Independent Pricing and Regulatory Tribunal (IPART)

Austral & Leppington North and East Leppington Draft Contributions Plans

Review of Stormwater Works - Nexus and Costs

DRAFT REPORT

23 March 2022

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1 EXECUTIVE SUMMARY

The Austral, Leppington North (ALN) and East Leppington (EL) precincts are part of the South West Priority Land Release Area and were rezoned in March 2013 to support urban development. The technical studies prepared in support of the rezoning proposed an 'end of pipe' WSUD solution for both precincts whereby the traditional urban street drainage network delivered flow to the bottom of the catchment and gross pollutant traps and bio-retention filters (raingardens) would ensure that Development Control Plan (DCP) pollution removal targets were met.

As a result of a change in stormwater management approach, which now proposes streetscape raingardens rather than end of pipe devices, the draft *Liverpool Contributions Plan 2021 Austral and Leppington North (ALN) Precincts* (ALN CP21) includes a cost of more than $290M for drainage works which represents an increase of over 82% on this component of the adopted plan. For East Leppington (EL) there has not been a change in strategy but the draft *Liverpool Contributions Plan 2021 East Leppington Precinct* (EL CP21) now includes a cost for drainage works of more than $35M which is an increase of 200% on this component of the adopted plan.

Due to these significant increases in stormwater infrastructure costs, the Independent Pricing and Regulatory Tribunal (IPART) has sought assistance from J. Wyndham Prince to undertake a review and respond to the following four questions.

1. **Review the stormwater works schedules in both plans and establish whether the costs from this list are reasonable.**

   Austral and Leppington North

   A review of the construction costs of a range of typical stormwater elements across the precinct shows that costs in the draft plan are likely underestimated by around **$179 M** (±15 % certainty). The key contributors to this difference in costs were identified as:

   - Recent cost increases for stormwater works in the Sydney market.
   - Inadequate consideration of the cost of staging the implementation of the streetscape raingardens.
   - Omission of the additional cost of the adjusted utility service works necessary to accommodate streetscape raingardens.
   - Several on-cost assumptions and exclusions.

   There are also some additional cost considerations (not allowed in the above estimate) relating to the proposal to adopt a streetscape based Water Sensitive Urban Design (WSUD) approach that don't appear to have been considered:

   - A traditional street drainage system incorporates regularly spaced pits and a pipe network (typically 2m deep) that ensure that flow widths and depths within the road reserve are safe for pedestrians and vehicles. The alternate streetscape strategy relies upon the collection of stormwater runoff for treatment in a shallow treatment device at each intersection before connection to a pipe network. For large catchments, this will likely result in unsafe flow widths and depths upstream of these devices. To address this shortfall additional streetscape treatment devices (to the 1519 devices currently proposed) regularly spaced throughout the catchment will be required.
   - The significant additional maintenance burden required to maintain the proposed **1538** streetscape **devices** (compared to the 35 devices in the adopted plan)
   - The increased unit rate maintenance costs for streetscape raingardens are estimated to be 3 times the cost of maintaining the equivalent end of pipe solutions.

   The unit rate cost of constructing streetscape raingardens are estimated to be around 5 times more than the traditional end of pipe solutions. A cost-benefit assessment of adopting this approach over other potential options was beyond the scope of this review but maybe worth considering.

East Leppington

A high-level assessment of the costs of key components of the stormwater works proposed for the precinct has identified that costs in the draft plan are likely overestimated by around **$11.9 M** (±25 % certainty).

The contributions plan adjustments relating to stormwater works being sought by Liverpool Council in EL CP21 reflect an additional $23M which is a 200% increase on the adopted plan. Council's application to IPART suggests this is needed to offset CPI increases between 2013 and 2020 and is also due to the need to prepare more detailed drainage design elements as the development of the East Leppington precinct evolves.

Unfortunately, there was insufficient information available in the background technical reports to allow for a detailed review of costs. Alternatively, we have derived the cost increases associated with an end of pipe raingarden over this same period as an indicator of the potential cost impacts. This demonstrates a significantly higher than CPI increase (40.8% vs 18.4%) is applicable for these works. There is no specific discussion in Council's submission to IPART that explains what is meant by the need to prepare more detailed design elements.

The raingarden bed sizes presented in the 2013 Cardno strategy represent around 0.3% of the contributing catchment areas and are likely to be undersized based on current stormwater quality modelling techniques. Applying current water quality modelling approaches and parameters, it is typically necessary to provide raingarden beds that have an area of around 0.7% of the catchment to meet the water quality performance objectives applicable to growth centre developments. Consequently, we have assessed the potential cost increases applicable if raingarden bed areas are 2.3 times (i.e. 0.7/0.3) the size allowed for in the 2013 contributions plan. When combining this with the expected 40.8 % increase in the cost of providing stormwater works, the estimated additional cost to the plan is $11.621M, which compares to the $23.443M proposed.

Given the uncertainties with the potential cost increases, it may be warranted to undertake a more detailed review of both the water quality modelling and the associated costs that underpin the 2013 Contributions Plan.

2. Review whether the costs are consistent with the respective plan's stormwater technical studies.

Austral and Leppington North

The stormwater works costings are not consistent with the costs listed in the technical studies prepared by SMEC in 2019. A schedule showing significantly increased costs was prepared by SMEC and issued to Council in 2021. Council appears to have adopted both the construction costs and the associated contingencies from this schedule, but different project on-costs were applied and then costs were indexed from 2018 to 2021 before adoption in ALN CP21. It is noted that there is consistency in the nomenclature applied to the drainage works components and the mapping of the works across both the CP and the supporting technical studies. The stormwater works proposed in the technical studies appear to have been adopted but were costed independently in ALN CP21.

East Leppington

The stormwater works costings for the EL precinct appear to have been derived independently of the work undertaken by Cardno in 2013 as there are no costs reported in the Cardno technical study provided. There is alignment between the nomenclature applied to the drainage works components and the mapping of the works across both the CP and the Water Cycle Management report (Cardno 2013)

3. If a cost is not reasonable, recommend an alternative cost.

The alternative estimate of likely total stormwater works costs identified for each of the Draft Contributions Plans are presented in Table 1-1:

Table 1-1 – Total Stormwater Works Costs Summary

	CP14 Costs	Draft CP21 Costs	2022 Indicative Estimate (JWP)	Cost Change	Cost Change %
ALN CP21	$159.7 M ($9,901 / lot)	$290.5 M ($17,107 / lot)	$469.9 M ($27,673 / lot)	$179.4 M	+61.8%
EL CP21	$11.7 M ($10,255 / lot)	$35.2 M ($31,174 / lot)	$23.3 M ($20,693 / lot)	$-11.9 M	-33.8%

It should be noted that these are Indicative estimates of the likely changes as they are based on a high-level review only. A more detailed assessment would be needed before the amended contributions plans are adopted.

Further details of each cost component are provided in Section 4 of this report

4. Make a judgement as to whether nexus has been established in both plans (i.e. whether the proposed infrastructure is required as a result of the planned development).

The proposed development in the ALN and EL precincts will result in a significant increase in impervious areas resulting in an increased rate of stormwater runoff, the concentration of runoff and the deterioration in water quality. These changes necessitate additional stormwater infrastructure to ameliorate the impacts. The cost of delivering the required infrastructure should be part of a contributions plan so that its cost is more equitably shared by the new community.

Austral and Leppington North

While there is a clear nexus for stormwater works for ALN there are no clear reasons given as to whether the only viable alternative to the former strategy is to pursue the substantially more expensive approach of using streetscape based WSUD. The capital cost increase of the streetscape raingarden works alone is substantial at **an additional $145.2 M** (which represents an extra $8,546/lot). It appears that the SMEC strategy does not fully account for all the streetscape controls required to ensure the system operates safely and effectively. It also imposes a substantial additional maintenance burden that may be unaffordable and unachievable for Council.

