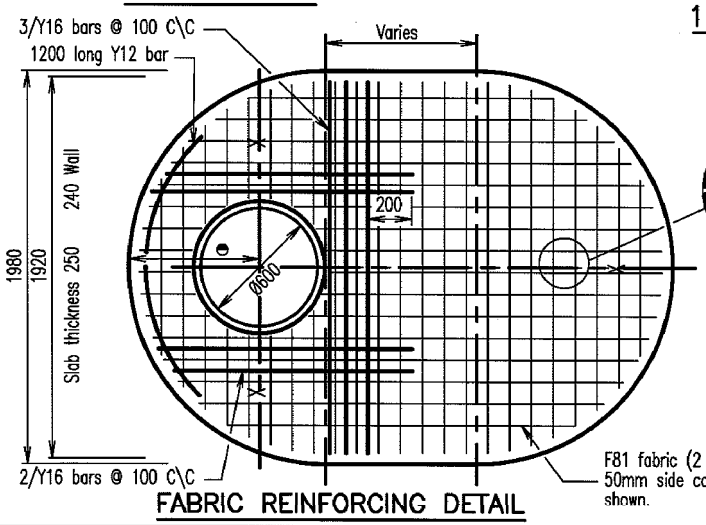
JWP - CADENZA 113327-D-0011



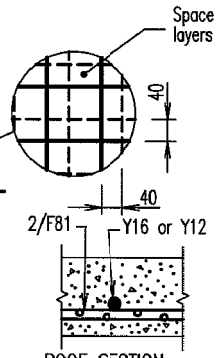
1500 DIA ACCESS CHAMBER EXTENDED 600



1500 DIA ACCESS CHAMBER EXTENDED 900



FABRIC REINFORCING DETAIL



ROOF SECTION

1500 DIA ACCESS CHAMBER EXTENDED 600

BAR NO.	SHAPE	LENGTH	NO. OFF	TOTAL
1		835	1	835
2		1160	1	1160
3		1385	1	1385
4		1550	1	1550
5		1680	1	1680
6		1775	1	1775
7		1845	1	1845
8		1890	2	3780
9		1920	8	15360
10		1560	2	3120
11		1920	2	3840
12		2170	2	4340
13		2300	2	4600
14		2375	2	4750
15		2450	2	4900
16		2600	1	2600
17		7195	1	7195
18		1105	1	1105

Steel Mass 59 kg — TOTAL LENGTH 65820
Concrete Volume 0.90 m³
Total Mass 2250 kg

1500 DIA ACCESS CHAMBER EXTENDED 900

BAR NO.	SHAPE	LENGTH	NO. OFF	TOTAL
1		835	1	835
2		1160	1	1160
3		1385	1	1385
4		1550	1	1550
5		1680	1	1680
6		1775	1	1775
7		1845	1	1845
8		1890	2	3780
9		1920	11	21120
10		1800	2	3600
11		2200	2	4400
12		2470	2	4940
13		2650	2	5300
14		2700	2	5400
15		2750	2	5500
16		2600	1	2600
17		7795	1	7795
18		1105	1	1105

Steel Mass 67 kg — TOTAL LENGTH 75770
Concrete Volume 1.03 m³
Total Mass 2575 kg

LEGEND

● Offset to access hole varies :-
a) Hole in line with chamber wall, or
b) Hole offset from wall 460mm (refer Alternative 2 on Standard Drawing D-0010).

NOTES

1. Roof design based on Austroads Bridge code, W7 wheel load, dynamic factor 0.4.
2. Concrete N40 in accordance with AS 1379 and AS 3600.
3. Reinforcement cover 30 MIN (bottom face).
4. Reinforcement :- F81 Fabric to AS 1304
   Bars Y12 and Y16, Grade 400 to AS 1302.
5. Refer Standard Drawing D-0011 for 'reinforcement dimensions'.
6. Lifting anchors to be "swiftlift" or equivalent. 1.8 tonne, galvanized to AS 1650 and fitted to manufacturer's specification at points shown 'X'.
7. Lifting capacity of mechanical devices to be no less than 4 tonnes.
8. All dimensions in millimetres.

B	Opening Diameter 600	3/4/00
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

ACCESS CHAMBER
ROOF SLABS
DIA. 1500 EXTENDED 600 AND 900

DRAINAGE
Standard Drawing
D-0012
A B

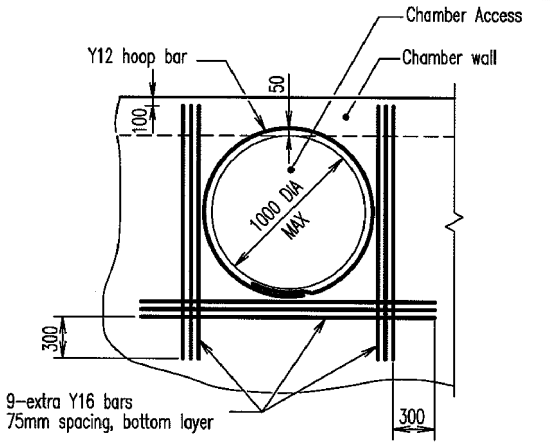
JWP - CADENZA 113327-D-0012

SHORT SPAN \ LONG SPAN	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	SLAB DEPTH
1200	Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	Y16 AT 175	Y16 AT 150	Y16 AT 150	Y16 AT 150	200
1400		Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	Y16 AT 150	Y16 AT 150	Y16 AT 150	Y16 AT 150	200
1600			Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 150	Y16 AT 150	Y16 AT 150	Y16 AT 150	200
1800				Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	Y16 AT 175	225
2000					Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	225
2200						Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	225
2400							Y16 AT 200	Y16 AT 200	Y16 AT 200	Y16 AT 175	225
2600								Y16 AT 200	Y16 AT 200	Y16 AT 175	250
2800									Y16 AT 200	Y16 AT 175	250
3000										Y16 AT 175	250

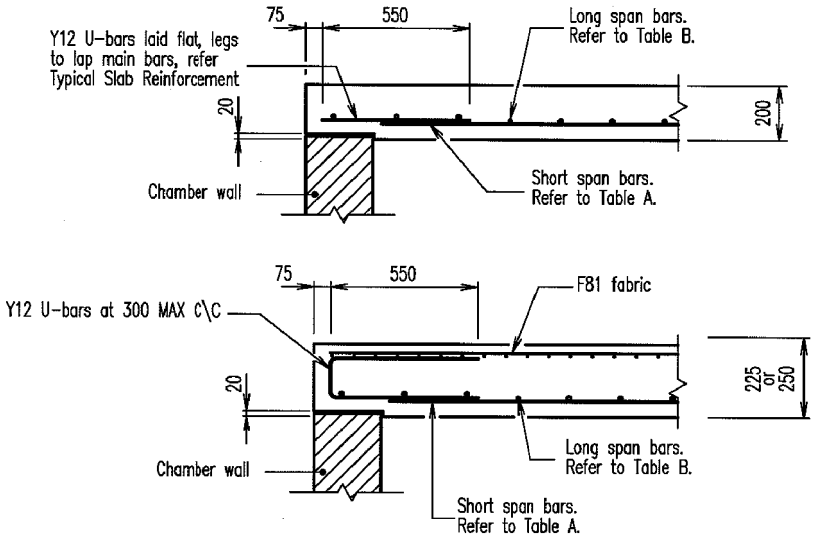
TABLE A : S BARS

SHORT SPAN \ LONG SPAN	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	SLAB DEPTH
1200	Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	200
1400		Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	200
1600			Y12 AT 150	Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	200
1800				Y12 AT 150	Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	225
2000					Y12 AT 150	Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	225
2200						Y12 AT 150	Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	225
2400							Y16 AT 200	Y12 AT 150	Y12 AT 150	Y16 AT 150	225
2600								Y16 AT 200	Y16 AT 200	Y16 AT 200	250
2800									Y16 AT 200	Y16 AT 200	250
3000										Y16 AT 175	250

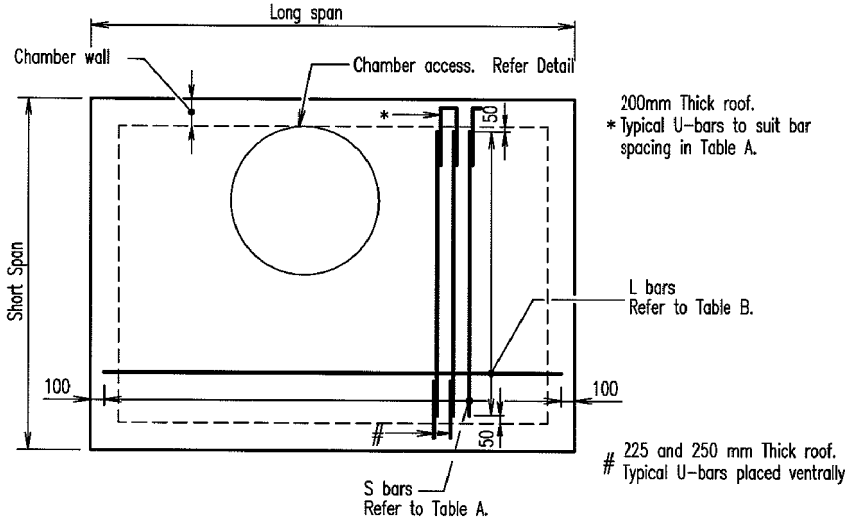
TABLE B : L BARS



SLAB REINFORCEMENT AROUND CHAMBER ACCESS



TYPICAL SECTIONS



TYPICAL SLAB REINFORCEMENT

NOTES

1. Concrete N32/20 in accordance with AS 1379 and AS 3600.
2. Reinforcement :– F81 Fabric to AS 1304
   Bars Y12 and Y16, Grade 400 to AS 1302.
3. All laps in reinforcment shall be :–
   Y12 – 300, Y16 – 400
4. Formwork in accordance with AS 3610.
5. Designed to Austroads Bridge Code, W7 wheel load, dynamic factor 0.4.
6. Maximum fill over roof slab shall be 3000mm.
7. Reinforcement cover 45 MIN.
8. Refer Service Authority for access hole diameter to be adopted.
9. Refer project drawings for details of chamber walls and floors.
10. For sections at chamber access refer Standard Drawing D–0010.
11. All dimensions in millimetres.

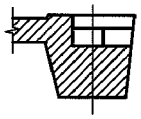
REVISIONS		DATE
B	TITLE ALTERED	16/1/97
A	ORIGINAL ISSUE	8/12/95

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

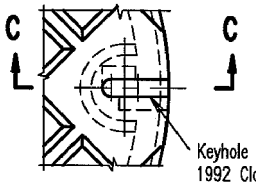
ACCESS CHAMBER ROOF SLAB – RECTANGULAR STANDARD REINFORCEMENT

DRAINAGE
Standard Drawing
D–0013
A | B

JWP – CADENZA 113327–D–0013

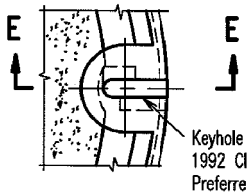


SECTION C–C

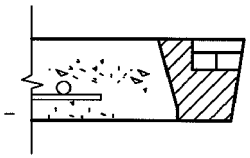


PLAN

LIFTING SLOTS – DETAIL A

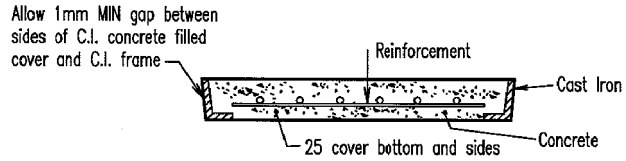


PLAN

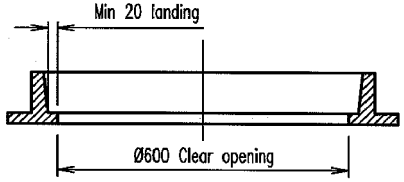


SECTION E – E

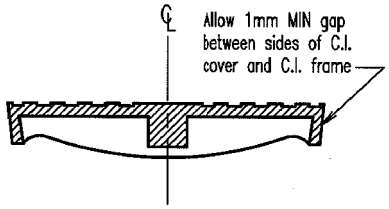
SLOTS – DETAIL B



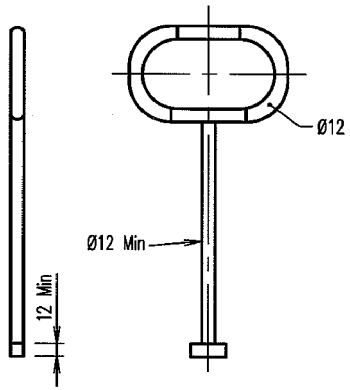
SECTION D–D



SECTION B–B

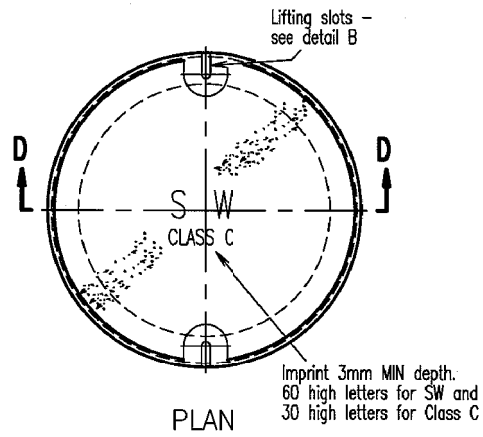


SECTION A–A



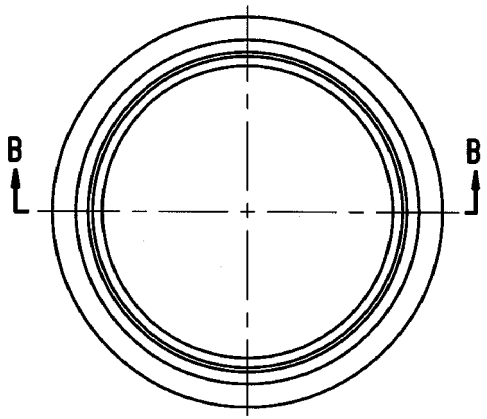
STEEL LIFTING KEY

Hot dip galvanized to AS 1650

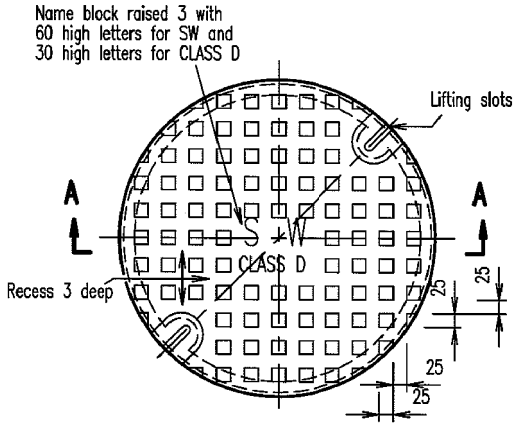


PLAN

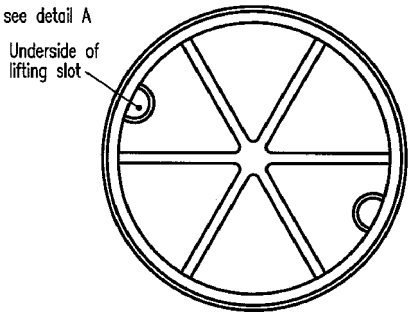
PLAN – C.I. CONCRETE FILLED COVER



PLAN – FRAME



PLAN – C.I. COVER



UNDERSIDE OF C.I. COVER

NOTES:

1. This drawing is intended to provide the performance specification only for the types of access chambers shown. The structures as shown are schematic as sizes and shapes may vary.
2. Access chambers which are proprietary items are required to be designed and certified to AS 3996–1992. Access covers subject to road traffic shall be of Class D design, where Minimum Ultimate Limit State Design Load = 210kN. Access covers subject to pedestrian traffic and occasional vehicle load shall be of Class C design, where Minimum Ultimate Limit State Design Load = 150kN. (Ref: AS 3996–1992 and Austroads Bridge Design Code 1992).
3. Cover and frame, grey cast iron, Grade ≥ T220 to AS 1830.
4. All reinforcement to be Grade 400 to AS 1302. All other steel to be Min Grade 250 to AS 1442.
5. Concrete infill N32/10 in accordance with AS 1379 and AS 3600.
6. All welds to AS 1554.
7. Bitumen paint cover and frame to AS/NZS 3750.4.
8. *All dimensions in millimetres.*

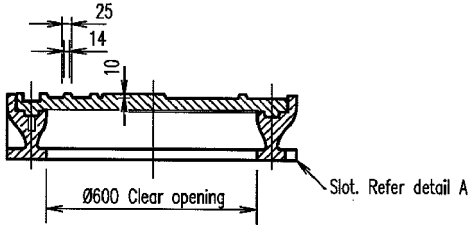
B	Dimensions Removed	3/4/00
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