East Leppington

The urban development will increase the demand on stormwater infrastructure, and it is noted that the amount of the contribution for stormwater infrastructure is calculated based on the equivalent net developable area (ha) that will generate demand for the facilities. While the EL CP21 does not justify the need for stormwater management infrastructure, we believe that a nexus for the stormwater management infrastructure for the East Leppington Precinct exists.

2 INTRODUCTION

The Austral, Leppington North (ALN) and East Leppington (EL) precincts are part of the Southwest Priority Land Release Area and were rezoned in March 2013 to support urban development. As part of the precincts' development, a series of public infrastructure items including roads, parks, culvert crossings, stormwater quantity and quality (Water Sensitive Urban Design – WSUD) management devices are needed to support the precincts' development. These public infrastructure devices are to be funded through a Local Infrastructure Contributions Plan under Section 7.11 of the *Environmental Planning and Assessment Act 1979 No 203*.

At the time of rezoning in 2011, the technical studies prepared by Cardno for the WSUD devices proposed an 'end of pipe' solution for both precincts whereby the traditional urban street drainage network delivered flow to the bottom of the catchment and gross pollutant traps and bio-retention filters (raingardens) would ensure that Development Control Plan (DCP) pollution removal targets were met. Flow from (and more than) the capacity of these filtration devices was to be delivered to a detention basin where storm flows are collected and released slowly into the receiving watercourse to ensure that peak flows due to the urban development were no greater than existing conditions in the 0.5 EY (2yr ARI) and 1% AEP (100-year ARI) storm events.

Preliminary costing for the stormwater management devices were prepared to inform the *Liverpool Contributions Plan 2014 Austral and Leppington North Precincts* which lists a cost in the order of $159.7M for drainage works. Similarly, the *Liverpool Contributions Plan 2014 East Leppington Precinct* listed a cost in the order of $11.7M for drainage works. Land acquisition cost for these devices across the three (3) precincts was also considered.

In 2018, Liverpool City Council commissioned SMEC to prepare a concept design report for the Austral and Leppington North precincts. Importantly, in part due to challenges discovered related to tailwater levels in downstream watercourses (i.e., Kemps Creek, Scalabrini Creek, Bonds Creek), the WSUD strategy moved from an 'end of pipe' approach to localised street-level controls. There are inherent inefficiencies with street-level controls from a treatment perspective which tend to result in the need for additional and/or larger devices to deliver comparable growth centre developments pollution reductions.

As a result of the change in stormwater management approach, the draft *Liverpool Contributions Plan 2021 Austral and Leppington North Precincts* now includes a cost for drainage works more than $290M (an increase in the cost of over 82%).

The East Leppington Water Cycle Management Report (Cardno, May 2013) does not appear to have been updated since 2013, however, Liverpool City Council is seeking an amendment as part of the draft *Liverpool Contributions Plan 2021 East Leppington Precinct*. The draft *Liverpool Contributions Plan 2021 East Leppington Precinct* now includes a cost for drainage works of more than $35M (an increase in the cost of over 200%).

The change in stormwater management costs is summarised in Table 2-1 below. It has been noted that the number of lots delivered does vary between the plans. However, this is not a significant factor in the cost calculations.

Table 2-1 – Contributions Plan Drainage Cost Changes

Drainage Item	Current ALN CP 2014 (16,133 lots)	Proposed ALN CP 2021 (16,981 lots)	Current EL CP 2014 (1,143 lots)	Proposed EL CP 2021 (1,128 lots)
Works	$159,738,847 ($9,901 per lot)	$290,496,427 ($17,107 per lot)	$11,720,920 ($10,255 per lot)	$35,164,370 ($31,174 per lot)
Land	$61,008,788 ($3,782 per lot)	$144,195,081 ($8,492 per lot)	$8,866,385 ($7,757 per lot)	$15,999,950 ($14,184 per lot)
Total	**$220,747,635 ($13,683 per lot)**	**$434,691,508 ($25,599 per lot)**	**$20,587,305 ($18,011 per lot)**	**$51,164,320 ($45,358 per lot)**

Due to these significant increases in stormwater infrastructure costs, the Independent Pricing and Regulatory Tribunal (IPART) has sought assistance from J. Wyndham Prince to:

1. Review the stormwater works schedules in both plans and establish whether the costs from this list are reasonable.
2. Review whether the costs are consistent with the respective plan's stormwater technical studies.
3. If a cost is not reasonable, recommend an alternative cost.
4. Make a judgement as to whether nexus has been established in both plans (i.e., whether the proposed infrastructure is required because of the planned development).

Details of our investigation are provided below.

3 SUMMARY OF TECHNICAL STUDIES

3.1 Austral and Leppington North Studies

The following section is a summary of a review of the technical studies associated with ALN which highlights key aspects of the strategy change and the basis upon which the contributions plan has resulted in cost increases. Our review has also highlighted some technical concerns with the alternate street-level control strategy for ALN which are discussed in more detail in Section 6.

3.1.1 ALN Precincts WCM WSUD Report (Cardno, April 2011)

The *Austral & Leppington North Precincts Water Cycle Management WSUD Report* was prepared for the Department of Planning & Infrastructure by Cardno in April 2011 to support the rezoning of these precincts.

The stormwater quality and quantity management adopted an 'end of pipe' approach whereby stormwater is delivered to the bottom of the catchment via the street drainage network to a neighbourhood scale Gross Pollutant Trap (GPT) (primary treatment devices) to ensure that gross pollutants were removed before discharge to secondary treatment devices such as stormwater quality ponds or raingardens. Appendix A.6 of the WCM report (Cardno, April 2011) indicates that vortex style GPTs would be provided. In addition to gross pollutant removal, vortex style GPTs also remove some nutrients which assist in reducing the size of the downstream raingardens. Outflow from the stormwater quality devices together with the overland flows that are more than the pipe system capacity is collected in detention basins to ensure peak flows in the receiving watercourses is no greater than existing conditions.

The stormwater quality modelling (Cardno, 2011) indicated that the 'end of pipe' raingarden filter areas would need to be 0.3% of the contributing catchment they are servicing, which is likely to be undersized considering current water quality modelling techniques. Our experience in other Growth Centre Precincts is that where vortex style GPTs are provided upstream of the raingarden, filter areas are typically in the order of 0.7% - 1.0% of the catchment they treat. The strategy proposed a total of 35 raingardens with a combined filter area of 34,770 m².

Most of the proposed detention basin volumes listed in Table 4-1 of the WCM report (Cardno, April 2011) are in the range of 350 – 480 m³/ha which is consistent with our experience of detention management in Western Sydney. The strategy proposed a total of 35 detention basins with a combined detention volume of 42,339 m³.

3.1.2 ALN WSUD Concept and Masterplan (SMEC, 2019-2021)

The *Austral and Leppington North Design of Water Management Infrastructure Detailed Concept Report* was prepared for Liverpool City Council by SMEC in March 2019. The report documents the detailed concept design of the stormwater management infrastructure within the Austral Precinct and the portion of the Leppington North Precinct that is located within the Liverpool City Council LGA.

The associated *Development of Streetscape Raingarden Master Plan for Austral and Leppington North* report was prepared for Liverpool Council by SMEC in February 2021 (SMEC, Feb 2021) and details the design procedures and considerations adopted for the master plan.

The adoption of the AR&R 2016 procedures in the basin optimisation assessment (stormwater quantity management) resulted in a reduced number of detention basins being required, and some detention basins only being required to manage minor storm events (i.e. up to the 50% AEP storm). The concept report (SMEC, 2019) proposes eight (8) 1% AEP detention basins and eleven (11) 50% AEP detention basins.

The stormwater quality management approach changed significantly from an 'end of pipe' approach to an 'at source' approach whereby street-level stormwater quality management devices (bioretention raingardens) provide primary and secondary treatment for catchments that do not have detention basins. Plate 2-1 on the following page provides an overview of a typical street-level raingarden arrangement at a four-way intersection.

Furthermore, the concept report (SMEC, 2019) indicates that some catchments that do have basins had limited space for raingardens, and therefore street-level stormwater quality management devices in these catchments cascade into an 'end of pipe' GPT and raingarden.

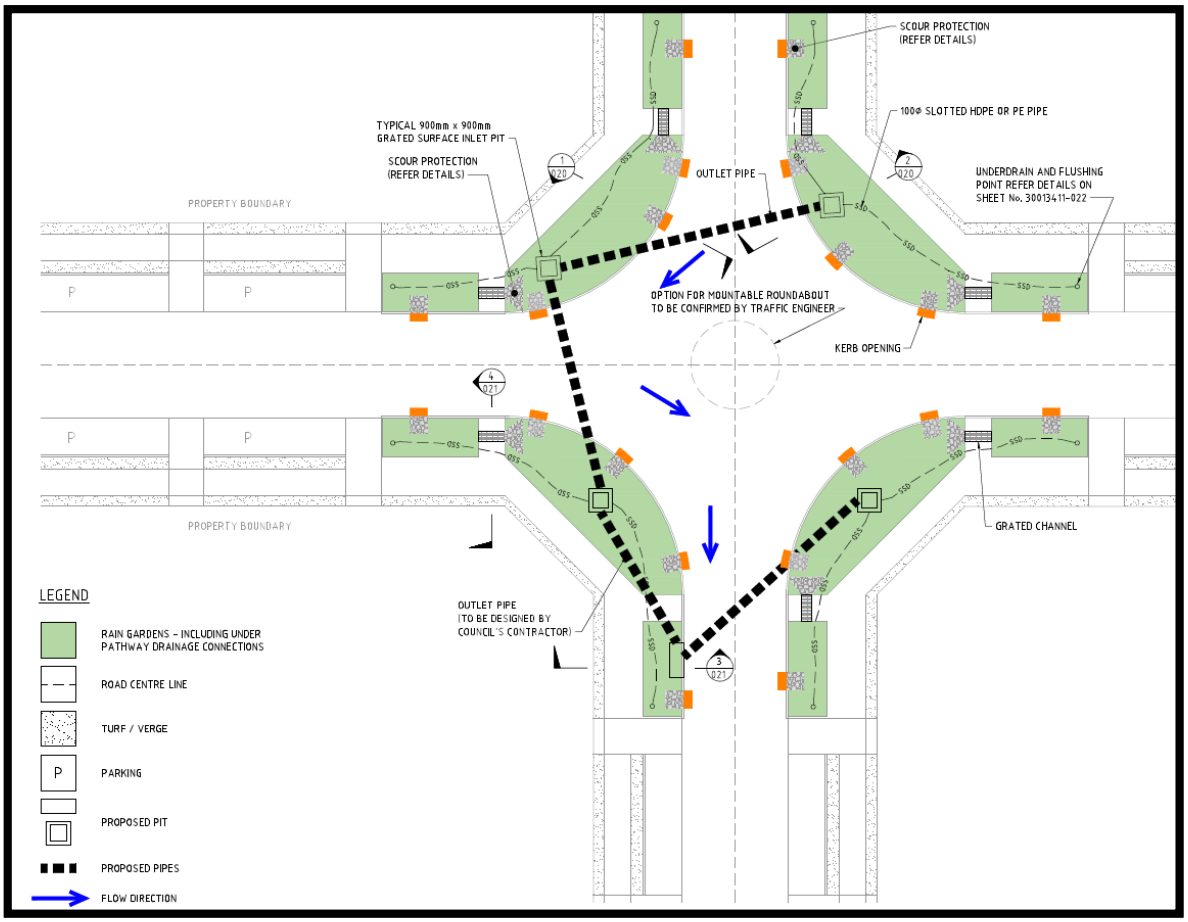

Plate 3-1 Raingarden General Arrangement at Intersection (SMEC 2021)

Table 7.48 of the Concept Report (SMEC, 2019) indicates that for catchments with streetscape raingardens only, the minimum raingarden footprint areas required are:

- 120 m²/ha for 85% impervious residential catchment (1.2% of catchment)
- 150 m²/ha for 100% impervious commercial catchment (1.5% catchment)
- 155 m²/ha for 90% impervious industrial catchment (1.55% catchment)

While the above device sizes are not unreasonable for streetscape systems, our experience in delivering regional S7.11 stormwater quality management infrastructure within the Sydney Growth Centre Precincts suggests that an 'end of pipe' vortex GPT and raingarden filter area in the order of 0.7% to 1.0% of the catchment is sufficient to deliver the statutory pollution reduction targets. Typically, the land take required for the raingarden is in the order of 2% of the catchment to account for batters, maintenance access etc.

For catchments with detention basins, Section 7.4.1 of the Concept Report (pg. 172 SMEC, 2019) indicates that the total bio-filter footprint (streetscape + 'end of pipe' bio-filter) would need to be 1.5% of the treated catchment. The 'end of pipe' bio-filters (except for System B11) is generally around 1% of the catchment (which, in our experience is reasonable), and thus it could be expected that the streetscape controls in these catchments would need a bio-filter area of 0.5% of the treated catchment.

The *Development of Streetscape Raingarden Master Plan for Austral and Leppington North* (SMEC, Feb 2021) indicates that for the total catchment area of 1675.24 ha, the bio-filter areas specified in Table 3-1 below are required. It is noted that a fixed raingarden size per type of intersection has been allocated in the masterplan, hence the allocated areas are larger than the areas required.

Table 3-1 – SMEC (2021) Bio-filter Areas

Type	Required Area (m²)	Allocated Area (m²)
Streetscape Bio-filter	109,756	109,883 (+0.07%
Co-located biofilters in basins	24,144	29,044 (+20.30%)
Total	**133,900**	**138,927 (+3.75%)**

The alternate streetscape approach has increased the total amount of bio-filter area required by 385% when compared to the 34,770 m² documented in the original strategy (Cardno, 2011), which leads to a significant increase in the cost to deliver the stormwater quality management infrastructure. However, this needs to be balanced with the validity of the smaller (0.3% catchment) devices put forward in the original WCM report (Cardno, 2011) which suggests that the original S7.11 Contributions Plan was potentially under-valued.

Non-vortex style GPTs were proposed on the nineteen (19) drainage systems with basins.

3.2 East Leppington Study

A high-level review of the general stormwater arrangements and indicative stormwater treatment device sizing for the East Leppington Precinct was also undertaken.

3.2.1 Water Cycle Management Report East Leppington (Cardno, May 2013)

The Water Cycle Management Report East Leppington (EL WCM) report was prepared for the Department of Planning & Infrastructure by Cardno in June 2012 to support the rezoning of the precinct. The report was updated in May 2013 to address some recommendations as part of a requested peer-review process by the DPI.

Similar to the Austral and Leppington North water cycle management strategy (Cardno, 2011), the stormwater quality and quantity management adopted an 'end of pipe' approach. Stormwater is delivered to the bottom of the catchment via the street drainage network to neighbourhood scale GPTs before discharge to secondary treatment devices such as stormwater quality ponds or raingardens. Peak storm flows are collected in detention basins that ensure peak flows in the receiving watercourses are no greater than existing conditions peak flows.