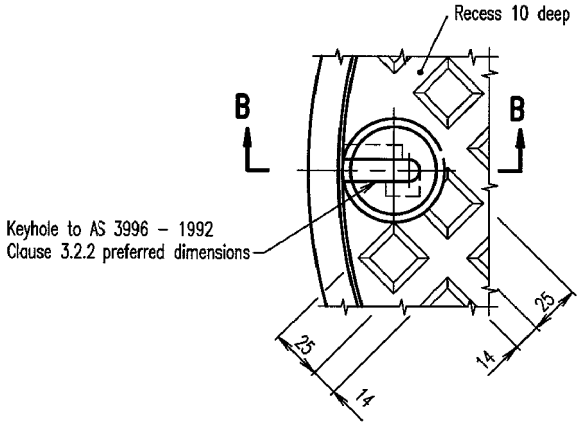
ACCESS CHAMBER
CAST IRON COVER AND FRAME
C.I. CONCRETE FILLED COVER

DRAINAGE
Standard Drawing
D–0014
A | B

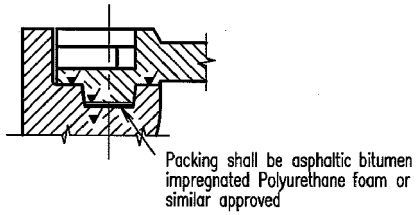
JWP – CADENZA 113327–D–0014



SECTION A–A

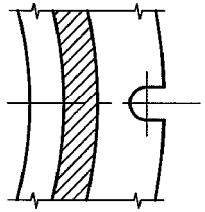


PLAN



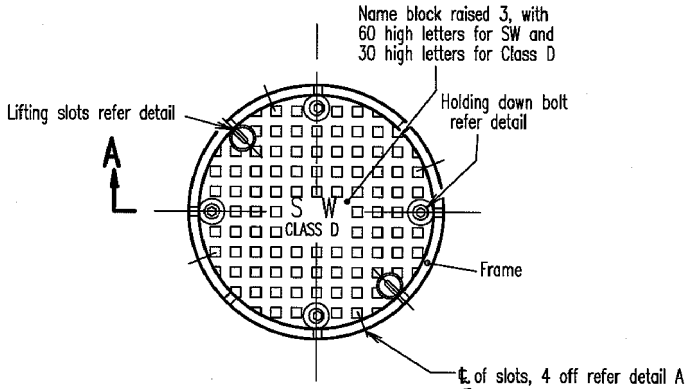
SECTION B–B

DETAIL AT LIFTING SLOTS



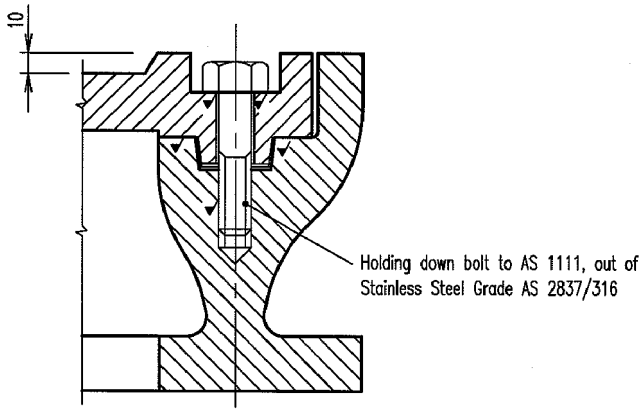
4 slots as shown

DETAIL A



PLAN

COVER AND FRAME



DETAIL OF HOLDING DOWN BOLTS

LEGEND

✓ Denotes machined surface.

NOTES:

1. This drawing is intended to provide the performance specification only for the type of access chamber shown. The structure as shown is schematic as sizes and shapes may vary.
2. Access chambers which are proprietary items are required to be designed and certified to AS 3996–1992.
3. Cover and frame, grey cast iron, Grade ≥ T220 to AS 1830.
4. Cover design to be Class D to AS 3996 – 1992, where Minimum Ultimate Limite Stcte Design Load = 210kN
5. All welds to AS 1554.
6. Bitumen paint cover and frame to AS/NZS 3750.4.
7. All dimensions in millimetres.

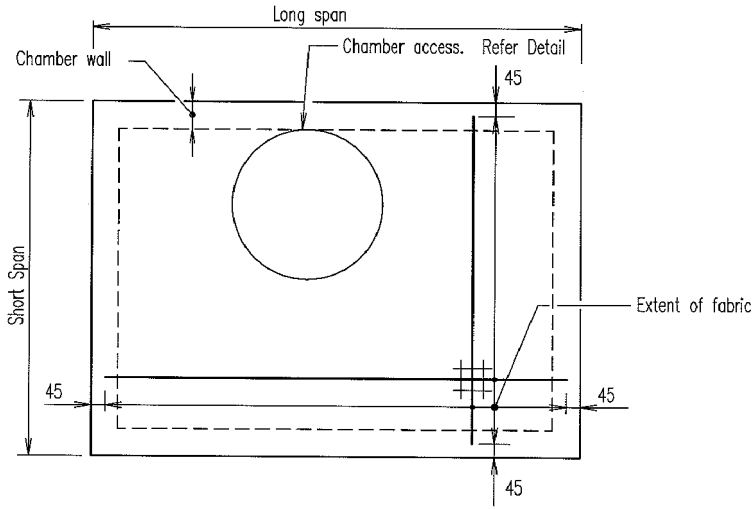
B	Dimensions Removed	3/4/00
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

ACCESS CHAMBER
CAST IRON COVER AND FRAME
BOLT DOWN

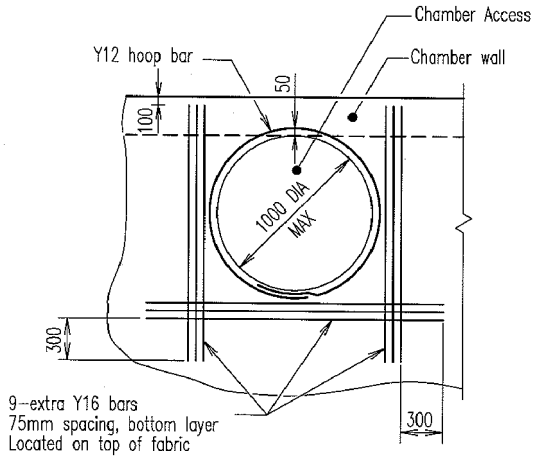
DRAINAGE
Standard Drawing
D–0015
A | B

JWP – CADENZA 113327–D–0015

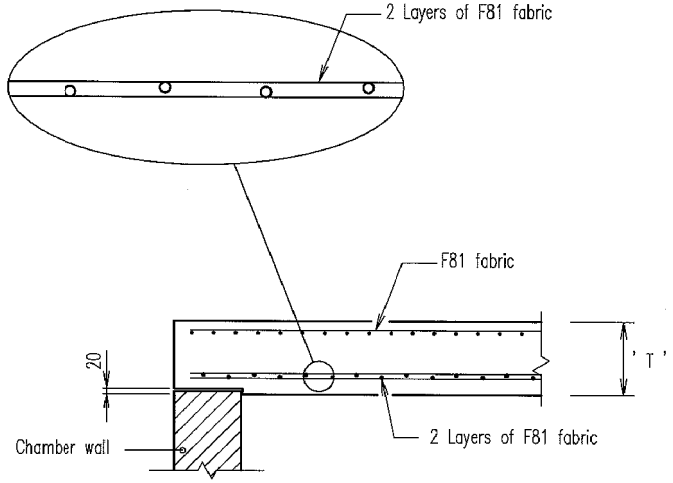


TYPICAL SLAB REINFORCEMENT

FABRIC REINFORCED SLAB	
SHORT SPAN	SLAB THICKNESS 'T'
1200 TO 1600	225
1800 TO 2400	250
2600 TO 3000	275



SLAB REINFORCEMENT AROUND CHAMBER ACCESS



TYPICAL SECTION

NOTES

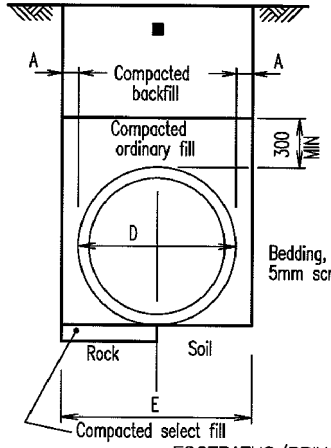
1. Concrete N32/20 in accordance with AS 1379 and AS 3600.
2. Reinforcement :– F81 Fabric to AS 1304
   Bars Y16, Grade 400 to AS 1302.
3. All laps in reinforcment shall be :–
   Y12 – 300, Y16 – 400, Fabric – 250
4. Formwork in accordance with AS 3610.
5. Designed to Austroads Bridge Code, W7 wheel load, dynamic factor 0.4.
6. Maximum fill over roof slab shall be 3000mm.
7. Reinforcement cover 45 MIN.
8. Refer Service Authority for access hole diameter to be adopted.
9. Refer project drawings for details of chamber walls and floors.
10. For sections at chamber access refer Standard Drawing D–0010.
11. All dimensions in millimetres.

A	ORIGINAL ISSUE	25/2/97
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

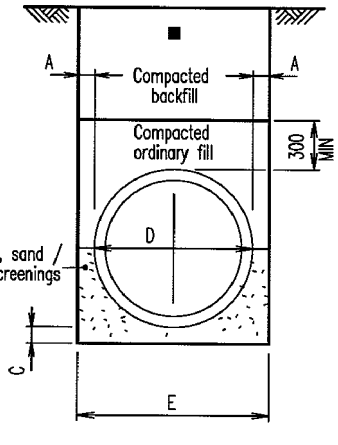
ACCESS CHAMBER ROOF SLAB – RECTANGULAR FABRIC REINFORCEMENT

DRAINAGE
Standard Drawing
D–0017
A

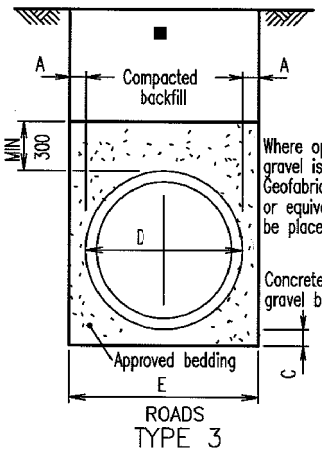


FOOTPATHS/PRIVATE PROPERTY/ROADS

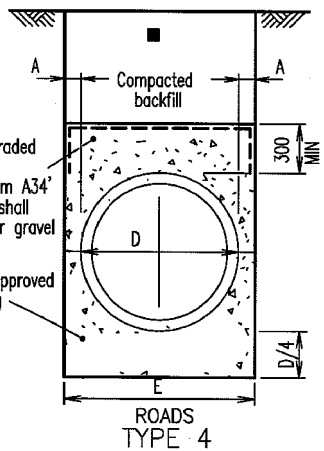
TYPE 1
Conforms to Support Type U AS 3725



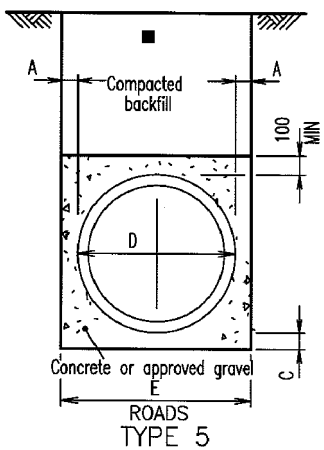
TYPE 2
Conforms to Support Type H1 AS 3725



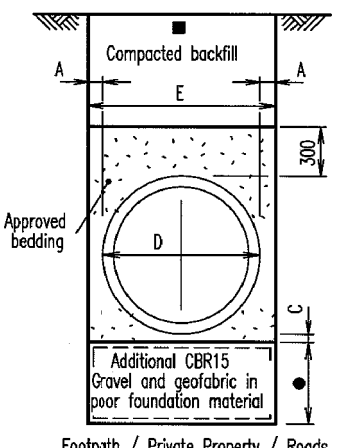
ROADS
TYPE 3
SAND SURROUND



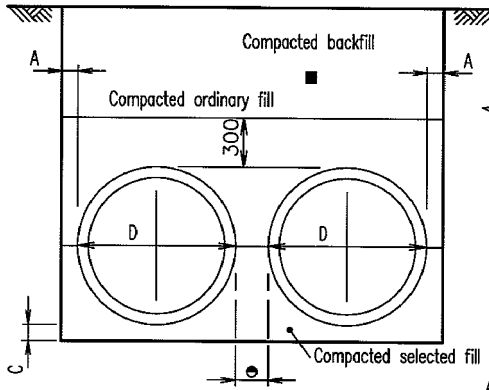
ROADS
TYPE 4
CONCRETE OR GRAVEL SURROUND



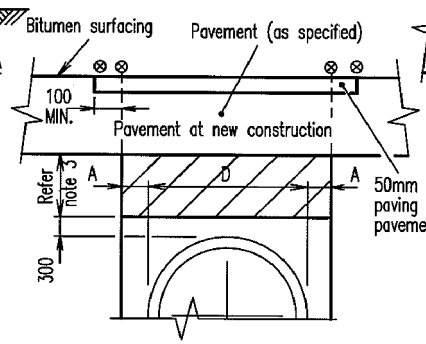
ROADS
TYPE 5
CONCRETE OR GRAVEL ENCASEMENT



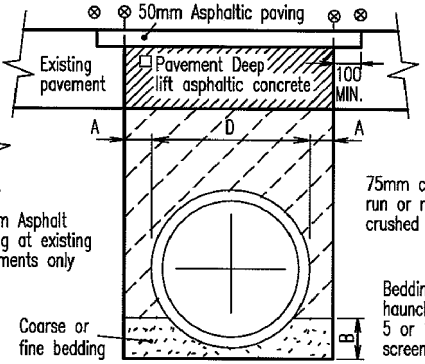
Footpath / Private Property / Roads
TYPE 6
BEDDING IN POOR GROUND



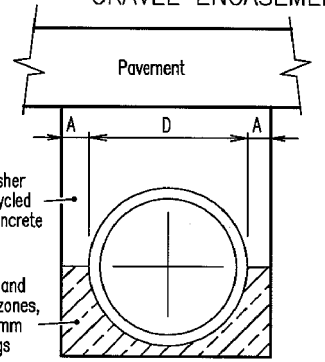
TYPE 7
BEDDING OF MULTIPLE PIPES
Conforms to Support Type H1



ALTERNATIVE A
AT NEW PAVEMENTS ON RESIDENTIAL STREETS & RURAL ROADS AND EXISTING SEALED PAVEMENTS



ALTERNATIVE B
AT EXISTING SURFACED PAVEMENTS ON INDUSTRIAL, TRUNK COLLECTOR, SUB-ARTERIAL & ARTERIAL STREETS / ROADS



ALTERNATIVE C
ALTERNATVE C

NOMINAL Ø culvert D(mm)	MINIMUM width A (mm)	HAUNCH depth B	Bedding depth C	Allowable width,E(m)	
				DES	MAX
300	300	36	100	1.0	1.1
375	300	45	100	1.1	1.2
450	300	53	100	1.1	1.3
525	300	61	100	1.2	1.5
600	300	69	100	1.3	1.6
750	300	85	100	1.5	1.8
900	300	103	100	1.6	1.9
1050	300	120	100	1.8	2.1
1200	300	135	100	2.0	2.2
1350	300	150	100	2.1	2.4
1500	300	169	100	2.3	2.7
1650	330	184	150	2.6	2.9
1800	360	200	150	2.8	3.1
1950	390	222	150	3.1	3.3
2100	420	239	150	3.4	3.5
2400	480	270	150	3.9	4.2
2700	540	303	150	4.3	4.6
3000	600	335	150	4.9	5.0

Bedding & Haunch material (Gravel, loam, sand or mixture) grading

AS Sieve Size	% Passing by mass	
	Type 1 – Pipes ≤ ø1200	Type 2 – Pipes > ø1350
19.0	100	98 – 100
9.5	–	35 – 50
4.75	–	5 – 10
2.36	40 – 100	0 – 2
0.425	15 – 70	0 – 1
0.075	3 – 30	0 – 1

LEGEND

- □ Pavement. Refer project documentation for detail
- ⊗ Saw cut at existing pavement
- ◓ Pipes : 300 when NOMINAL D < 600
  600 when NOMINAL D 600 – 1800
  900 when NOMINAL D > 1800
  Dimensions can be reduced to 150 MIN for non mechanical compaction of backfill
- ■ Refer Alternative A, B and C for backfill requirements at existing and new pavements.
- ● Depth to be approved by the Superintendent
- Gravel (MIN CBR15) backfill
- No fines concrete backfill (8 parts 10mm NOM size aggregate to 1 part cement).

NOTES:

1. Selected backfill in all cases shall be carried through to the wings and continued 300 thick for the length and height of wings.
2. Bedding compaction (Compacted selected fill / sand bedding)
   Cohesive material – 95% standard compaction
   Non-cohesive material – density index of 70 MIN, refer AS 1289.E5.1
   Sand – compact by flooding and use of vibrators.
3. Backfill compaction
   Compacted gravel (300mm) layer under road pavement 95% standard compaction.
   Compacted ordinary fill / CBR15 Gravel 90% standard compaction – below 300mm zone.
   Compacted backfill – at footpaths / private property 90% standard compaction.
   MAX. densities determined by standard compaction tests to AS 1289.5.1.1.
4. Refer project drawings for types and/or alternatives to be adopted.
5. Type U & Type H1 to conform to AS 3725.
6. Dimension A can be reduced to 150 MIN for non mechanical compaction of backfill
7. Pipes are to be designed to their correct strength class under all construction loads, dead loads and in-service loads.
8. All dimensions in millimetres.