The stormwater quality modelling documented in Section 5 and Table 5-2 of the EL WCM report indicated that the raingarden filter areas would need to be 0.3% of the catchment they are servicing. Whilst Appendix C2 suggests a filter area of approximately 0.5% catchment would be required. Both values are less than our experience of 0.7% - 1.0% of catchment within the Sydney Growth Centre precincts where vortex style GPTs are provided upstream of the raingarden. The strategy proposed a total of 20 raingardens with a combined filter area of 10,263 m². The modelling appears to be very high level, with a single node representing each urban catchment which does not align with modern modelling techniques. It is also noted that Figure C.3 (MUSIC model layout) indicates GPTs were not considered in the modelling, which is inconsistent with Table 5-1 which suggests that GPTs which provide nutrient removal are to form part of the stormwater treatment train.

It is noted that the recommended area to be set aside in the ILP for the stormwater quality bio-filter devices was 3% of the catchment to account for batters, inlet/outlet structures, design tolerances and maintenance access. In our experience, this would appear reasonable.

Unfortunately, no catchment information was available to compare the proposed detention basin volumes listed in Table 3-3 of the EL WCM report with catchments they are servicing. However, Appendix A does indicate that detention volumes in the order of 370 m³/ha were adopted, which is in line with our expectations for detention within Western Sydney. Section 3.3 of the report notes that some basins had to over-attenuate flows to ensure flood levels within the receiving watercourses were not increased.

There is concern that if the detail design of these devices is undertaken using the current Council standards for stormwater quality modelling (Council MUSIC-Link parameters), the bio-filters would need to increase in size to meet DCP pollutant reduction targets. However, it does appear that sufficient land (3% catchment) should have been set aside which should be sufficient to cater for larger bio-filters in the order of 0.7% to 1.0% catchment if required.

4 COST REVIEW

This costs review does not undertake a detailed review of all the cost calculations that supported the Contributions Plans as that was beyond the scope of this assessment. Alternatively, we have focused on costs for average or typical devices in each category across the ALN Contributions Plan as being representative of the likely impact across the precinct. In deriving totals, we have applied the estimated cost variances we have derived for each typical device across all the line items in the primary cost schedule.

With East Leppington (EL) a review and commentary are provided that considers whether CPI increases adequately account for the recent increases in the cost of stormwater works. It also considers the cost implication of ensuring the proposed raingardens are sized adequately to meet Council and best practice modelling techniques for these systems.

In addition to the noted key aspects, the cost review considers a range of other factors that impact the cost of the stormwater works within the respective Contributions Plans. These are presented utilising responses to the specific questions raised by IPART which represent the scope of this review.

4.1 Establish whether the costs from works schedules are reasonable

The assessment of whether costs are reasonable looks at costs for ALN and EL independently in the following sub-headings:

4.1.1 Austral and Leppington North

Cost Assumptions and Exclusions

As part of the SMEC 2019 analysis and reporting, cost estimates were developed for the proposed water management infrastructure based on detailed concept designs. Separate costs estimate spreadsheets provided a detailed breakdown of expected construction costs for basins and drainage systems without basins.

Our high-level review of the cost schedules confirmed that the breakdown and listing of items and quantities are quite detailed.

Overall, we have identified that the rates used to develop the costs are wide-ranging values that are, in some cases not indicative of current market rates. This can be attributed to the age of the data and the location of the sites adopted. The overall result therefore potentially undervalues the cost of the works.

The assumptions and exclusions applicable to the cost estimates were also reviewed and comments on each are provided below. Many of the exclusions relate to items or works that would be required and it is unclear whether this gap was covered by suitable contingency allowances.

SMEC has rightly acknowledged the inherent uncertainty around quantities and costings for this new approach to stormwater management in Section 9.3 of their report.

<table>
<tr><th>Assumption.</th><th>JWP Comment</th></tr>
<tr><td>Estimated quantities are based on SMEC detailed concept design drawings, as specified for each individual costing</td><td>Noted</td></tr>
<tr><td>Rates are generally based on information from the Australian Construction Handbook (Rawlinsons Quantity Surveyors and Construction Cost Consultants, 2018)</td><td>Rates used are outdated, up to 10 years in some cases (refer to the table below from cost spreadsheets). These vary considerably. It was noted that SMEC indexed rates to at least provide some representation of costs up to a common date of March 2018.</td></tr>
<tr><td colspan="2"><table>
<tr><th>RATE 1</th><th>RATE 2</th><th>RATE 3</th><th>RATE 4</th><th>RATE 5</th><th>RATE 6</th><th>RATE 7</th><th>RATE 8</th></tr>
<tr><td>Rawlinsons 2011</td><td>South Rockhampton Flood Levee Cost Estimate (2014)</td><td>Amalfi Park Cost Estimate (2013)</td><td>Menangle Basins Cost Estimate (2018)</td><td>Austral & Leppington Estimated Schedule of Quantities (2012)</td><td>Humes (2018)</td><td>Gabion walls and sandstone</td><td>Rawlinsons 2018</td></tr>
</table></td></tr>
<tr><td>Costings are in Australian dollars (2018) and do not allow for future inflation.</td><td>Noted</td></tr>
</table>

Assumption.	JWP Comment
All pipes/culverts are concrete Class 4 rubber ring jointed.	Agree, this is council standard
GPTs are costed at the unit price only.	Unit prices are applicable if they relate to both supply and installation costs and allow for some degree of contingency that represents the likely average over the works covered.
Total cut to disposal is assumed, with contaminated soil transported to an approved landfill (Low-level contamination, i.e. General Solid Waste) within 10 km, with an allowance for an additional 10 km of cartage to Eastern Creek Landfill in line with the Phase 1 Contamination Assessment Report (SMEC, 2018b).	Some degree of contamination will have to be dealt with over the many stormwater devices and a suitable allowance for this should be included in the costs.
Rates for dewatering assume "average duration" for the required period, assumed to be 6 months.	If this is for dewatering of sedimentation ponds before becoming basins with raingardens, then the period should be about 3 years to allow for approx. 95% of housing to be established
Temporary site fencing is assumed to be required for a period of 6 months.	If this is for the duration of sedimentation ponds before becoming basins with raingardens, then the period should be about 3 years to allow for approx. 95% of housing to be established
Junction pits are assumed 900 mm x 900 mm x 900 mm deep with 150 mm base and walls, with an additional rate required per additional 100 mm of depth in excess of 900 mm. The rate for the pit includes excavation, backfilling, benching, channels, step irons and connections to pipes.	Precast pits should be considered for cost savings & reduced construction times. A raingarden bed is 1350mm depth which would result in deeper pits.
The rate for soil for disposal is assumed as excavated to reduce levels in clay and deposit in spoil heaps within 1 km.	It is assumed this relates to topsoil that will be respread
All soil required for fill is assumed to be won from the cut on site.	An allowance should be made for some import
Subsoil drainage has been included but will need to be confirmed in Detailed Design.	Agreed but at least an allowance attempts to provide some cost cover
Assumed no 'heath' or soft ground conditions encountered, removed and/or replaced.	Agreed
All quotes provided are indicative only and will need to be confirmed prior to refining the cost estimate.	Agreed

Exclusion	JWP Comment
Consultants fees	This is an essential element, and an estimate should be included to inform EP&A Act S7.11 costs and hence give an accurate probable cost for the infrastructure project
Utility/services investigation relocation protection	It is essential to include all aspects of utility relocation and/or protection associated with the street-based bioretention systems
Geotechnical investigations	An allowance should be included for professional consulting fees to inform EP&A Act S7.11 costs
GPT testing before construction;	An allowance should be included for all professional consulting fees needed to deliver the works to inform EP&A Act S7.11 costs
Detailed topographic survey;	The cost of the survey should be included for all stormwater devices other than for streetscape raingardens
Rock, clay or waterlogged soils in bulk earthworks encountered, removed and/or replaced;	Agreed. Part of contingency allowances
Statutory and consultancy fees for all approvals (e.g., environmental etc.);	Needed for EP&A Act S7.11 costs

Exclusion	JWP Comment
Construction setout and survey;	An allowance should be included
Work as executed survey & documentation;	A necessary item to be included
Site insurances;	Needed to inform EP&A Act S7.11 costs
Internal road drainage;	Agreed, Consideration in designs should lead to minimal additional works being required
All landscaping and planting (excluding bioretention basin) for distribution channel batter slopes and trunk channel batter slopes;	Agreed
Management or maintenance of the basins;	Agreed. This would be an ongoing cost, not a construction cost. However, should allow for the establishment of planting over 2 years.
Preparation of a Site Management Plan or Environmental Management Plan;	Agreed. This is usually a minimal contractor's expense depending on client requirements
Rates for demolition do not include an allowance for disposal of material off-site, or disposal of contaminated waste;	Reasonable allowances are needed as costs could be significant. It is likely to be encountered at ALN and EL
Traffic management only covers the cost of the Traffic management plan and excludes the cost for traffic controlling during construction	An estimate should be included
Sandstone block unit rates do not allow for delivery costs.	Allowance for delivery cost should be included

Streetscape raingardens

The SMEC Design Report – Development of Streetscape Raingarden Masterplan for ALN, 10 February 2021 contains the indicative concept designs for streetscape raingardens at a 4-way Intersection, T junction and road bend. Cost estimates of the raingardens for the intersection, T junction and bend were also provided.

A review of the estimates has revealed that many rates adopted were not suitable examples or were significantly under-priced when compared to the costs we derived from the construction cost database that J. Wyndham Prince maintains for the estimation of civil works. Our assessment is summarised on annotated copies of the cost estimate derived for the 4-way intersection obtained from the SMEC report which is provided in Table 4-5. The suggested changes to the cost schedule, including those relating to additional line items, adjusted cost rates and recommended allowances are indicated in blue text. We have also reorganised the SMEC schedule for the street-based raingarden works so that the required works staging sequence and associated costs are more clearly delineated.

It is noted that our indicative analysis of the cost of streetscape raingardens suggests the cost is around **250 % higher** than Council's allowances in the contributions plan.

The following allowances were either excluded or overlooked in the SMEC cost estimate. Each of these will directly affect the cost of delivery of the stormwater works and should be specifically accommodated in their respective cost schedules.:

- Site establishment
- Survey/setout
- Traffic control
- Erosion & sediment controls
- Waste classification and disposal at a licenced facility
- Utility service design and construction impacts (deeper and realigned mains to avoid raingardens at intersections)
- Staging or works
- Decommissioning of stage 1 construction i.e. silt traps at end of use
- Landscaping establishment

- Project on costs of delivery agency and design

It is not clear whether these exclusions were accommodated by suitable adjustments to the recommended contingencies. Nevertheless, their inclusion would help provide a clearer representation of overall costs and they have been added to the updated cost estimates presented in Table 4-5. In addition, Council's approach of indexing construction costs from the time of reporting (2019) to late 2020 would likely underestimate costs due to some larger than CPI changes in construction costs that have occurred recently.

In summary, the review undertaken identifies that streetscape raingarden costs presently applied in the Contributions Plan are likely underestimated by **around $100M**. Refer to further details of this assessment in Section 4.3 below.

To provide a more appropriate estimation of costs for stormwater items it is suggested that consideration be given to updating all the cost estimates that informed the draft contributions plan to incorporate amended quantities, expand on some on-cost components and include up to date cost rates for the works.

4.1.2 East Leppington

As mentioned previously the draft *Liverpool Contributions Plan 2021 East Leppington Precinct* now lists a cost of $35,164,370 (+ 200%) for drainage works.

The information provided for the stormwater costs review was limited to only the total costs for each basin, drainage infrastructure, and drainage lands. No cost breakdown spreadsheets were available for review of construction costs for each drainage item and no concept design plans were available. The original costs of stormwater items were determined by Cardno via the Water Cycle Management Report East Leppington report which was finalised in May 2013 to support the rezoning of the precinct.

To reflect present-day costs, Council has indexed the costs from the base date of 2013 to 2021 by ABS price indexes. While this approach has appropriately considered broader inflationary pressures across the economy, it may not accurately present the increases in the cost of stormwater works across this period.

To assess whether the increase in stormwater works costs are adequately reflected by CPI increases we undertook a comparison of the growth in actual construction costs for raingardens over the same period. Raingardens represent 37% of the overall stormwater works costs of the adopted EL contributions plan. The estimates of raingarden media bed works provided by Cardno for ALN in 2013 indicated that raingardens cost $355/m^2. Data from the JWP Cost database confirms this is a reasonable estimate for these works in 2013. Recent raingarden works undertaken across Sydney and elsewhere are costing $500/m^2. This information is summarised in Table 4-1 below which shows that raingarden cost increases (+40.8%) significantly outpaced CPI (+18.4%) over the period between March 2013 to December 2021.

In addition, Council also indicates in their submission to IPART that:

Water managements costs have reflected the largest increase the original CP estimated works costs which is largely resulting from the need to prepare more detailed design elements for drainage as development of the East Leppington precinct evolves.

Unfortunately, there is no specific discussion in Council's submission that explains what is meant by "the need to prepare more detailed design elements". In Section 3.3 above, we note that the raingarden bed sizes presented in the 2013 Cardno strategy represent around 0.3% of the catchment areas. Our experience in, using the latest water quality modelling approaches and parameters, is that it is necessary to provide raingarden beds that have an area around 0.7% to 1.0% of the catchment to meet water quality performance objectives applicable to growth centre developments. Consequently, we have assessed the potential cost increases applicable if raingarden bed areas are required to be 0.7% of the catchment and this is also presented in Table 4-1 below.

Table 4-1 – EL CP21 – Comparison of Various Increases in Stormwater Works Cost

Item	Current EL CP 2014 (1,143 lots)	Adjusted CP 2014 (Bigger R/G)	Proposed EL CP 2021 (1,128 lots)	Cost Increase	Cost Increase /lot
Cost of Stormwater Works	$11.721 M (a)		$35.164 M	$23.443 M (200%)	$20,783
Cost of Increasing 'end of pipe' raingardens from 0.3 to 0.7 % of catchment (in 2013 dollars)	$3.643 M (10,263 m² @ $355/m²)	$8.500 M (23,947 m² @ $355/m²)		$4.857 M (b)	$4,306
Adjusted CP 21 to account for larger Raingardens (2013 dollars) (a+b)	$16.579 M				
Estimated cost increase for raingardens (10,263 m² bed areas from 2013 to 2021)	$3.643 M ($355/m²)		$5.131 M ($500/m²)	$1.488 M (40.8%) (c)	$1,319
Apply 40.8%(c) cost increase to all Stormwater Works	$16.579 M		$23.343 M	$6.764 M (40.8 %)	$5,996
Combined larger raingardens and works cost increases (2013 to 2021)	$11.721 M		$23.343 M	$11.622 M	$10,303

Blue text - JWP estimated costs

When combining the costs associated with increasing raingarden bed areas to align with best practice water quality modelling and applying a 40.8 % increase in the cost of providing all stormwater works, the estimated additional cost to the plan is $11.621 M, which is significantly less than the $23.443 M increase proposed by Council.