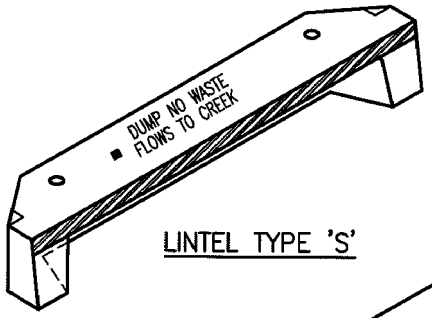
REVISIONS	DATE
C Note 7 added	6/1/00
B Bedding modification Type 2, 4, 7 and Alternative B	16/1/97
A ORIGINAL ISSUE	8/12/95

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

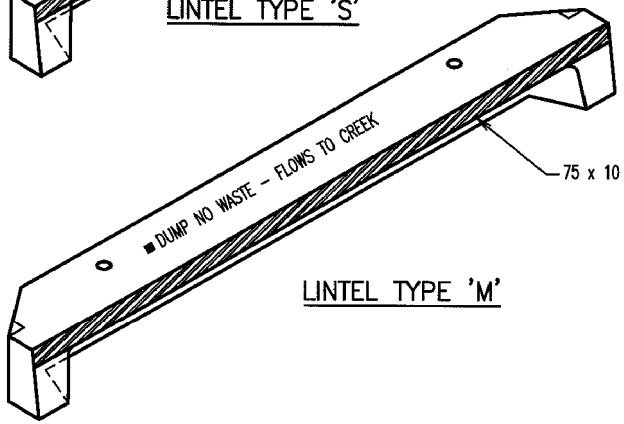
EXCAVATION, BEDDING AND BACKFILLING OF STORMWATER DRAINAGE PIPES

DRAINAGE
Standard Drawing
D–0030
A | B | C

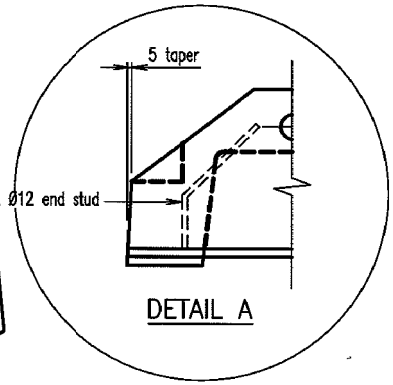
JWP – CADENZA 113327-D-0030



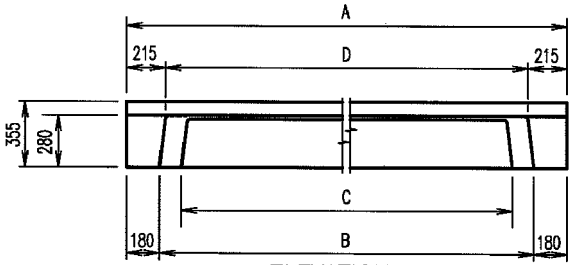
LINTEL TYPE 'S'



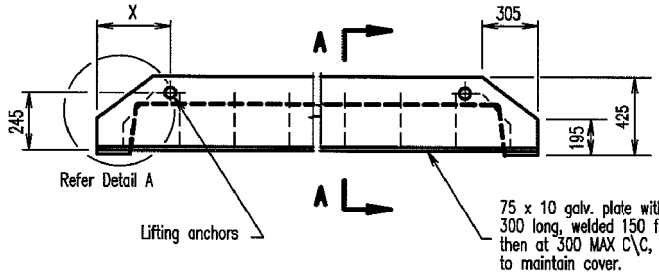
LINTEL TYPE 'M'



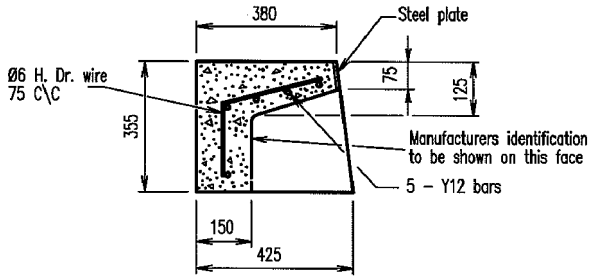
DETAIL A



ELEVATION



PLAN



SECTION A–A

NOTES

1. The minimum design load rating shall be class C.
2. Concrete to be minimum grade N40 in accordance with AS 1379 and AS 3600.
3. Each lifting anchor to be "swiftlift" or equivalent 1.3 tonne, galvanized to AS 1214 and fitted to manufacturers specification.
4. Reinforcing steel Grade 400 to AS 1302. Place centrally, 40 MIN end cover.
5. All steel flats Grade 250 to AS 3678.
6. All welds to AS 1554.
7. H. Dr. wire to AS 1310.
8. Steel plate hot dip galvanized to AS 4680.
9. All dimensions in millimeters.

LEGEND

■ Text 40mm high letters imprinted 5mm into concrete.

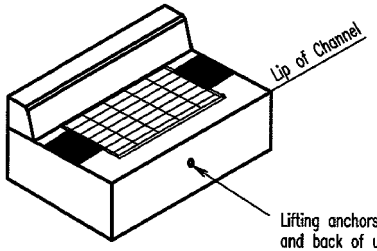
LINTEL	A	B	C	D	X	MASS (kg)
S	2400	2040	1800	1970	400	445
M	3600	3240	3000	3170	690	550

B	AMENDED	1/02	
A	COUNCIL ISSUE	1/98	
REVISIONS		DATE	APPROVED

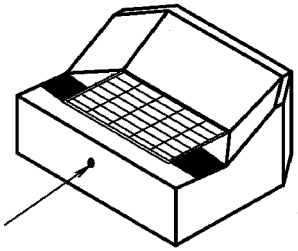
Redland

GULLY – ROADWAY TYPE PRECAST LINTEL DETAILS

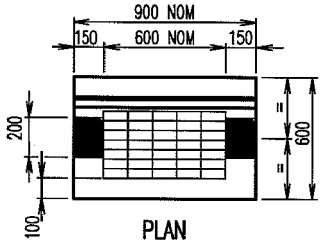
DRAINAGE
Standard Drawing
D–RSC–2
A | B



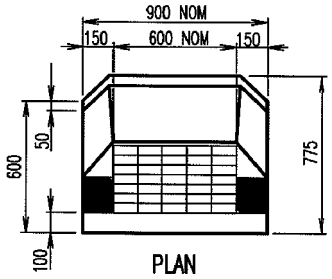
ISOMETRIC VIEW



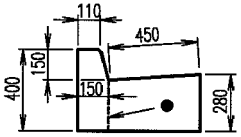
ISOMETRIC VIEW



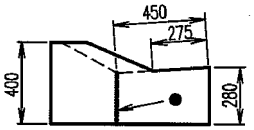
PLAN



PLAN



END ELEVATION



END ELEVATION

BARRIER KERB

MOUNTABLE KERB

ANTI–PONDING GULLIES

(No Lintel)

Refer note 12

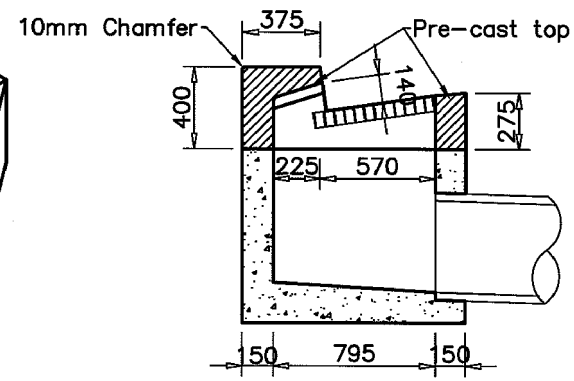
COMPONENT	PRECAST GULLY
Proof Load	50 kN
Ultimate Load	75 kN

TABLE A
LOADING CRITERIA

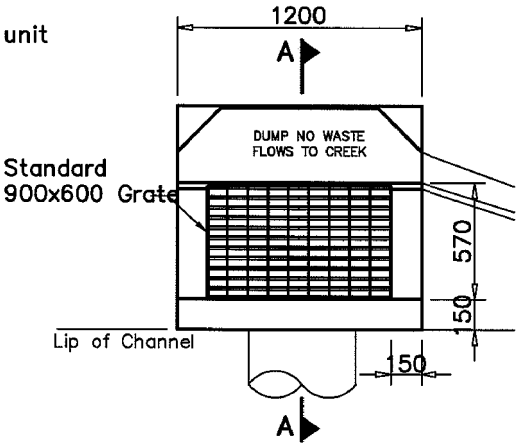
LEGEND

■ Load test area (200 x 150), refer note 3.

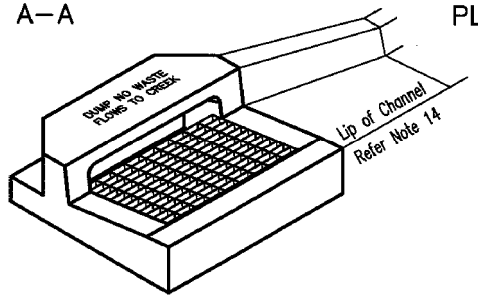
● Manufacturers' identification to be shown on this face.



SECTION A–A



PLAN



ISOMETRIC VIEW

ANTI–PONDING GULLY

(With Back Inlet)

NOTES

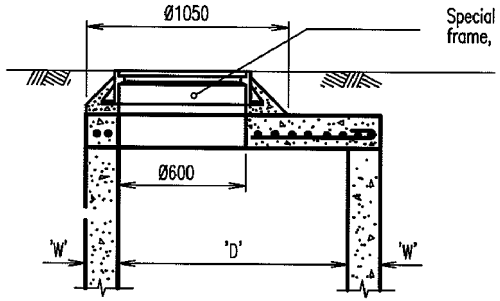
1. Concrete in accordance with AS 1379 & AS 3600, Castings to AS 1830.
2. Each lifting anchor to be "swiftlift" or equivalent 1.3 tonne, galvanised to AS 1214 and fitted to manufacturers' specification.
3. Reinforcement to AS 1302 shall be provided by the designer to obtain the strength required to pass the appropriate test criteria.
   The load detailed in Table A shall be applied to each location, separate tests at each location.
4. All steel flats Grade 250 to AS 3678.
5. All welds to AS 1554.
6. H. Dr. wire to AS 1303.
7. Steel plate hot dip galvanised to AS 4680.
8. Grate and frame Class D to AS 3996.
9. Grate frame to be cast into concrete.
10. Precast concrete units must be approved by the Superintendent prior to use.
11. Provide 10mm mortar (1 cement : 3 fine sand) joint between gully pit and precast units.
12. Maximum depth to invert shall be 1000 if gully does not have a back inlet.
13. Precast units to be placed on cast in–situ Chamber. Chamber wall wall thickness to match unit.
14. Kerb and Channel to be transitioned over 750mm to match inlet of gully.
15. All dimensions in mm.

B	AMENDED	1/02	
A	ORIGINAL ISSUE	1/98	
	REVISIONS	DATE	APPROVED

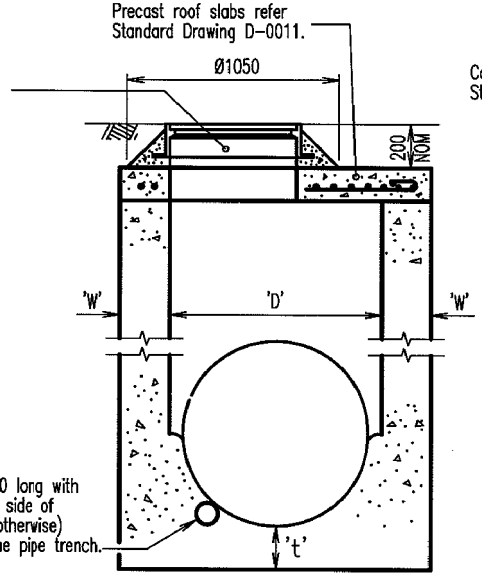
Redland

GULLY – ROADWAY TYPE
PRECAST UNITS
ANTI–PONDING

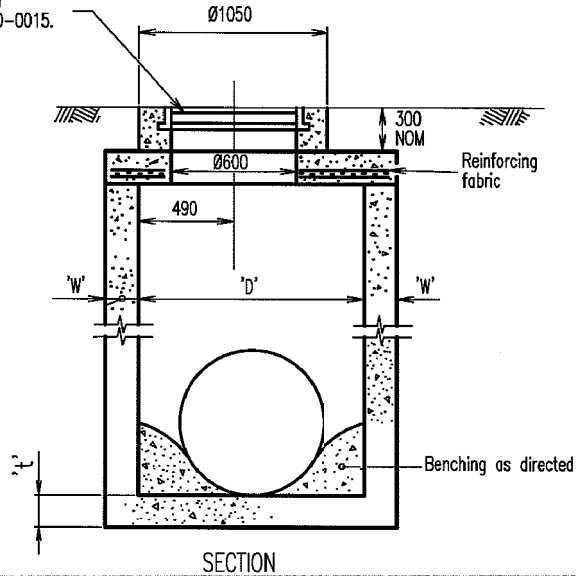
DRAINAGE
Standard Drawing
D–RSC–4
A | B



SECTION
ALTERNATIVE 1



Ø100 uPVC slotted pipe stub, 1000 long with end cap,installed on the upstream side of access chamber (unless directed otherwise) The stub is required to dewater the pipe trench.

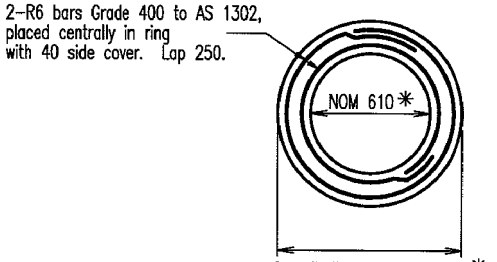


SECTION
ALTERNATIVE 2

INVERT GRADE DIMENSION 't' (MIN)

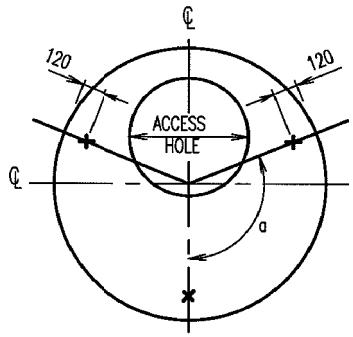
Access chamber DIA 'D'	FLOOR THICKNESS 't'		Wall thickness 'W'	Roof slab DIA
	INLET	OUTLET		
1050	175	150	150	1350
1200	250	225	225	1650
1350	250	225	225	1800
1500	250	225	225	1950
1800	250	225	250	2400
2100	275	250	275	2730

TYPICAL SECTION
ACCESS CHAMBER DETAILS



PLAN
ROOF RING

For use in raising covers and frames of existing access chambers
* Size to suit existing access chamber



α =112° For Ø1350

α =120° For Ø1650-2650

LIFTING ANCHOR LOCATIONS
(Refer Note 5)

NOTES

1. Structural concrete N25, benching N10 in accordance with AS 1379 and AS 3600.
2. Refer Standard Drawing D-0011 and D-0012 for roof slab reinforcement details.
3. Alternatives :-
   for access hole location refer Service Authority.
   for turent type refer Service Authority.
4. Refer Project Drawings for size and level of culverts, and chamber cover level.
5. Lifting anchors to be "swiftlift" or equivalent 1.8 tonne, galvanized to AS 1650 and fitted to manufacturer's specifications.
6. Access ladders or step irons to AS1657 only to be used where approved by Local Authority.
7. All dimensions in millimetres.