The previous technical discussion on East Leppington highlighted the concern that if the detail design of biofilter devices was undertaken using the current Council standards, the bio-filters would need to increase in size. This would increase construction costs. The discussion also highlighted the over-attenuation within the detention basins to manage flood levels in the receiving watercourses suggests that there may be some rationalisation for the removal of some basins from the strategy, in a similar manner to the SMEC (2019) update to the Austral and Leppington North basin strategy. The removal could not be confirmed within the scope of this review hence no cost-saving can be certain.

To provide a more appropriate estimation of costs for stormwater items it is suggested that consideration be given to the following actions:

a) Undertake a review of the water quality modelling that underpins the Contribution plan to confirm that the proposed raingarden bed areas are adequate to achieve the required performance objectives specified in the Liverpool Growth Centres Precincts DCP (2021) using current best practice modelling methods and parameters. Update the water quality modelling if required to reflect current modelling best practices.

b) Adjust the original basin concept designs (if any) as required to align with the updated modelling outcomes.

c) Update the cost estimates (if any) that informed the draft contributions plan to incorporate amended quantities and up to date cost rates for the works. [It is noted that item c) would improve confidence in the estimates even if a) and b) were not undertaken].

4.2 Are costs consistent with contributions plans technical studies

4.2.1 Austral and Leppington North

A review of the following documents was undertaken to confirm consistency between the technical studies and ALN CP21

- ALN Detail Design of Water management Infrastructure – Detailed Concept Design Report (SMEC 2019)
- Development of Streetscape Raingarden Master Plan for ALN (SMEC 2021)
- ALN works schedules (Excel) (SMEC 2021) - particularly “Drainage Con” worksheet
- ALN SMEC Council adjusted cost sheets – for IPART application (email from NH dated 9/3/21)

It is noted that there is consistency in the nomenclature applied to the drainage works components and the mapping of the works across both the CP and the supporting technical studies.

It appears Council has adopted both the construction costs and the associated contingencies from SMEC’s updated emailed schedule. However, different project on-costs were applied and then costs were indexed from 2018 to 2021 by Council before adoption in ALN CP21.

It is noted that there are also four creek culverts listed in Table 9.1 of the SMEC Concept Design Report that are not costed in the plan, nor the updated SMEC cost schedules emailed on 9/2/21. There is no discussion about why these have been removed so it is unclear whether their omission was intended.

4.2.2 East Leppington

Similarly, a review of the following key documents relating to the EL stormwater works was undertaken to confirm consistency with the EL CP21:

- Water Cycle Management Report – East Leppington (Cardno 2013)
- EL D21 24060 IPART submission works tables – (Excel) (LCC 2021) – “Water Management” worksheet

It is noted that there is consistency in the nomenclature applied to the drainage works components and the mapping of the works across both the CP and the supporting technical studies and cost schedule.

There are no costs discussed in the Water Cycle Management report but there is consistency between EL CP21, and the works table schedules.

4.3 If a cost is not reasonable, recommend an alternative cost

4.3.1 Austral and Leppington North

The approach adopted was to review costs for average or typical stormwater management devices across the ALN Contributions Plan as being representative of the likely impact across the precinct. In deriving the cost totals, we have applied the estimated cost variances we have derived for each typical device across all the line items in the primary cost schedule.

Representative basins (B22 and B8), a drainage system without a basin (NB33) and a culvert (B_FOURTH) were selected to assess and compare costs and provide an indication of likely cost changes for ALN. For the representative drainage elements, the quantities listed by SMEC were not adjusted as there were no concept design plans available. Cost rates were reviewed and adjusted where there was a significant rate difference identified.

The original SMEC sheets are provided in Appendix A. The adjusted cost schedules, with adjusted rates, are presented in red text are provided in Appendix B. A table of the estimated cost of items that were excluded by SMEC has also been provided in Appendix B where it was felt that the items should be included. The following Table 4-2 summarises the findings of this cost review. All costs exclude GST.

Table 4-2 – ALN CP21 Revised Cost of Representative Stormwater Works Elements

Drainage system	SMEC cost estimate	JWP cost estimate	Indicative cost change	Indicative cost change %
1%AEP basin - B22	$8,682,075	$11,305,881	$2,623,806	130.2%
50%AEP basin - B8	$5,152,081	$6,814,591	$1,662,510	132.3%
Without basin - NB33	$1,010,720	$1,768,926	$758,206	175.0%
Culvert B_Fourth	$1,232,952	$1,870,291,	$637,339	151.7%

For streetscape raingardens, the cost review is aligned with the SMEC concept design for a 4-way intersection (refer to Plate 3-1) Cost rates were reviewed and adjusted where there was a significant rate difference identified. Some additional work components were added where this was deemed appropriate to fully define likely costs or to reflect the raingardens construction delivery staging.

The cost changes are summarised in Table 4-3 and are shown in detail in Table 4-5 further below. All costs exclude GST. It is expected that similar cost increases would be experienced for the T Junction and road bend streetscape raingarden elements as their cost schedule structures and the works required are almost identical.

Table 4-3 – ALN CP21 Revised Cost of Typical Streetscape Raingarden

Item	SMEC total direct cost estimate	JWP total direct and indirect cost estimate	Indicative cost change	Indicative cost change %
4-way intersection	$116,471	$298,580	$182,109	256%

When the project on-costs are included, the cost is $343,366 which equates to $1,196/sqm. This rate is consistent with the expected costs for these elements specified by Melbourne Water and more broadly across the Stormwater industry (see further discussion in Section 4.4).

Total indicative costs

To derive comparative cost totals across the ALN precinct, the above indicative percentage increases have been applied to the totals of the ALN works schedules which were prepared by SMEC in March 2021 These are summarised in Table 4-4 below.

Table 4-4 – ALN CP21 Revised Cost of Stormwater Works

Item	Total works cost (indexed) based on SMEC	JWP indicative cost estimate based on % increase	Indicative cost change	Notes
Drainage Systems with 1% AEP Basins	$103,198,633	$134,386,246	$31,187,613	Adopt % increase for B22
Drainage Systems with 50% AEP Basins	$98,473,147	$130,249,160	$31,776,013	Adopt % increase for B08
Drainage Systems without Basins	$14,407,483	$25,215,462	$10,807,979	Adopt % increase for NB33
Creek Culverts (stormwater works only)	$10,230,592	$15,519,002	$5,288,410	Adopt % increase for B-Fourth

Item	Total works cost (indexed) based on SMEC	JWP indicative cost estimate based on % increase	Indicative cost change	Notes
Streetscape raingardens	$64,186,572	$164,545,797	$100,359,225	Adopt % increase from intersection for T junction and bends (Table 4-5)
Total	**$290,496,427**	**$469,915,666**	**$179,419,239**	**61.8% increase**

Table 4-5 – ALN CP21 Streetscape Raingarden 4 -way Intersection Adjusted Cost Estimate

Intersection Cost Estimate

			SMEC (2021)		JWP (2022)		
Direct Costs	Quantity	Unit	Base Rate	Cost	Base Rate	Cost	J. Wyndham Prince Comments
Phase 1 - Sediment Basin (Construction during Subdivision Works)							
Site Establishment	1	Item			$ 2,500.00	$ 2,500.00	Portion of broader works
Survey & Setout	1	Item			$ 1,750.00	$ 1,750.00	Portion of broader works
Traffic control	1	Item			$ 3,000.00	$ 3,000.00	Portion of broader works
Erosion & Sediment controls	1	Item			$ 750.00	$ 750.00	Portion of broader works
Earthworks excavation (0.6 deep)	172.64	m3	$ 8.05	$ 1,389.72	$ 8.05	$ 1,389.72	Split across 2 stages now. Excavate Trim & Compact and cart surplus offsite
Earth disposal	276.22	tonne	$ 54.18	$ 14,965.60	$ 54.18	$ 14,965.60	VENM or ENM disposal only
15km Additional Cartage Over 10km	431.59	m3	$ 8.55	$ 3,690.09	$ 8.55	$ 3,690.09	
Waste Classification (VENM or ENM for disposal)	1	Item			$ 1,500.00	$ 1,500.00	
Waste Classification (GSW for disposal)	1	Item			$ 1,500.00	$ 1,500.00	
Saw Cutting Kerb (150mm depth)	20	m	$ 69.10	$ 1,382.00	$ 69.10	$ 1,382.00	
Concrete Channel with Grate including excavation works	16	m	$ 460.00	$ 7,360.00	$ 460.00	$ 7,360.00	
Inlet Scour Protection	10	m2	$ 72.00	$ 720.00	$ 195.00	$ 1,950.00	Amended Rate
Cost associated with deeper watermain (2.5m depth)	1	item			$12,320.00	$ 12,320.00	Allowed 4 bends, extra excavation & disposal, trench shoring, backfill, additional testing, based on 2 crossings per intersection
Cost associated with electrical & comms in new alignme	1	Item			$ 9,700.00	$ 9,700.00	Allowed extra bends for alignment, allowed extra depth of road crossings in 2 locations per intersection
Cost associated with alternate sewer arrangement	1	Item			$12,500.00	$ 12,500.00	Contingency for additional manhole, concrete encasement or other fittings
Phase 2 - Sediment Basin Maintenance (say 3 yrs)							
Site Establishment - Maintenance visit	12	each			$ 250.00	$ 3,000.00	12 times during maintenance period
Site saftey fencing, signage & maintenance	1	Item			$ 6,300.00	$ 6,300.00	During maintenance period, allowed 3 years
Traffic control	12	each			$ 250.00	$ 3,000.00	12 times during maintenance period
Flocculation, water testing & pumping after rain event	12	each			$ 650.00	$ 7,800.00	12 rain events, includes minor traffic control
Phase 3 - Raingarden Construction (at 95% Housing complete)							
Site Establishment	1	Item			$ 3,500.00	$ 3,500.00	Establish contractor back on site
Survey & Setout	1	Item			$ 2,500.00	$ 2,500.00	Includes WAE
Traffic control	1	Item			$ 6,500.00	$ 6,500.00	Works on Public Road
Erosion & Sediment controls	1	Item			$ 750.00	$ 750.00	
Sediment removal and disposal (0.3 deep)	86	m3	$ -	$ -	$ 16.00	$ 1,376.00	
Disposal at licenced facility	164	tonne	$ -	$ -	$ 370.00	$ 60,680.00	Includes cartage to local facility
Earthworks excavation extending from Phase 1 (1.5 deep	258.95	m3	$ 8.05	$ 2,084.58	$ 8.05	$ 2,084.58	Excavate Trim & Compact and cart surplus offsite
Earth disposal	414.33	tonne	$ 54.18	$ 22,448.40	$ 54.18	$ 22,448.40	VENM or ENM disposal only
S.G pit (900x900mm) surface finish tbc.	2	unit	$ -	$ -	$ 2,500.00	$ 5,000.00	Additional for street pipe drainage connections
375mm Diameter Pipes (assumed outlet)	64	m	$ 210.00	$ 13,440.00	$ 225.00	$ 14,400.00	Includes excavation in revised rate
S.G pit (900x900mm)/1.8m kerb inlet pit	4	unit	$2,550.00	$ 10,200.00	$ 2,550.00	$ 10,200.00	Standard depth, no reinforcing steel
Pit Cover	4	unit	$ 340.00	$ 1,360.00	$ 340.00	$ 1,360.00	
Filter Cloth	8	m2	$ 8.75	$ 70.00	$ 8.75	$ 70.00	
Impermeable Liner	410.32	m2	$ 21.67	$ 8,891.63	$ 26.00	$ 10,668.32	Amended Rate
Drainage Layer (gravel)	43.068	m3	$ 75.00	$ 3,230.10	$ 130.00	$ 5,598.84	Amended Rate
Underdrain Ag Pipe	270.4	m	$ 16.25	$ 4,394.00	$ 28.00	$ 7,571.20	Amended Rate
Submerged Zone	86.136	m3	$ 49.00	$ 4,220.66	$ 140.00	$ 12,059.04	Amended Rate
Transition Layer (coarse sand)	28.712	m3	$ 49.00	$ 1,406.89	$ 125.00	$ 3,589.00	Amended Rate
Filter Media (sandy loam)	114.848	m3	$ 49.00	$ 5,627.55	$ 105.00	$ 12,059.04	Amended Rate
Surface Vegetation	287.1	m2	$ 24.00	$ 6,890.40	$ 32.00	$ 9,187.20	Allowed 6 tubestock per square meter
Pebble Mulch	28.712	m3	$ 94.00	$ 2,698.93	$ 130.00	$ 3,732.56	Amended Rate
Phase 4 - Post Works Establishment							
Establishment Maintenance of planting	24	months			$ 287.00	$ 6,888.00	Assumes $1 /m2 / month
Total Direct and Indirect Costs				$ 116,470.56		$298,579.59	SMEC values derives from Appendix D of Streetscape Raingarden Masterplan
Project On Costs							
Contractor Indirect Costs			20.0%		0%		Adopted rates already include contractor indirect costs and margin
Contractor Margin			12.0%		0%		
Council On-Costs (Delivery Agency)			10.0%		10%		
Council On-Costs (Design)			3.0%		5%		
Adjustment Factors							
Distance Factor			1.0%		0%		Adopted rates already include similar distance and congestion allowances
Congestion Factor			17.5%		0%		
Total Project On Costs			**63.5%**	**$ 73,958.81**	**15%**	**$ 44,786.94**	
Total Base Costs including Adjustment Factors (excludes Contingency)				**$ 190,429.36**		**$343,366.53**	
Base Cost per Square Metre ($/m2)				$ 663.29		$ 1,195.98	Based on 287.1 m^2 bed area.

Cost relativities for on-street raingardens

While to date there have not been many streetscape raingardens constructed within Sydney, these are being implemented more broadly across other Australian cities. Melbourne Water prepared a summary of expected WSUD life cycle costs that includes streetscape raingardens in October 2013. A copy of the Melbourne Water October 2013 data is presented in Table 4-6 below.

Table 4-6 – WSUD Life Cycle Costs (Melbourne Water 2013)

ASSET	ASSET PARAMETERS	CONSTRUCTION[1]	MAINTENANCE		RENEWAL
			ESTABLISHMENT (FIRST TWO YEARS)	ONGOING	
WETLANDS[2]	< 500 m² 500 to 10,000 m² > 10,000 m²	$150/m² $100/m² $75/m²		$10/m²/yr $2/m²/yr $0.5/m²/yr	No data
SEDIMENT BASINS[2]	< 250 m² 250 to 1000 m² > 1000 m²	$250/m² $200/m² $150/m²		$20/m²/yr $10/m²/yr $5/m²/yr	Remove and dispose of: Dry waste = $250/m³ Liquid waste = $1,300/m³
ON-STREET RAINGARDENS[3]	< 50 m² 50 to 250 m² > 250 m²	$2000/m² $1000/m² $500/m²		$30/m²/yr $15/m²/yr $10/m²/yr	Minor reset = $50 to $100/m²
BIORETENTION BASINS[3]	< 100 m² 100 to 500 m² > 500 m²	$1000/m² $350/m² $250/m²		$5/m²/yr	No data
TREE PITS[3]	< 10 m² total 10 to 50 m² total > 50 m² total	$8000/m² $5000/m² $1000/m²	Two to five times ongoing maintenance cost	No access issues = $150/asset/yr Traffic issues or specialist equipment required = $500/asset/yr	No data

It is quite evident from the Melbourne Water data that streetscape raingardens are significantly more expensive to build and to maintain than traditional (end of pipe) raingardens. The streetscape raingardens proposed for ALN are typically within the size range of 50 to 250sqm compared to end of pipe bioretention basins which are typically greater than 500 sqm in bed area. Consequently, the streetscape treatment costs are likely to cost $1000 /sq.m ($1165/sq.m in Dec 2021) which is 4 times more than an end of pipe approach at $250/sq.m ($291 in Dec 2021). Where smaller streetscape raingardens are required to ensure safe gutter flows (refer to discussion at Section 6.2) the cost differential would be even greater.