C	Step Irons removed, opening dia, wall thickness and Note 6 amended	3/4/00
B	ø1800 and ø2100 chambers added	3/2/97
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

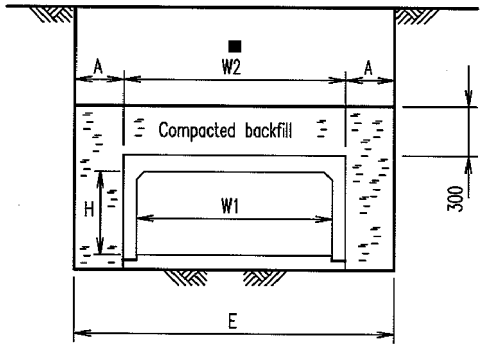
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

STORMWATER ACCESS CHAMBER DETAILS
DIA 1050 TO 2100

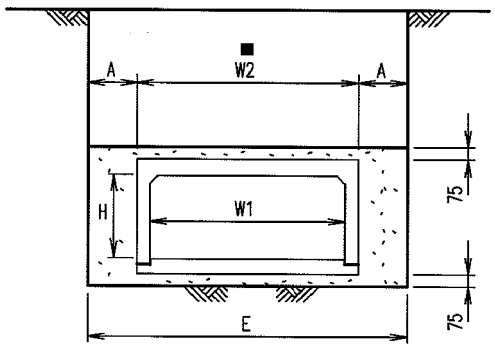
DRAINAGE
Standard Drawing
D-0010

A | B | C

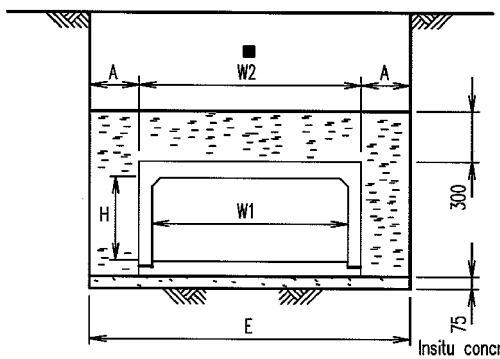
JWP - CADENZA 113327-D-0010



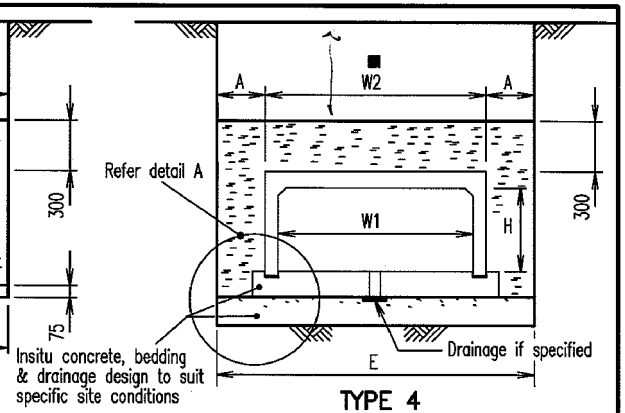
TYPE 1
NATURAL BEDDING



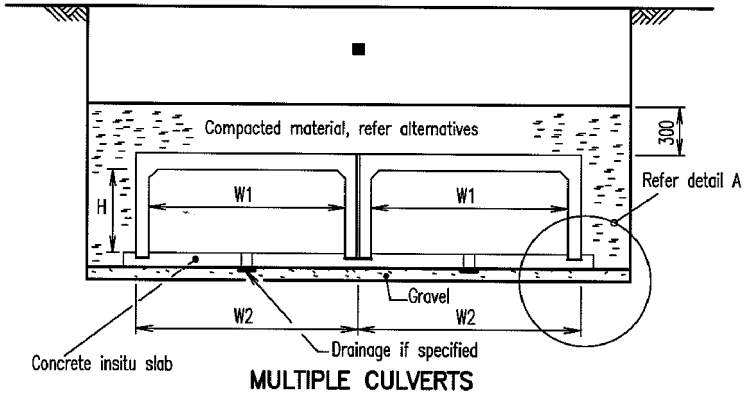
TYPE 2
SAND SURROUND



TYPE 3
SAND BEDDING



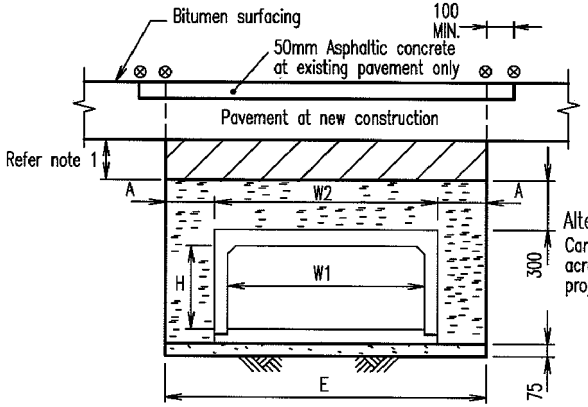
TYPE 4
INSITU BASE SLAB



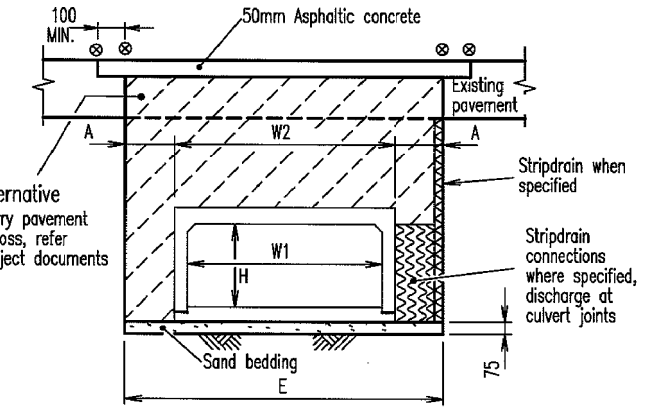
MULTIPLE CULVERTS

W1	W2	E NOM.
300	420	1000
375	500	1100
450	570	1200
600	730	1300
750	890	1500
900	1050	1700
1200	1360	2000
1520	1700	2300
1820	2010	2600
2130	2340	3000
2440	2670	3300

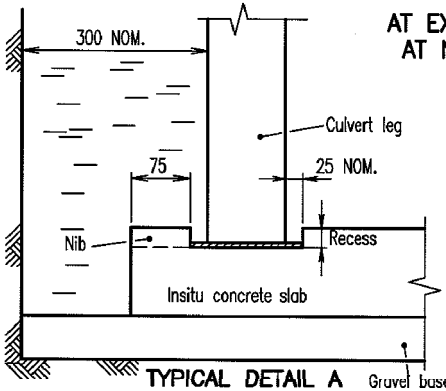
EXCAVATION WIDTH



ALTERNATIVE A
AT EXISTING SURFACED PAVEMENTS OR AT NEW PAVEMENTS ON RESIDENTIAL STREETS & RURAL ROADS



ALTERNATIVE B
AT EXISTING SURFACED PAVEMENTS ON INDUSTRIAL, TRUNK COLLECTOR, SUB-ARTERIAL & ARTERIAL STREETS / ROADS



TYPICAL DETAIL A

LEGEND

- A 300mm NOMINAL
- ■ Refer Alternative A for backfill requirements at new pavement
- ⊗ Saw cut at existing pavement
- Gravel (MIN CBR15) or 75mm crusher run backfill
- Lean mix concrete backfill (1:15 mix)
- 10mm Cement mortar bed, 1:3 mix

NOTES:

1. Backfill compaction
   Approved fill / approved bedding / compacted backfill / CBR15 Gravel 90%
   Compacted gravel (300mm layer) under road pavement 95%
   Compacted fill – at footpaths / private property 90%
   MAX. densities determined by Standard compaction tests to AS 1289.E5.1.
2. Refer to Main Roads Std Drg 1316 for installation of precast culverts.
3. Tape all joints with 75mm wide Denso (600) Tape or equivalent.
4. All dimensions in millimetres.

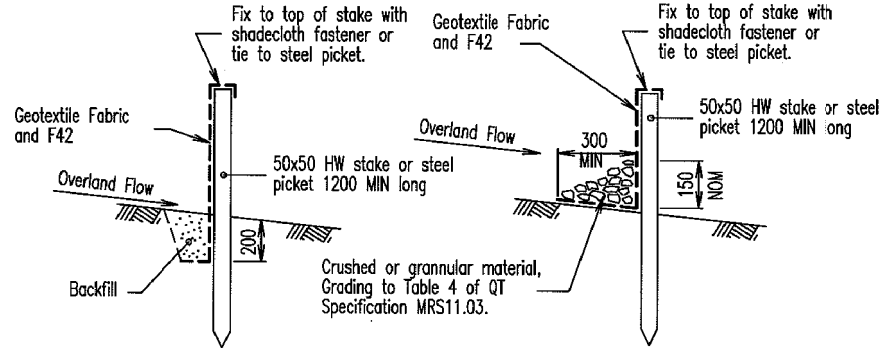
B	Note 2 added	6/1/00
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

EXCAVATION, BEDDING AND BACKFILLING OF PRECAST BOX CULVERTS

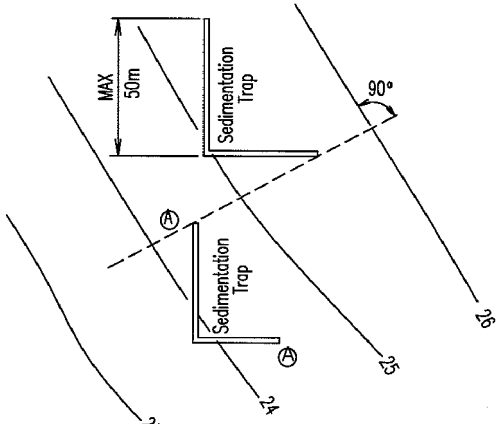
DRAINAGE
Standard Drawing
D-0031
A

JWP - CADENZA 113327-D-0031



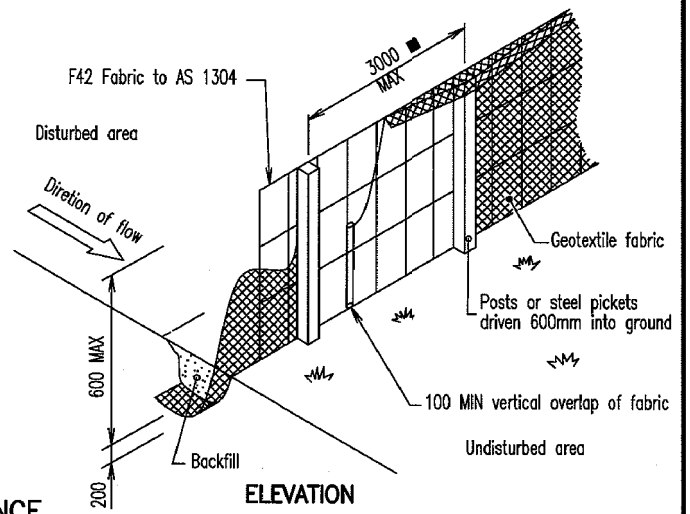
ALTERNATIVE 1

ALTERNATIVE 2

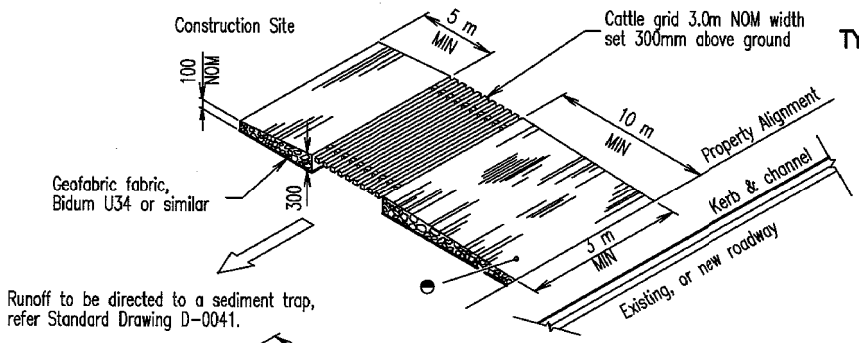


TYPICAL LAYOUT ACROSS GRADE

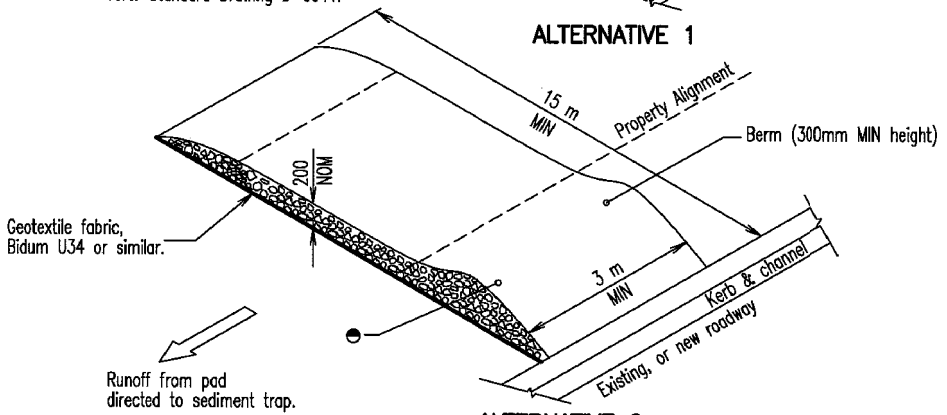
Points A at same elevation



ELEVATION



ALTERNATIVE 1



ALTERNATIVE 2

TEMPORARY CONSTRUCTION ENTRY / EXIT SEDIMENT TRAP

SEDIMENT FENCE

LEGEND

- ● Unbound pavement material (gravel) to Grading B, Table 9 of QT Specification MRS11.05, exclude material finer than AS sieve 2.36mm.
- ■ Without F42 fabric, 2000 MAX C\C

NOTES

1. General
   - (a) Temporary drainage control. Flow should be diverted around the work site where possible.
   - (b) All drainage, erosion and sediment controls to be installed and be operational before commencing up-slope earthworks.
   - (c) All control measures to be inspected at least weekly and after significant runoff producing storms.
   - (d) Control measures may be removed when on-site erosion is controlled and 70% permanent soil coverage is obtained over all upstream disturbed land.
   - (e) In areas where runoff turbidity is to be controlled, exposed surfaces to be either mulched, covered with erosion control blankets or turfed if earthworks are expected to be delayed for more than 14 days.
   - (f) Straw bale sediment traps are a secondary option which generally should not be used if other options are available.
2. Sediment Fence
   - (a) Not to be located in areas of concentrated flow.
   - (b) Normally located along the contour with a maximum catchment area 0.6 ha per 100m length of fence.
   - (c) Woven fabrics are preferred, non-woven fabrics may be used on small work sites, i.e. operational period less than 6 months or on sites where significant sediment runoff is not expected.
   - (d) Where fences need to be located across the contour the layout shall conform to 'Typical Layout Across Grade'.
   - (e) Fences are required 2m MIN from toe of cut or fill batters, where not practical one fence can be at the toe with a second fence 1m MIN away. Fence should not be located parallel with toe if concentration of flow will occur behind the fence.
3. Temp Construction Entry/Exit Sediment Trap.
   - (a) Adjacent stormwater runoff to be diverted away from entry/exit.
   - (b) Wheel - wash or spray unit may be required during wet weather.
4. Safety issues must be considered at all times, incorporate traffic control devices to the satisfaction of the Superintendent.
5. All dimensions in millimetres unless indicated otherwise.

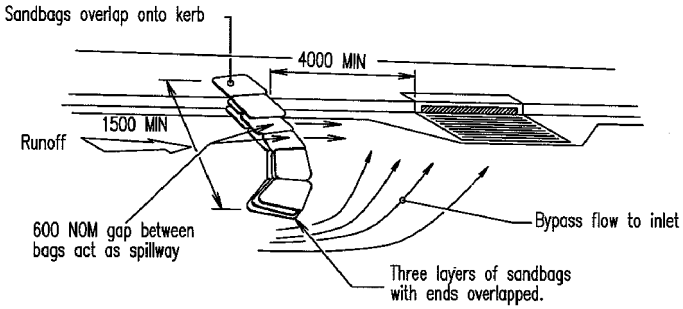
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

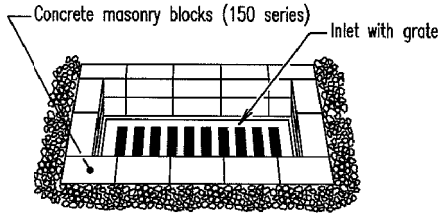
SEDIMENT CONTROL DEVICES
SEDIMENT FENCE
ENTRY/EXIT SEDIMENT TRAP

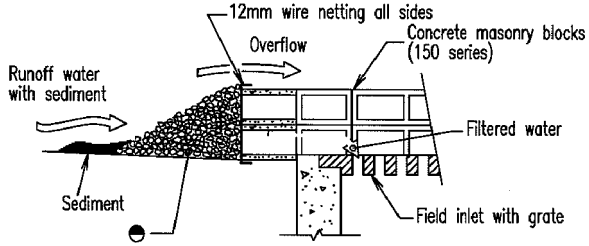
DRAINAGE
Standard Drawing
D-0040
A

JWP - CADENZA 113327-D-0040

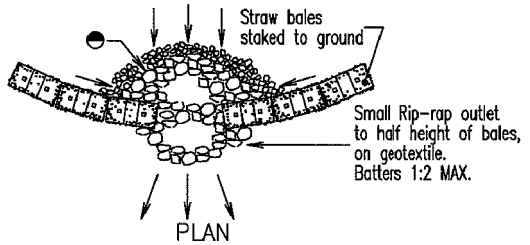


ON GRADE KERB INLET SEDIMENT TRAP

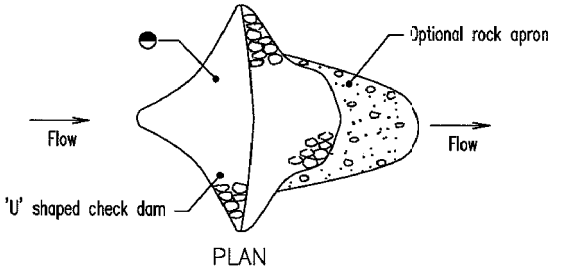


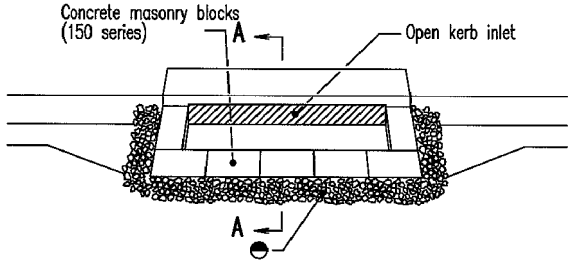


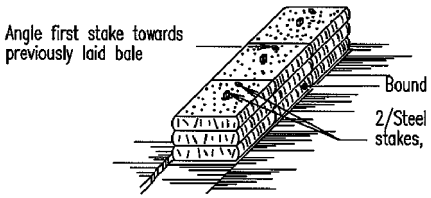
FIELD INLET SEDIMENT TRAP



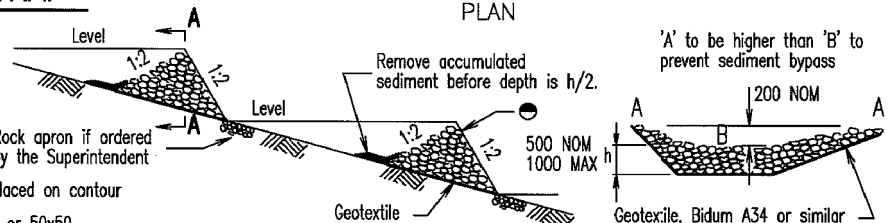
STRAW BALE AND STONE TRAP SEDIMENT CONTROL – CONCENTRATED FLOW



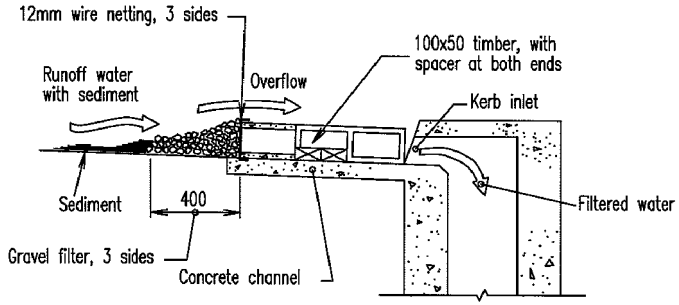




ANCHORING DETAIL



CHECK DAMS FLOW CONTROL



SECTION A–A

SAG INLET SEDIMENT TRAP

A stabilised bypass 'overland flow path' should exist adjacent to inlet in genuine sags.

BEDDING DETAIL

STRAW BALE BANK SEDIMENT CONTROL

LEGEND

- Gravel filter, refer Grading B, Table 9 of QT Specification MRS11.05, exculde material finer then AS sieve 2.36mm.

NOTES

1. Field Inlet
   a) A stabilised bypass overland flow path should exist adjacent to the field inlet.
   b) Water level control perimeter banks may be required.
   c) Blocks to be restrained by a horizontal timber rail at block joint height fixed to timber stakes at corners.
2. Check Dams
   a) Catchment area limited to 4 ha.
   b) Use in minor open drains only, (velocity control), sediment collection is a secondary purpose.
3. Straw Bale Banks
   a) Bales shall be placed at the toe of a slope or on the contour,in a row with ends tighly abutting the adjacent bales.
   b) Each bale shall be embedded in the soil a minmum of 100mm on the downstream side and placed so the bindings are horizontal.
   c) Bales shall be securely anchored in place with either two stakes or steel pickets driven through the bale. The first stake in each bale shall be driven toward the previously laid bale at an ange to force the bales together.
   d) Inspections shall be frequent and repair or replacement shall be made promptly as needed. Replace at least 3 monthly.
4. Safety issues must be considered at all times, incorporate traffic control devices to the satisfaction of the Superintendent.
5. All dimensions in millimetres.

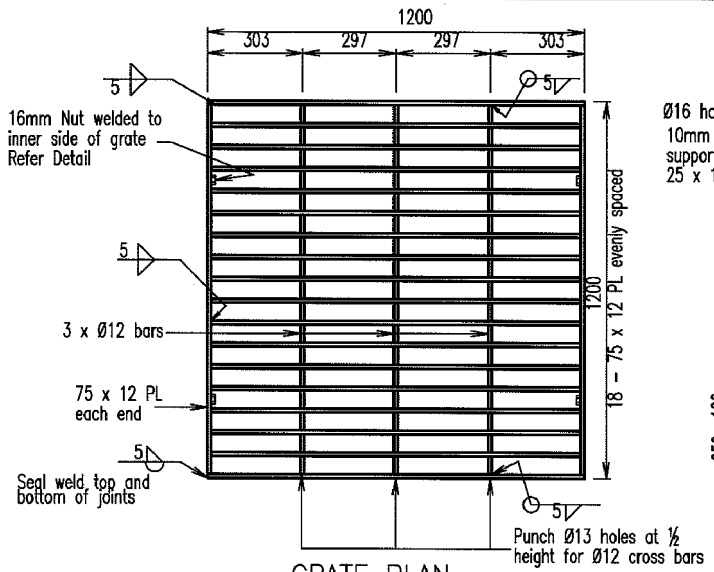
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

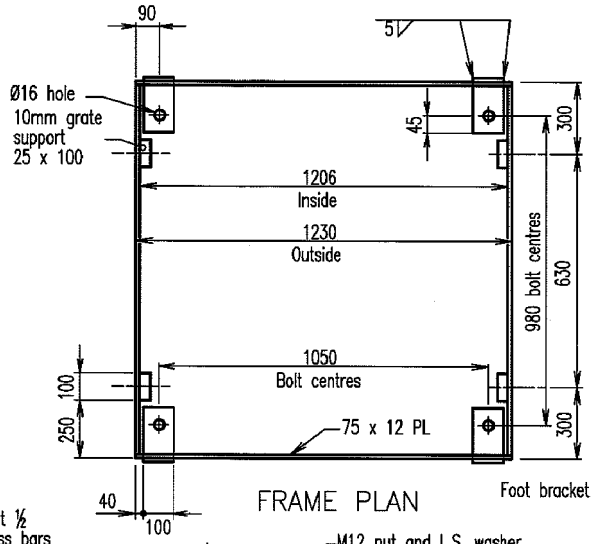
SEDIMENT CONTROL DEVICES KERB AND FIELD INLETS, CHECK DAMS & STRAW BALE BANK

DRAINAGE
Standard Drawing
D–0041
A

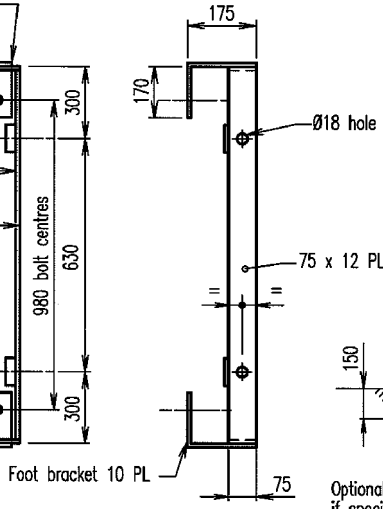
JWP – CADENZA 113327–D–0041

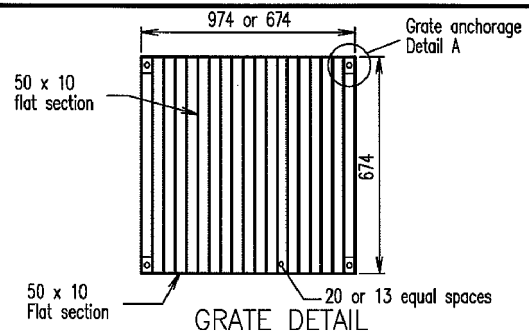


GRATE PLAN

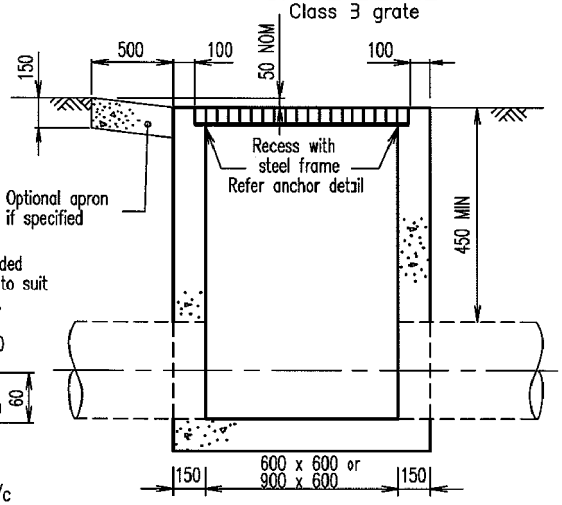


FRAME PLAN

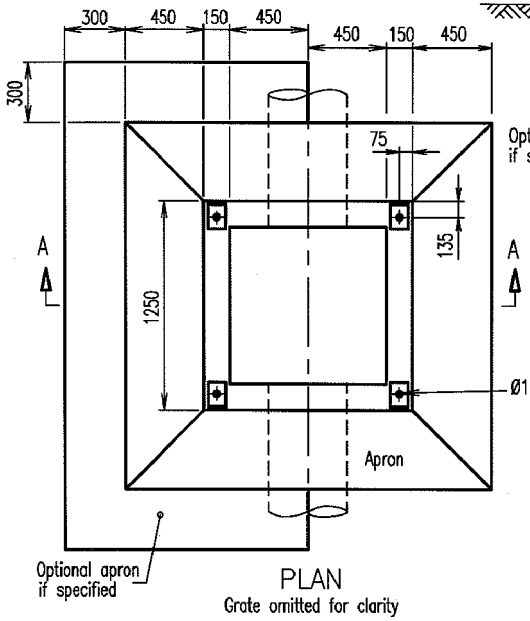




GRATE DETAIL
Class B grate

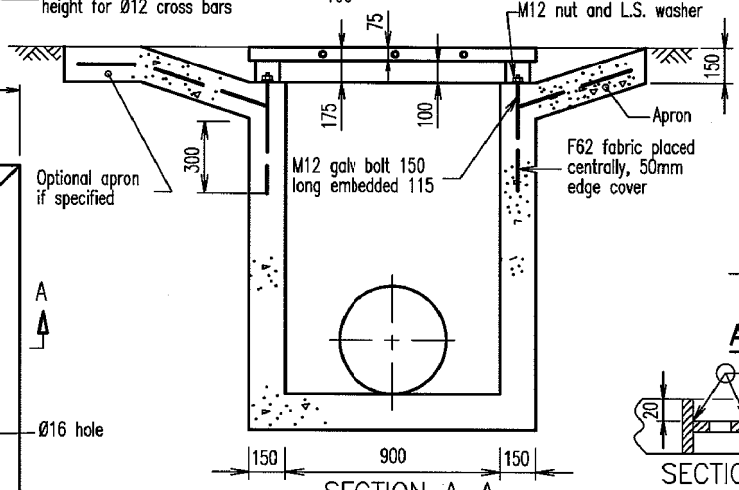


SECTION OF FIELD INLET
TYPE 2

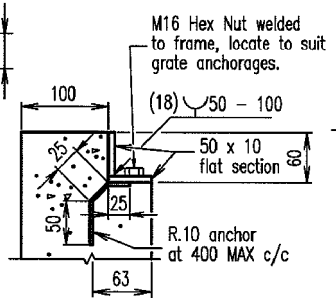


PLAN
Grate omitted for clarity

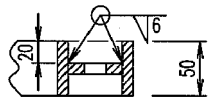
TYPE 1



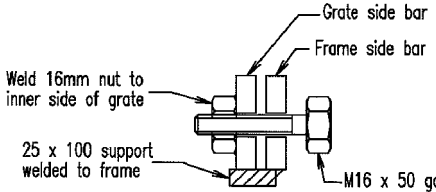
SECTION A–A



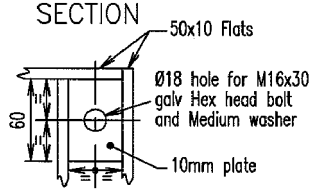
ANCHOR DETAIL



SECTION



DETAIL OF BOLT



PLAN
DETAIL A

NOTES

1. Concrete N25 in accordance with AS 1379 and AS 3600.
2. All welds to AS 1554. All welding symbols to AS 1101.3.
3. Grate and frame to be hot dip galvanized after fabrication to AS 1650 .
4. Reinforcing bars Grade 250 to AS 1302.
5. All flats Grade 250 to AS 3678.
6. All angles Grade250 to AS 3679.
7. Hexagonal head bolts to AS 1111.
   Nuts to AS 1112.
   Washers to AS 1237.
   Galvanizing to AS 1214.
8. Class B grate to AS 3996 – grate in direction nominated, refer Project Drawings.
9. All dimensions in millimetres.

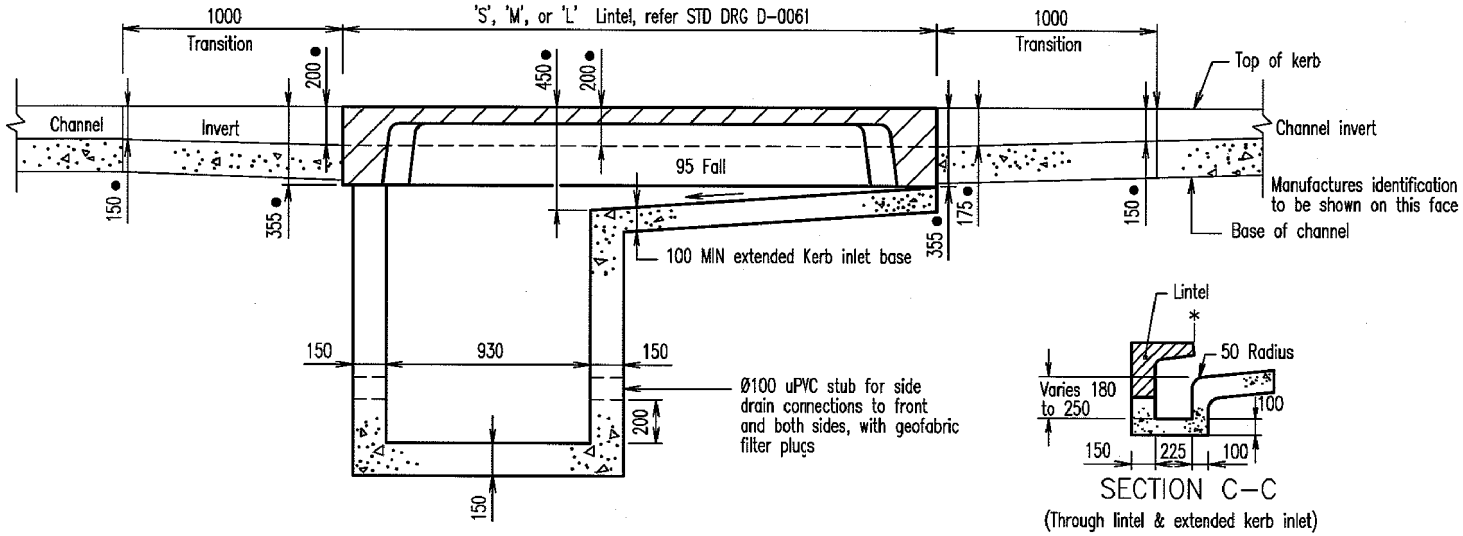
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

FIELD INLET AND OVERFLOW GULLY
TYPE 1 AND TYPE 2

DRAINAGE
Standard Drawing
D–0050
A

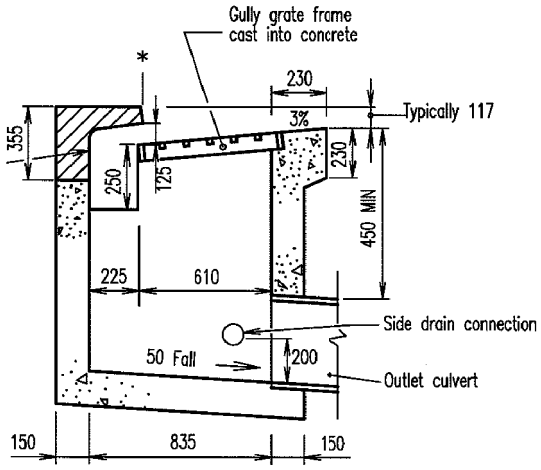
JWP – CADENZA 113327–D–0050



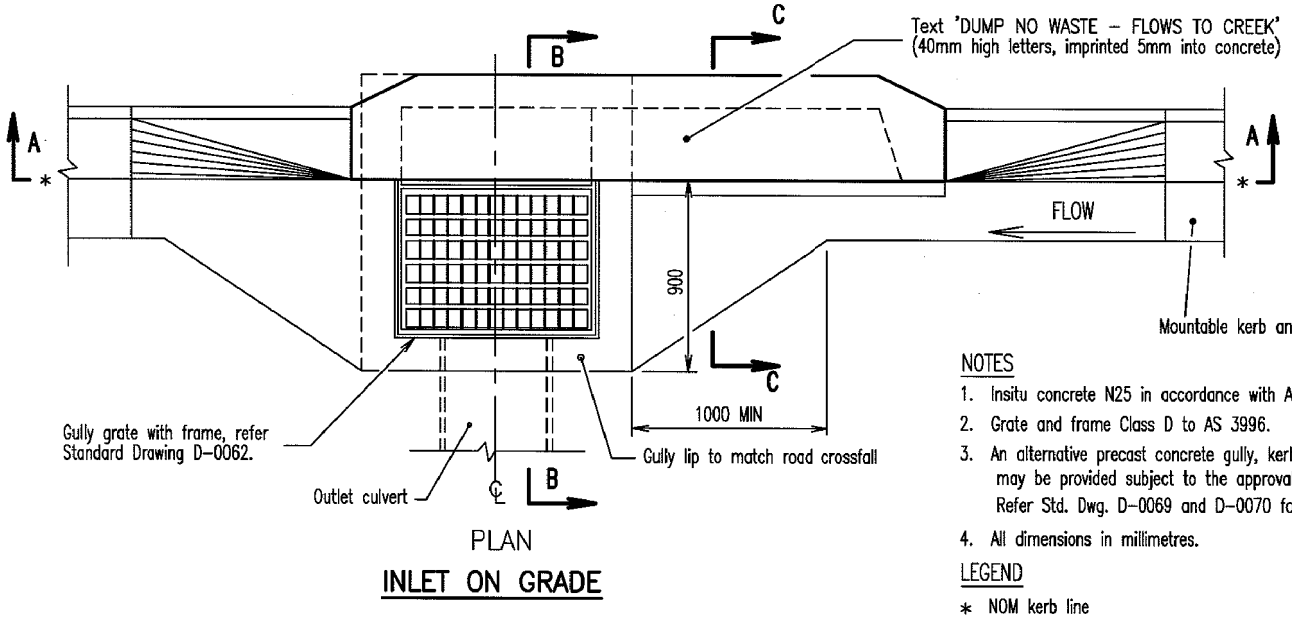
SECTION A – A

SECTION C–C

(Through lintel & extended kerb inlet)

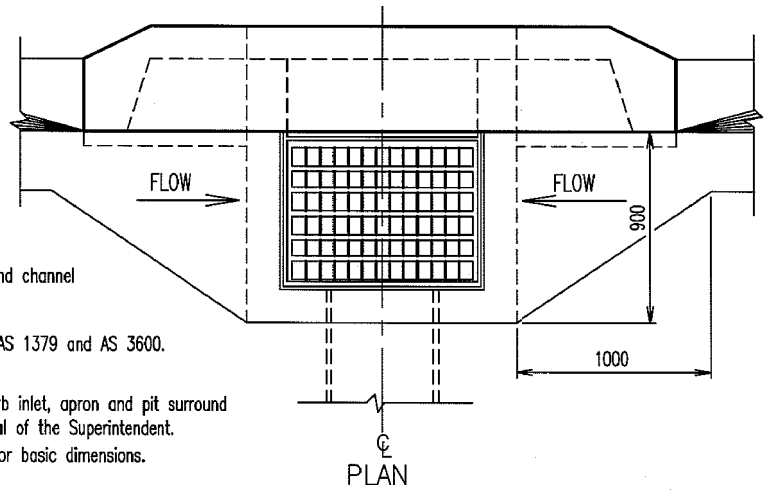


SECTION B – B



PLAN

INLET ON GRADE



PLAN

INLET IN SAG

NOTES

1. Insitu concrete N25 in accordance with AS 1379 and AS 3600.
2. Grate and frame Class D to AS 3996.
3. An alternative precast concrete gully, kerb inlet, apron and pit surround may be provided subject to the approval of the Superintendent. Refer Std. Dwg. D-0069 and D-0070 for basic dimensions.
4. All dimensions in millimetres.

LEGEND

* NOM kerb line

● Setting out dimensions

REVISIONS	DATE
B Note 3 Precast gully added	16/1/97
A ORIGINAL ISSUE	8/12/95

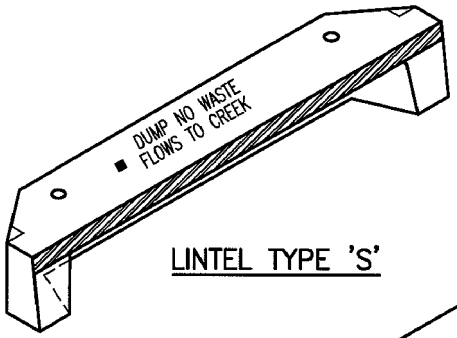
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

GULLY – ROADWAY TYPE
GENERAL ARRANGEMENT
KERB IN LINE

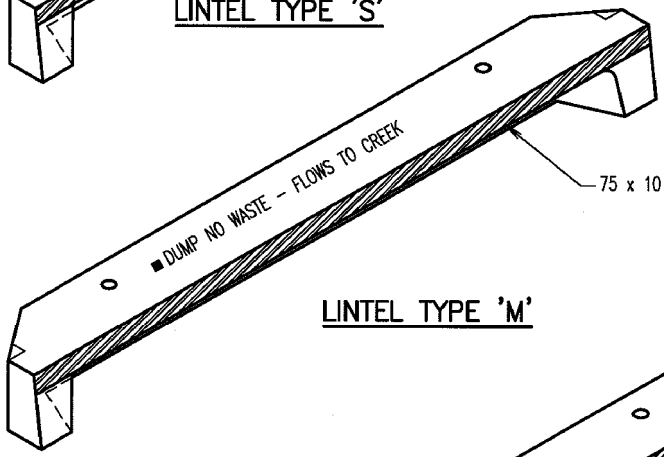
DRAINAGE
Standard Drawing
D–0060

A | B

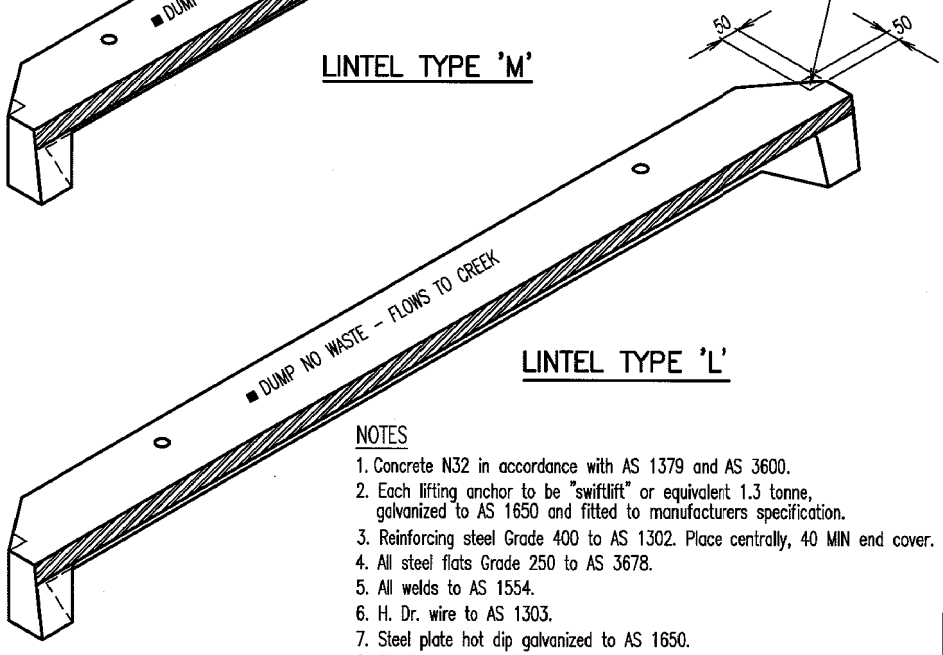
JWP – CADENZA 113327-D-0060



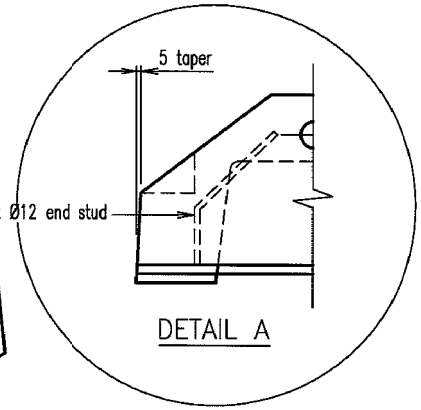
LINTEL TYPE 'S'



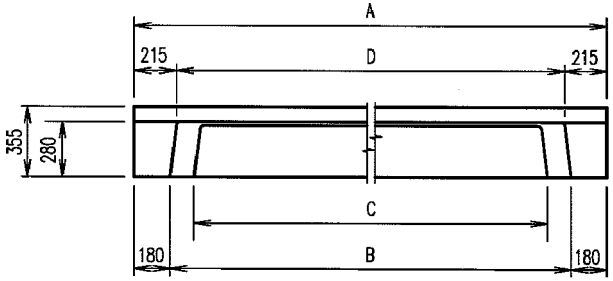
LINTEL TYPE 'M'



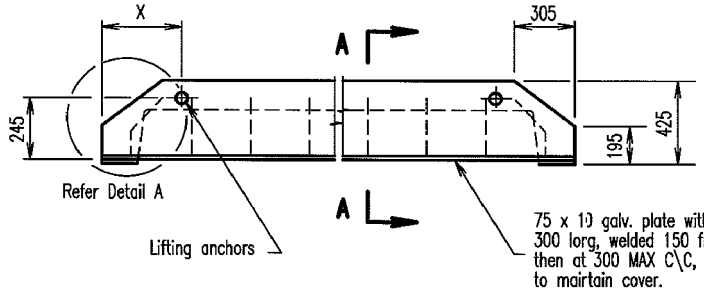
LINTEL TYPE 'L'



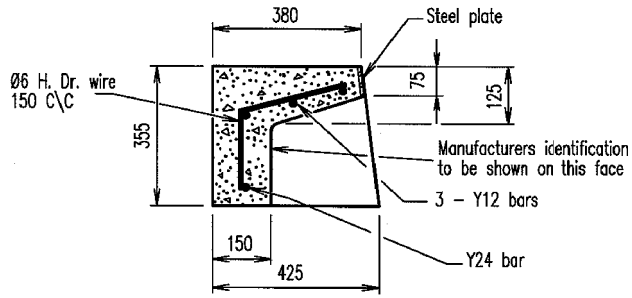
DETAIL A



ELEVATION



PLAN



SECTION A–A

NOTES

1. Concrete N32 in accordance with AS 1379 and AS 3600.
2. Each lifting anchor to be "swiftlift" or equivalent 1.3 tonne, galvanized to AS 1650 and fitted to manufacturers specification.
3. Reinforcing steel Grade 400 to AS 1302. Place centrally, 40 MIN end cover.
4. All steel flats Grade 250 to AS 3678.
5. All welds to AS 1554.
6. H. Dr. wire to AS 1303.
7. Steel plate hot dip galvanized to AS 1650.
8. All dimensions in millimeters.

LEGEND

■ Text 40mm high letters imprinted 5mm into concrete.

LINTEL	A	B	C	D	X	MASS (kg)
S	2400	2040	1800	1970	400	445
M	3600	3240	3000	3170	690	550
L	4800	4440	4200	4370	1000	725

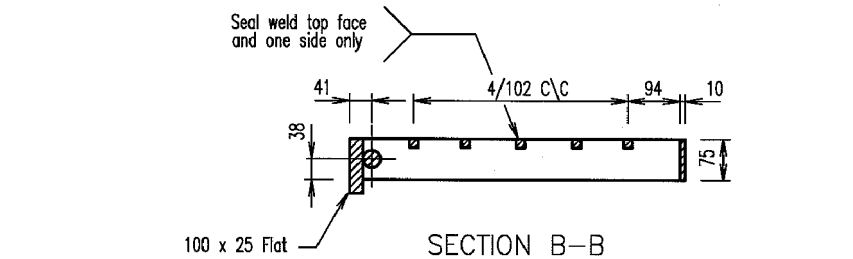
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.

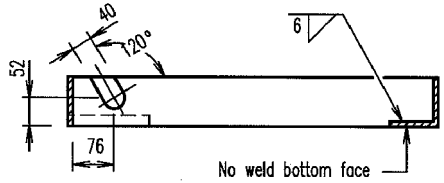
GULLY – ROADWAY TYPE
PRECAST LINTEL DETAILS
KERB IN LINE

DRAINAGE
Standard Drawing
D–0061
A

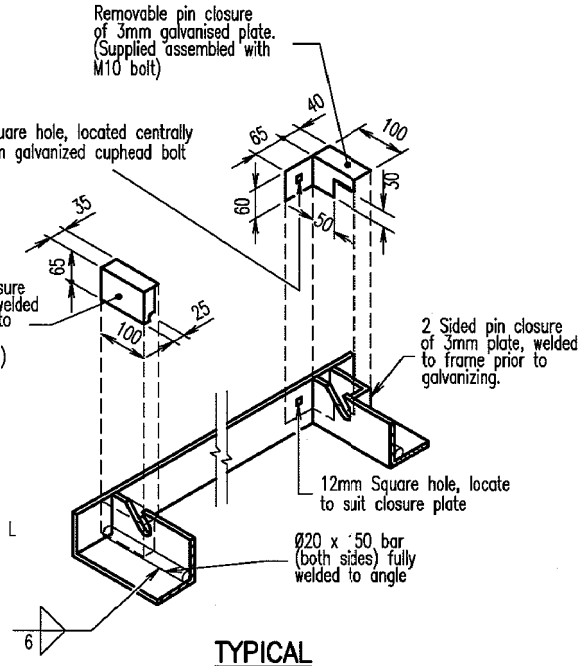
JWP – CADENZA 113327-D-0061



SECTION B–B

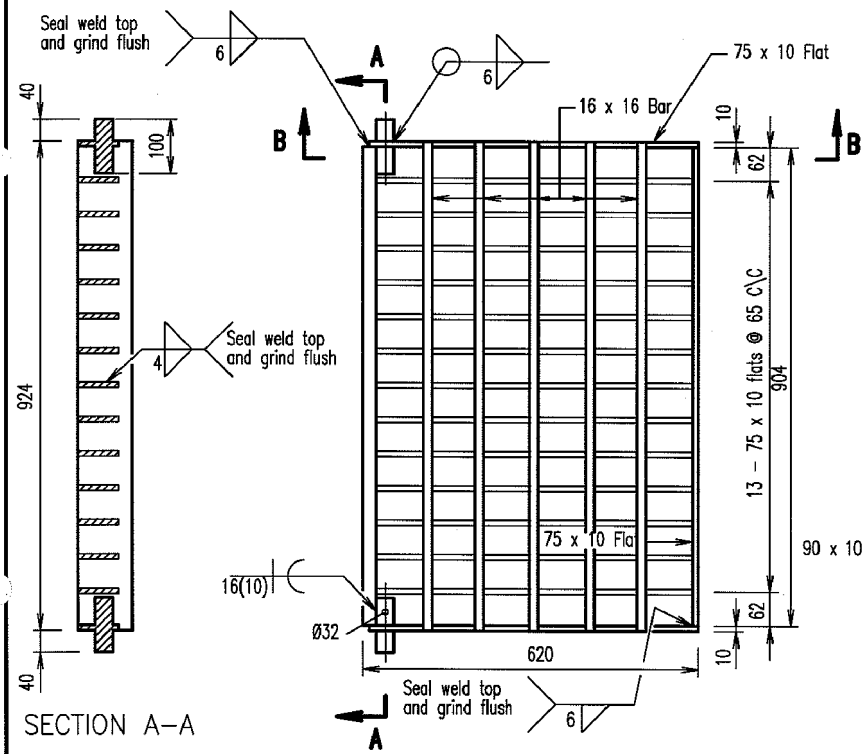


SECTION C–C



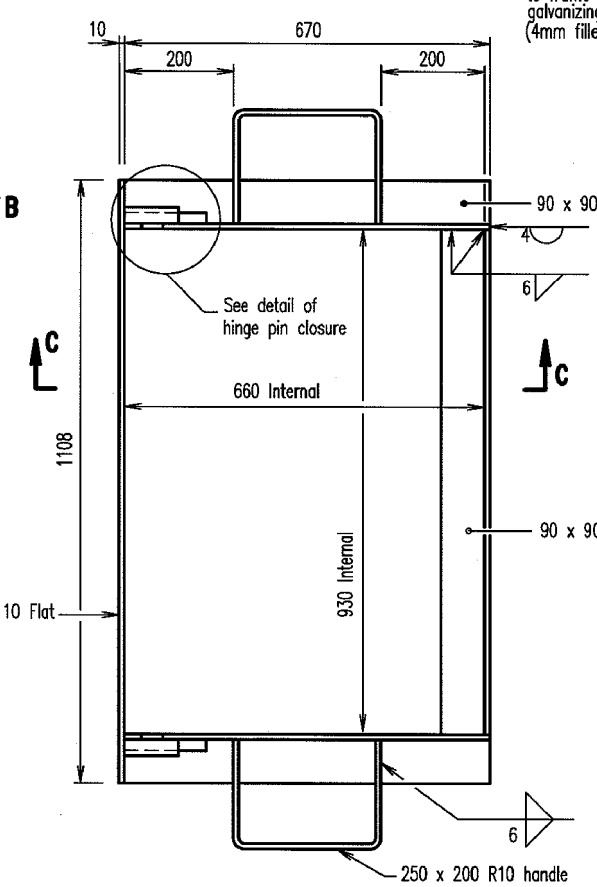
TYPICAL DETAIL OF HINGE PIN CLOSURES

A locking device shall be provided in accordance with clause 3.2.1.4 of AS 3996.



SECTION A–A

PLAN OF GRATE



PLAN OF FRAME

NOTES

1. Mass of grate = 85 kg.
2. Mass of frame = 39 kg.
3. All steel flats Grade 250 to AS 3678.
3. All steel bars and angles Grade 250 tc AS 3679.
5. Grate and frame to be hot dip galvanized, after fabrication to AS 1650.
6. All welds to AS 1554. Welding symbols to AS 1101.3.
7. Refer Standard Drawing D–0060 for gully details.
   Refer Standard Drawing D–0061 for precast lintel details.
8. Grate and frame Class D to AS 3996.
9. Alternative fabricated steel grate and frame, Grade 250 to AS 3679, may be used when approved.
10. All dimensions in millimetres.

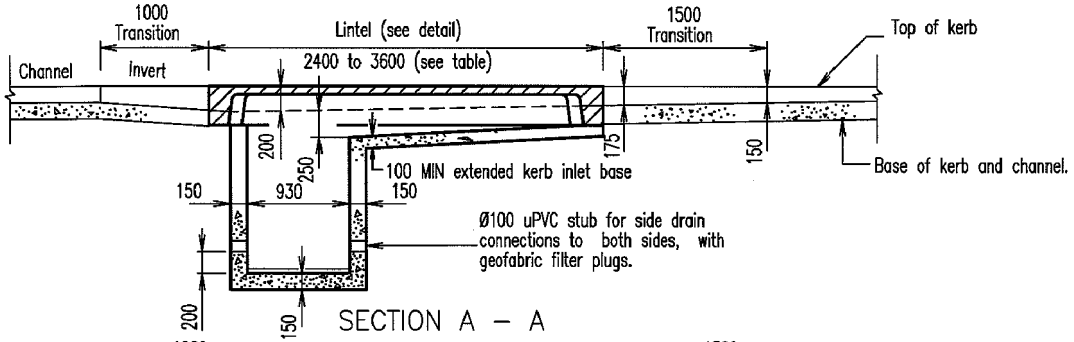
REVISIONS	DATE
B Original Note 10 omitted	16/1/97
A ORIGINAL ISSUE	8/12/95

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

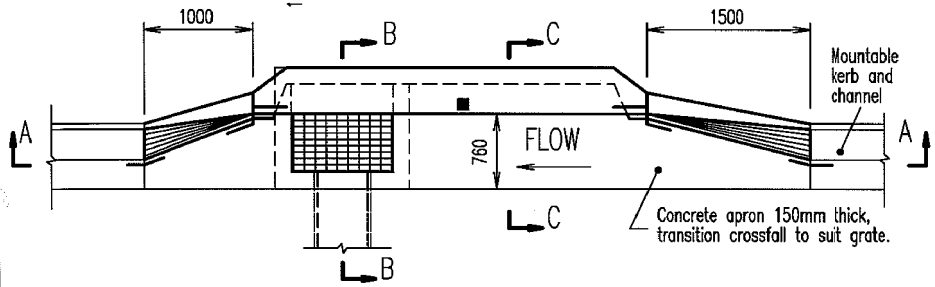
GULLY – ROADWAY TYPE GRATE AND FRAME

DRAINAGE
Standard Drawing
D–0062
A | B

JWP – CADENZA 113327–D–0062

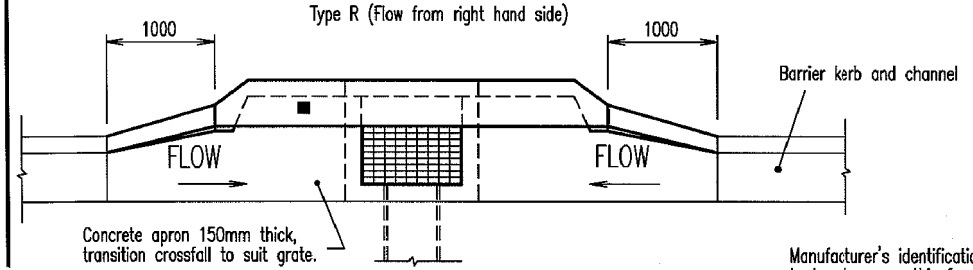


SECTION A – A

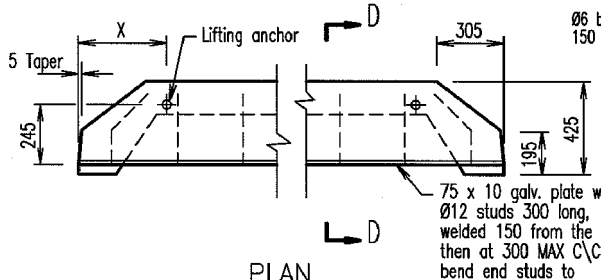


TYPICAL INLET ON GRADE

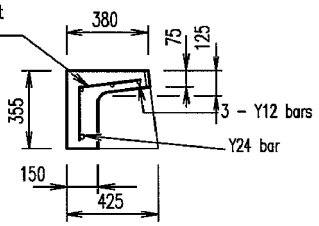
Type R (Flow from right hand side)



TYPICAL INLET IN SAG

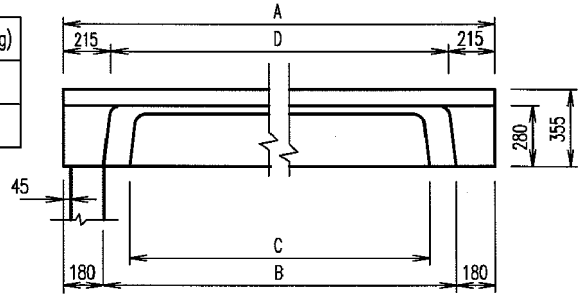


PLAN



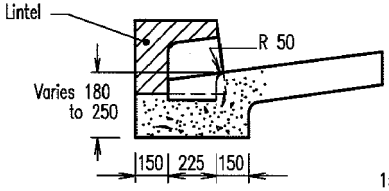
SECTION D – D

TYPE	A	B	C	D	X	MASS(kg)
S	2400	2040	1800	1970	400	445
M	3600	3240	3000	3170	690	550

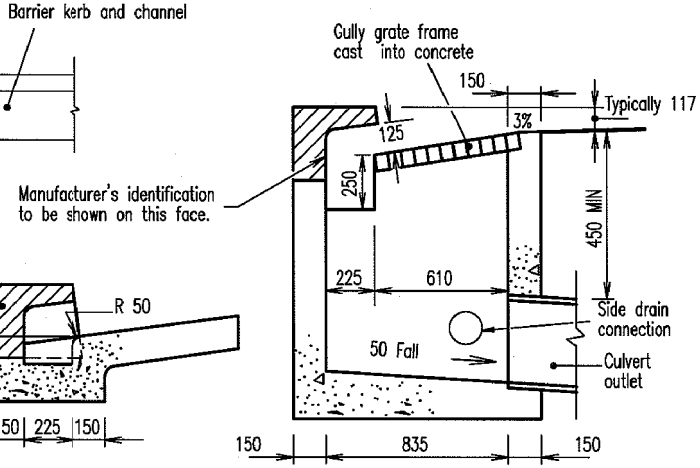


ELEVATION

LINTEL



SECTION C – C



SECTION B – B

NOTES

1. The catchpit may be cast–in–situ or precast. This drawing indicates a cast–in–situ catchpit with a precast lintel.
2. Precast concrete N32 in accordance with AS 1379 and AS 3600.
3. Cast in–situ concrete N25 in accordance with AS 1379 and AS 3600.
4. Each lifting anchor to be "Swiftlift" or equivalent 1.3 tonne, galvanised to AS 1650 and fitted to manufacturer's specification.
5. Reinforcing bars Grade 400 to AS 1302, place centrally, 40 MIN end cover.
6. Refer Standard Drawing D–0062 for grate and frame details.
7. Grate and frame Class D to AS 3996. A locking device should be provided in accordance with clause 3.2.1.4 of AS 3996
8. Steel plate hot dip galvanized to AS 1650.
9. All dimensions in millimetres.

LEGEND

■ Text 'DUMP NO WASTE – FLOWS TO CREEK' (40 high letters, imprinted 5 mm into concrete)

REVISIONS	DATE
C Title amended	5/7/00
B Part of Note 7 omitted	16/1/97
A ORIGINAL ISSUE	8/12/95

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.

GULLY – ROADWAY TYPE GENERAL ARRANGEMENT CHANNEL LIP IN LINE

DRAINAGE
Standard Drawing
D–0063

A | B | C

JWP – CADENZA 113327–D–0063

Appendix E

Redland Shire Council Draft Valuation Procedures

Valuation Procedures

Redland
SHIRE COUNCIL

Procedures Manual - Draft

Redland Shire Council

CAIT Revaluation of Stormwater Assets

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3 September 2007

Table of Contents

1 Introduction

This document describes the processes used to valuate the stormwater assets that are within Maximo.

CAIT supplied Unit Costs for standard equipment types, materials, sizes and in some cases depths.

High level issues that were identified will be noted in preparation for improving the accuracy and integrity of the data in Maximo.

2 Data Preparation

The following steps have been followed to valuate the Maximo stormwater assets and to generate the calculations and look up tables for re-valuating at a later date.

1. Spreadsheet supplied by CAIT was imported in to a Micro Soft Access database.
2. The unit costs in this spreadsheet were summarised to derive a list of item codes for equipment types, sizes and depths.
3. The derived item cost list was imported in to Maximo as a table (itemmaster) for performing SQL queries to apply the unit costs against all stormwater assets.
4. The Valuation Query was developed for assigning unit costs to each Maximo stormwater asset using a combination of class structure id, material type, diameter, width, height and depth.
5. Running the query in Maximo returned 55,181 assets.
6. 1,310 records did not have a unit cost assigned.
7. These 1,310 were matched to the Unit Costs supplied by Connell Wagner.
8. Of these 1,310 records:
   a. 1 was an unlined open drain with a type of 'U' (eqnum 140622) and was excluded
   b. 93 open drains had no type specified or had a description of 'UL' and were excluded
   c. 1 open drain with a tdescription of Drop Structure was excluded (eqnum 130051)
   d. 5 Major Culverts with no details were excluded (see Excluded Equipment)
9. Data exceptions were reviewed and manually corrected/excluded.

2.1 Data Exceptions

- The following 3 headwalls did not have unit costs automatically assigned, CAIT supplied unit costs that were manually applied.

EQNum	Description	Install Date	Class Structure ID	Class Structure	Desc Size
254464	HEADWALL	22/11/06	1040	STORMWATER HEADWALLS	2 x 300
254465	HEADWALL	22/11/06	1040	STORMWATER HEADWALLS	1 x 375
254854	HEADWALL	2/09/04	1040	STORMWATER HEADWALLS	1 x 450

- There was no unit cost for the following manhole with width of 900, the unit cost for a 1050 manhole was applied.

EqNum	Description	Install Date
148134	Manhole - 900	1/01/00

- The following lined drains (with widths recorded over 3m) were given the same unit cost as a 3m lined drain

EqNum	Description	Install Date
260436	OPEN DRAIN	1/10/88
260435	OPEN DRAIN	1/04/84
260437	OPEN DRAIN	1/04/84

- The following major box culverts have also been excluded from the valuations at the direction of CAIT

EQNum	Description	Install Date
~~211648~~	~~Heinemann Road major culvert~~	~~31/12/90~~
~~211658~~	~~Kingfisher Road major culvert~~	~~31/12/80~~
~~211732~~	~~Springacre Road major culvert~~	~~31/12/82~~
~~211746~~	~~Valley Way major culvert~~	~~31/12/92~~
~~211766~~	~~Birkdale Road major culvert over Tarradarapin Crk~~	~~31/12/82~~

2.2 Duplicates

- Duplicate records were identified for the following equipment

EqNum	Description	Type	Count
127932	BOX CULVERT		2
132673	Stormwater open drain	L	2
140614	Stormwater open drain	L	2
140615	Stormwater open drain	L	2
140616	Stormwater open drain	L	2
141325	BOX CULVERT		5
141326	BOX CULVERT		5
141327	BOX CULVERT		5
143087	Manhole - 1500		2
143088	Manhole - 1500		2
143089	Manhole - 1500		2
143324	Manhole - 1500		2
143343	Manhole - 1800		2
143618	Manhole - 1200	MH	2
144167	Manhole - 1500	MH	2
145483	Manhole - 1050	MH	2
145486	Manhole - 1500		2
145910	Manhole - 1050		2
146350	MANHOLE - 1050	MH	2
146368	Manhole - 1050	MH	2
147099	Manhole - 1500	SP	2
147100	Manhole - 1500	SP	2
147857	Manhole - 1050	MH	2
148931	MANHOLE - 1500	MH	2
148932	MANHOLE - 1500	MH	2
148999	MANHOLE - 1500	MH	2
149217	Manhole - 1500	MH	2
149785	Manhole - 1050	MH	2
154577	Headwall - 675	S	2
157717	Headwall - 750		2
161732	Headwall	S	2
162938	Headwall	S	2
165344	Stormwater open drain	L	2
165345	Stormwater open drain	L	2
217009		L	2
251722	OPEN DRAIN	L	2

- Of the above duplicates the following were adjusted/excluded

Eqnum	Class Structure	Unit Rate	Diameter	Action	Comment
141325	1038			exclude	
127932	1038			exclude	
141326	1038			exclude	

141327	1038			exclude	
161732	1040	$ 980.69	525		
162938	1040	$ 1,326.79	675		
154577	1040	$ 980.69	525		
157717	1040	$ 1,748.95	825		
146350	1034	$ 2,605.41	1050		
147857	1034	$ 2,605.41	1050		
149785	1034	$ 2,605.41	1050		
145483	1034	$ 4,319.89	1500		
145910	1034	$ 3,581.33	1200		
146618	1034	$ 2,605.41	1050		Not Duplicated
144167	1034	$ 4,319.89	1500		This has a depth of 2.3 applied 5594.62
147099	1034		1200x1800		6458.91 (CW)
148999	1034	$ 4,319.89	1500		
149217	1034	$ 2,605.41	1050		
143088	1034	$ 2,605.41	1050		
143089	1034	$ 2,605.41	1050		3361.29 (2.02m deep)
143324	1034	$ 2,605.41	1050		4119.10 (3.99m deep)
148931	1034	$ 4,319.89	1500		
147100	1034		1050x1800		6458.91 (CW)
148932	1034	$ 4,319.89	1500		
143087	1034	$ 2,605.41	1050		
145486	1034	$ 2,605.41	1050		3361.29 (2.27m deep)
143343	1034		1500x1800		8335.04 (CW)
143618	1034		1200		
146368	1034		1500		

EQNUM	CLASS	WIDTH	LENGTH	UNIT RATE CODE	UNIT RATE
217009	1039	5	11.14	L5000-500	$394.00
165345	1039	5	29.49	L5000-500	$394.00
165344	1039	5	20.98	L5000-500	$394.00
140614	1039	5	2.56	L5000-500	$394.00
140615	1039	5	38.88	L5000-500	$394.00

140616	1039	5	32.65	L5000-500	$394.00
132673	1039	5	80.33	L5000-500	$394.00
251722	1039	4.5	314.42	L5000-500	$394.00

Action	EqNum	Description
Removed	**127932**	BOX CULVERT
Removed	**131236**	BOX CULVERT
Removed	**131237**	BOX CULVERT
Removed	**134176**	BOX CULVERT
Removed	**141323**	BOX CULVERT
Removed	**141324**	BOX CULVERT
Removed	**141325**	BOX CULVERT
Removed	**141326**	BOX CULVERT
Removed	**141327**	BOX CULVERT
Removed	**141328**	BOX CULVERT

3 Assumptions

Man Holes

Man Hole depths were assumed to be in ranges in the following intervals:
- 0 - 2m
- 2 - 3m
- 3 - 4m
- 4 - 5m

That is a depth of 2.02 would be applied the unit rate for a manhole at a depth of between 2 and 3 metres.

Open Drains

Open drain widths were taken as the rounded Maximo width with any Maximo widths greater than the maximum unit rate of 5m having the unit rate for a 5m open drain applied.

Open Drains (Class Structure ID 1039) with no type and no description were assumed to be unlined.

Open drains with no type and a description of LINED were assumed to be lined.

Open drains with no type and a description like UL were assumed to be unlined and not valued.

Catch Pits

All Catch Pits were given the unit rate for a CP2400 of $2525.03

All FI Catch pits were given a unit rate for FI of $2144.61

All Anti Ponding catch pits were given the base unit rate for AP of $1919.82

4 Valuation Query

```
SELECT
     sw.eqnum, sw.description, item.itemcode, sw.eq2, sw.installdate, sw.classstructureid,
     classstructure.description as classstruct, descsize.alnvalue as descsize,
     type.alnvalue as type, diamtr.numvalue as diameter, width.numvalue as width,
     height.numvalue as height, depth.numvalue as depth, length.numvalue as length,
     material.alnvalue as material, pdiam.numvalue as pdiam, tsize.numvalue as size,
     item.designlife, year(getDate())-year(installdate) as age, item.unitcost
FROM (
     select *
     from equipment

     -- only look at OPS assets
     where siteid='OPS'

     -- assets from predefined class structures
     and classstructureid in (1034,1035,1038,1039,1040,1042)

     -- do not include disposed assets
     and eq2 <> 'DISPOSED'

     -- do not include Open Drains specifically flagged as Unlined.
     and eqnum not in (
          select eqnum from equipmentspec where assetattrid = 'TYPE' and alnvalue in ('UL','UNLINED')
     )

     -- do not include Open Drains with no type specified but have ' UL ' in the description.
     and eqnum not in (
          select e.eqnum
          from equipment e
          left join equipmentspec es on e.eqnum = es.eqnum and es.assetattrid='TYPE'
          where e.classstructureid = 1039
          and (e.description like '% UL %' or (e.description = 'Stormwater open drain' and alnvalue is null))
     )
) sw
LEFT JOIN equipmentspec descsize ON (sw.eqnum = descsize.eqnum and descsize.assetattrid='descsize')
LEFT JOIN equipmentspec type ON (sw.eqnum = type.eqnum and type.assetattrid='TYPE')
LEFT JOIN equipmentspec diamtr ON (sw.eqnum = diamtr.eqnum and diamtr.assetattrid='DIAMTR')
LEFT JOIN equipmentspec width ON (sw.eqnum = width.eqnum and width.assetattrid='WIDTH')
LEFT JOIN equipmentspec height ON (sw.eqnum = height.eqnum and height.assetattrid='HEIGHT')
LEFT JOIN equipmentspec depth ON (sw.eqnum = depth.eqnum and depth.assetattrid='DEPTH')
LEFT JOIN equipmentspec length ON (sw.eqnum = length.eqnum and length.assetattrid='LENGTH')
LEFT JOIN equipmentspec material ON (sw.eqnum = material.eqnum and material.assetattrid='MATERIAL')
LEFT JOIN equipmentspec pdiam ON (sw.eqnum = pdiam.eqnum and pdiam.assetattrid='PDIAM')
LEFT JOIN equipmentspec tsize ON (sw.eqnum = tsize.eqnum and tsize.assetattrid='SIZE')
LEFT JOIN classstructure ON classstructure.classstructureid = sw.classstructureid
left join itemmaster item on item.classstructureid = sw.classstructureid and
(
     -- man holes
     (item.classstructureid = 1034
     and
          (
               (depth.numvalue > item.mindepth and depth.numvalue <= item.maxdepth)
               or
               ((depth.numvalue=0 or depth.numvalue is null) and item.maxdepth = 2)
          ) and (
               (
                    (item.diameter = tsize.numvalue or item.diameter = width.numvalue)
                    and
                    ((type.alnvalue not in ('el') or type.alnvalue is null) and item.type='mh')
               ) or (
                    (item.width = length.numvalue and item.height = width.numvalue)
                    and
                    (type.alnvalue = 'el' and item.type='el')
               )
          )
     )
     or
```

```
        -- Pipes
        (item.classstructureid = 1035 and item.material = material.alnvalue and
                        item.diameter = diamtr.numvalue)
        or

        -- box culverts
        (item.classstructureid = 1038 and item.width = width.numvalue and (item.height = height.numvalue
                        or height.numvalue = 0))
        or

        -- part lined open drains
        (item.classstructureid = 1039 and item.width = round(width.numvalue,0) * 1000 and item.type='PL'
                        and type.alnvalue = 'PL')
        or

        -- lined open drains
        (item.classstructureid = 1039 and item.width = round(width.numvalue,0) * 1000 and item.type='L'
                        and (type.alnvalue <> 'PL' or type.alnvalue is null))
        or

        -- head walls
        (item.classstructureid = 1040 and
                (pdiam.numvalue = item.diameter or descsize.alnvalue = Cast(item.diameter as varchar)))
        or

        -- catch pits
        (item.classstructureid = 1042
            and
            (
                (item.type='AP' and type.alnvalue = 'AP' and item.itemcode='AP')
                or
                (item.type='FI' and type.alnvalue = 'FI' and item.itemcode='FI')
                or
                (item.type='CP' and type.alnvalue = 'CP' and item.diameter=2400)
            )
        )
)
```

5 Background Data

Item Master table that was used to calculate the Design Life and Unit Cost for Stormwater assets

Item Code	Unit Cost	Item Num	Class Structure	Design Life	Material	Width	Height	Min Depth	Max Depth	Diameter	Type
100RCP	127.24		1035	80	RCP					100	
100uPVC	127.24	1097	1035	80	uPVC					100	
1050RCP	1009.84	1110	1035	80	RCP					1050	
1200RCP	1234.09	1111	1035	80	RCP					1200	
1350RCP	1452.25	1112	1035	80	RCP					1350	
1350uPVC	1452.25		1035	80	uPVC					1350	
1500RCP	1873.21	1113	1035	80	RCP					1500	
150DICL	146.95		1035	80	DICL					150	
150RCP	146.95		1035	80	RCP					150	
150uPVC	146.95	1098	1035	80	uPVC					150	
1650RCP	2225.4	1114	1035	80	RCP					1650	
1800RCP	2556.21	1115	1035	80	RCP					1800	
1950RCP	3112.71	1116	1035	80	RCP					1950	
2100DICL	3469.18		1035	80	DICL					2100	
2100RCP	3469.18	1117	1035	80	RCP					2100	
225RCP	200.44		1035	80	RCP					225	
225uPVC	200.44	1099	1035	80	uPVC					225	
250uPVC	225.34	1100	1035	80	uPVC					250	
300FRC	233.53	1101	1035	80	FRC					300	
300RCP	233.53		1035	80	RCP					300	
375FRC	277.2	1102	1035	80	FRC					375	
375RCP	277.2		1035	80	RCP					375	
450FRC	311.11	1103	1035	80	FRC					450	
450RCP	311.11		1035	80	RCP					450	
525FRC	369.69	1104	1035	80	FRC					525	
525RCP	369.69		1035	80	RCP					525	
600FRC	436.14	1105	1035	80	FRC					600	
600RCP	436.14		1035	80	RCP					600	
600uPVC	436.14		1035	80	uPVC					600	
675FRC	521.79	1106	1035	80	FRC					675	
675RCP	521.79		1035	80	RCP					675	
750FRC	592.62	1107	1035	80	FRC					750	
750RCP	592.62		1035	80	RCP					750	
750uPVC	592.62		1035	80	uPVC					750	
825RCP	687.13	1108	1035	80	RCP					825	
900RCP	802.3	1109	1035	80	RCP					900	
AP	1919.82	1118	1042	80							AP
AP900x600	2495.51		1042	80		900	600				AP
AP900x900	2927.93		1042	80		900	900				AP
BC1200x1200	1864.08	1163	1038	80		1200	1200				
BC1200x300	1217.86	1156	1038	80		1200	300				

BC1200x450	1323.5	1157	1038	80		1200	450				
BC1200x600	1428.6	1158	1038	80		1200	600				
BC1200x750	1540	1159	1038	80		1200	750				
BC1200x900	1649.68	1160	1038	80		1200	900				
BC1500x1200	2261.18	1168	1038	80		1500	1200				
BC1500x1500	2460.06	1169	1038	80		1500	1500				
BC1500x600	1695.37	1161	1038	80		1500	600				
BC1500x750	1868	1167	1038	80		1500	750				
BC1500x900	2039.98	1162	1038	80		1500	900				
BC1800x1200	2474.39	1173	1038	80		1800	1200				
BC1800x1800	2883.22	1175	1038	80		1800	1800				
BC1800x600	2074.81	1170	1038	80		1800	600				
BC1800x750	2188	1171	1038	80		1800	750				
BC1800x900	2300.61	1172	1038	80		1800	900				
BC2100x1200	2700.52	1179	1038	80		2100	1200				
BC2100x1500	2935.21	1180	1038	80		2100	1500				
BC2100x2100	3452.66	1181	1038	80		2100	2100				
BC2100x600	2223.1	1176	1038	80		2100	600				
BC2100x750	2345	1177	1038	80		2100	750				
BC2100x900	2465.99	1178	1038	80		2100	900				
BC2400x1200	2956.38	1183	1038	80		2400	1200				
BC2400x1500	3187.57	1184	1038	80		2400	1500				
BC2400x1800	3428	1185	1038	80		2400	1800				
BC2400x2100	3728.7		1038	80		2400	2100				
BC2400x2400	3989.51	1186	1038	80		2400	2400				
BC2400x900	2725.36	1182	1038	80		2400	900				
BC2700x1200	3108.24	1188	1038	80		2700	1200				
BC2700x1500	3438.75		1038	80		2700	1500				
BC2700x1800	3769.45	1189	1038	80		2700	1800				
BC2700x900	3041.56	1187	1038	80		2700	900				
BC3000x1200	3583.7	1191	1038	80		3000	1200				
BC3000x1500	3853.62	1192	1038	80		3000	1500				
BC3000x1800	4150.07	1193	1038	80		3000	1800				
BC3000x2400	4705.45	1194	1038	80		3000	2400				
BC3000x2700	5040.5	1195	1038	80		3000	2700				
BC3000x3000	5337.68	1196	1038	80		3000	3000				
BC300x300	507.95	1147	1038	80		300	300				
BC3300x2100	4845.32	1197	1038	80		3300	2100				
BC3600x1200	4311.22	1198	1038	80		3600	1200				
BC3600x1500	4610.89	1199	1038	80		3600	1500				
BC3600x1800	4910.75	1200	1038	80		3600	1800				
BC3600x2100	5176.76	1201	1038	80		3600	2100				
BC3600x2400	5442.96	1202	1038	80		3600	2400				
BC3600x3300	6307.29		1038	80		3600	3300				
BC375x300	555.5		1038	80		375	300				
BC450x300	603.34	1148	1038	80		450	300				
BC450x450	737.77	1149	1038	80		450	450				
BC600x300	727.21	1150	1038	80		600	300				

BC600x450	832.9	1151	1038	80		600	450				
BC600x600	938.6	1152	1038	80		600	600				
BC750x300	835.5	1164	1038	80		750	300				
BC750x600	1078	1165	1038	80		750	600				
BC900x300	941.8	1153	1038	80		900	300				
BC900x450	1079	1166	1038	80		900	450				
BC900x600	1215.89	1154	1038	80		900	600				
BC900x750	1353		1038	80		900	750				
BC900x900	1490.08	1155	1038	80		900	900				
CP2400	2525.03	1120	1042	80						2400	CP
CP3600	2875.56	1121	1042	80						3600	CP
EL1950x1500-2	5312.26		1034	80		1950	1500	0	2		EL
EL2100x1500-2	5946.33		1034	80		2100	1500	0	2		EL
EL2200x1500-2	6117.19		1034	80		2200	1500	0	2		EL
EL2250x1050-2	5481.62		1034	80		2250	1050	0	2		EL
EL2400x1500-2	6458.91		1034	80		2400	1500	0	2		EL
EL2400x1500-3	8335.04		1034	80		2400	1500	2	3		EL
EL2400x1800-3	8928.65		1034	80		2400	1800	2	3		EL
EL2500x1200-4	9744.08		1034	80		2500	1200	3	4		EL
EL2500x1500-2	6629.78		1034	80		2500	1500	0	2		EL
EL2500x1500-3	8549.29		1034	80		2500	1500	2	3		EL
EL3000x1200-2	6902.87		1034	80		3000	1200	0	2		EL
EL3000x1500-3	9620.57		1034	80		3000	1500	2	3		EL
EL3100x1050-2	6757.9		1034	80		3100	1050	0	2		EL
EL3200x1500-2	7825.82		1034	80		3200	1500	0	2		EL
EL3500x1200-2	7688.14		1034	80		3500	1200	0	2		EL
EL4000x1500-3	11763.11		1034	80		4000	1500	2	3		EL
EL4200x1200-5	16421.12		1034	80		4200	1200	4	5		EL
EL4500x1200-3	11928.08		1034	80		4500	1200	2	3		EL
EL4500x1500-2	10047.03		1034	80		4500	1500	0	2		EL
EL4700x1500-2	10388.76		1034	80		4700	1500	0	2		EL
EL4800x1500-3	13477.15		1034	80		4800	1500	2	3		EL
EL5000x1500-2	10901.35		1034	80		5000	1500	0	2		EL
FI	2144.61	1119	1042	80							FI
FI1200x1200	3489.14		1042	80		1200	1200				FI
FI3000x1500	7488.36		1042	80		3000	1500				FI
FI450x450	1483.95		1042	80		450	450				FI
FI600x600	1804.18		1042	80		600	600				FI
FI900x900	2565.85		1042	80		900	900				FI
GPT1050-2	6364.8		1034	80				0	2	1050	GPT
GPT1050-3	7568.66		1034	80				2	3	1050	GPT
GPT1200-2	6626.02		1034	80				0	2	1200	GPT
GPT1200-3	8327.29		1034	80				3	4	1200	GPT
GPT1500-2	7492.7		1034	80				0	2	1500	GPT
GPT2000-2	9030.25		1034	80				0	2	2000	GPT
GPT2000-4	13463.81		1034	80				3	4	2000	GPT
GPT3000x1500-2	9817.45		1034	80		3000	1500	0	2		GPT

GPT3650x1950-2	11692.36		1034	80		3650	1950	0	2		GPT
HW100	315.81	1122	1040	80						100	
HW1050	2667.33	1136	1040	80						1050	
HW1200	3442.72	1137	1040	80						1200	
HW1200x375	1464.76		1040	80		1200	375				
HW1200x450	1580.49		1040	80		1200	450				
HW1250	3935.93	1138	1040	80						1250	
HW1350	4980.14	1138	1040	80						1350	
HW150	395.75	1123	1040	80						150	
HW1500	6691.44	1140	1040	80						1500	
HW1650	7900.26	1141	1040	80						1650	
HW1800	9220.29	1142	1040	80						1800	
HW2100	11301.92	1143	1040	80						2100	
HW225	521.35	1124	1040	80						225	
HW2400	16321.84	1144	1040	80						2400	
HW300	629.69	1126	1040	80						300	
HW3000	26157.53	1145	1040	80						3000	
HW375	727.05	1127	1040	80						375	
HW400	762.05	1128	1040	80						400	
HW450	835.81	1129	1040	80						450	
HW450x300	711.5		1040	80		450	300				
HW525	980.69	1130	1040	80						525	
HW5400	92149.04	1146	1040	80						5400	
HW600	1140.88	1131	1040	80						600	
HW675	1326.79	1132	1040	80						675	
HW750	1529.44	1133	1040	80						750	
HW825	1748.95	1134	1040	80						825	
HW900	1985.44	1135	1040	80						900	
L1000-1000	276.12		1039	80		1000	1000				L
L2000-1000	343.75		1039	80		2000	1000				L
L3000-1500	559.75		1039	80		3000	1500				L
L500-500	127.55		1039	80		500	500				L
L5000-1500	711.82		1039	80		5000	1500				L
L5000-2000	889.59		1039	80		5000	2000				L
MH1050-2	2605.41		1034	80				0	2	1050	MH
MH1050-3	3361.29		1034	80				2	3	1050	MH
MH1050-4	4119.1		1034	80				3	4	1050	MH
MH1050-5	4878.85		1034	80				4	5	1050	MH
MH1200-2	3581.33		1034	80				0	2	1200	MH
MH1200-3	4659.84		1034	80				2	3	1200	MH
MH1200-4	5740.57		1034	80				3	4	1200	MH
MH1200-5	6823.52		1034	80				4	5	1200	MH
MH1500-2	4319.89		1034	80				0	2	1500	MH
MH1500-3	5594.62		1034	80				2	3	1500	MH
MH1500-4	6871.87		1034	80				3	4	1500	MH
MH1500-5	8151.63		1034	80				4	5	1500	MH
MH1800-2	5448		1034	80				0	2	1800	MH

MH1800-3	7044.2		1034	80				2	3	1800	MH
MH1800-4	8643.25		1034	80				3	4	1800	MH
MH1800-5	10245.17		1034	80				4	5	1800	MH
MH2100-2	6813.14		1034	80				0	2	2100	MH
MH2100-3	8770.51		1034	80				2	3	2100	MH
MH2100-4	10731.07		1034	80				3	4	2100	MH
MH2400x1500-2	6458.91		1034	80		2400	1500	0	2		MH
MH2400x1500-3	8335.04		1034	80		2400	1500	2	3		MH
MH2400x1500-4	10214.21		1034	80		2400	1500	3	4		MH
MH900-2	2605.41		1034	80				0	2	900	MH
PL1000-500	128.3		1039	75		1000	500				PL
PL4000-1500	668.79		1039	75		4000	1500				PL
PL5000-2000	1007.16		1039	75		5000	2000				PL
SP1800x1400-2	6803.79		1034	80		1800	1400	0	2		SP
SP2100x1100-2	6798.37		1034	80		2100	1100	0	2		SP
SP2400x2200-4	14748.07		1034	80		2400	2200	3	4		SP
SP3000x2400-3	11436.18		1034	80		3000	2400	2	3		SP
SP3200x1400-2	9312.02		1034	80		3200	1400	0	2		SP
SP3500x2000-2	9224.61		1034	80		3500	2000	0	2		SP
SP3650x1400-3	13062.24		1034	80		3650	1400	2	3		SP
SP4350x2550-2	14191.53		1034	80		4350	2550	0	2		SP
SP4500x1200-3	13817.63		1034	80		4500	1200	2	3		SP
SP4595x2305-4	21845.05		1034	80		4959	2305	3	4		SP
SP4600x1650-3	15990.24		1034	80		4600	1650	2	3		SP
SP4900x2815-5	28871.69		1034	80		4900	2815	4	5		SP
SP5450x4700-3	27929.52		1034	80		5450	4700	2	3		SP