As part of a recent engagement with NSW Department of Planning, Industry and Environment (DPIE) to advise on alternate WSUD strategies for new development in Wianamatta-South Creek, DesignFlow (a Brisbane and Adelaide based Water specialist consultancy) indicated that streetscape raingardens typically cost $1350/sqm, and this compared to their expectations that precinct/regional raingardens typically cost $500/sqm. It is also understood that Sydney Water is currently adopting $480/sq.m for end of pipe raingarden costs.

Applying this broad perspective to ALN CP21 it is expected that there will be a notable cost increase in adopting the streetscape raingarden approach compared to the more traditional end of pipe approach originally proposed.

Utility services

The NSW Streets Opening Coordination Council provides the Guide to Codes and Practices for Streets Opening. The latest version is 2018 in which the agreed arrangements for utility services locations and depths are presented. These utility locations and depths clash with the proposed use of streetscape raingardens in road verges, which typically require excavation depths of around 1.4 m. The cost of utility adjustment to accommodate these intersection-based elements seems to be unaccounted in SMEC's estimates. Utility reconfiguration does add a significant additional cost. Allowances for these adjustments are included in the revised estimates for streetscape raingardens provided in Table 4-5.

Maintenance of streetscape raingardens

Whilst it doesn't directly affect capital costs, an important influence on the choice of stormwater treatment approach should be the long-term ongoing maintenance costs of any adopted system.

The SMEC Design Report – Development of Streetscape Raingarden Masterplan for ALN, 10 February 2021 a table that summarises routine maintenance requirements and costs for streetscape raingardens. A copy of the table, which is an extract from "Streetscape WSUD raingarden & tree pit design package for Moreland City Council. GHD, 2013" is provided in Table 4-7.

Table 4-7 – Routine Maintenance Costs of Streetscape Raingardens

Table 7. Routine maintenance cost estimate (GHD, 2013)

Routine Maintenance Task – Not Dependent on Surface Area	Frequency (/year)	Time Required (h/person)	Labour Cost/Fee ($/year)
Litter Removal	4	0.5	$200
Sediment Removal/Ameliorate Surface	4	1	$400
Raking to Reinstate Surface at Erosion Points	4	0.5	$200
Top-up Filter Media and Regrade Surface	1	2	$200
Infiltration Test	1 in 3 years		$500
Weeding	4	1	$400
Inspect and Flush-out Drainage	2	1	$200
Remove Debris from Inlets	4	0.5	$200
Remove Debris from Outlets	4	0.5	$200
Total			**$2,500**
Routine Plant replacement – Dependent on Surface Area	**Frequency (/year)**	**Cost ($/m²)**	**Labour Cost/Fee ($/m²/year)**
Replace Plants where Dead	4	$2	$8
Time Required	0.5 h/m²	$25	$100
Total			**$108**

To highlight the extent of maintenance commitment that would be required the expected number of streetscape raingardens to be provided are summarised in Table 4-8.

Table 4-8 – ALN Streetscape raingardens quantities

Streetscape Item	Number of Items	Number of raingardens in each item	Total Number of streetscape raingardens
4-way intersection	181	4	724
T junction	383	2	766
Road bend	29	1	29
Total			**1519**

Assuming there is 4 cleans/year there would be 6076 cleans/year. With 240 working days/year and cleaning say 25 devices /day this would potentially require 3 - 4 work crews on a permanent basis. During periods of ongoing significant rainfall, it is likely that some additional surge capacity would be required to adequately maintain these devices.

It should also be noted that it is not possible to intercept gross pollutants in a separate trap upstream of each streetscape device. This means that unless the devices are maintained at the nominated frequency of at least 4 cleans /year they are likely to clog with coarse sediment and litter and fail to operate (rendering the original significant capital investment in water quality management effectively obsolete).

Another maintenance cost that seems under allowed for is the cost of closing a traffic lane down while maintenance work is undertaken. This will add to the cost and has been factored into the updated costs for streetscape raingardens presented in Table 4-5.

It is not clear whether Council has fully considered the maintenance resource requirements and associated costs. It is noted that SMEC does not discuss these issues in their strategy report so Council may be unaware of the implications.

Interim Sedimentation Basins

Before the implementation of streetscape raingardens, the strategy proposed by SMEC is to configure each raingarden location as an interim silt trap (refer to SMEC interim silt plan 30013411-018- Rev 01). This would need to operate until 95% of housing construction is completed in the catchment upstream of each device, at which time the final raingarden can be constructed.

As the typical soils in the Precincts are dispersive clays, each of these interim basins will require flocculation and dewatering after all rainfall events which would likely require the pump out and de-silting of the 1519 devices each 0.6m deep sediment basins. Maintenance would be required at least 4 times/year for each device, even in dry years. Depending on the rate of housing construction, the interim operation may extend for a few years.

The cost of undertaking this maintenance would be borne by the various land developers up until the handover of the public roads to Council. After that, the costs would be borne by Council as the asset owner unless alternative arrangements were defined in a Voluntary Planning Agreement (VPA) with the developer. The cost of this maintenance is extra over to, and equivalent to, those outlined in Section 4.4.5 above.

Gross Pollutant Traps

The SMEC Streetscape Strategy (SMEC 2019) considers 19 style GPT's on catchments with Basins. While catchment areas draining to each basin were not reported by SMEC (2019), we note that the Cardno (2011) strategy had adopted catchments of up to 110 Ha. draining to a single GPT. Additional GPT's may be required to reduce the catchment areas serviced by each device and to achieve alignment with Council's preferred cleaning frequencies for these devices (typically 3 – 6 months intervals).

However, since many of the upstream catchments now have streetscape raingardens, there is a question as to whether many of the proposed conventional GPTs will still be required. The streetscape raingardens will be very effective in the removal of gross pollutants, and this may allow for a reduction in size or the complete removal of some of the 19 devices proposed.

The detailed assessment of these impacts and how they affect CP21 costs was beyond the scope of this review.

4.3.2 East Leppington

Undersized raingardens

The raingarden bed sizes presented in the 2013 Cardno strategy represent around 0.3% of the catchment areas (refer to Sections 3.3 and 4.1.3 for further discussion). Applying the latest water quality modelling approaches and parameters, it is typically necessary to provide raingarden beds that have an area of around 0.7% of the catchment to meet the water quality performance objectives applicable to growth centre developments.

We have assessed the potential cost increases applicable if raingarden bed areas are 2.3 times (i.e. 0.7/0.3) the size allowed for in the 2013 plan. When combining this with a 40.8 % increase in the cost of providing all stormwater works, the estimated additional cost to the plan is $11.621M, which compares to the $23.443M proposed.

Given the potential cost increases, it may be warranted to undertake a detailed review of both the water quality modelling and the associated costs that underpin the 2013 Contributions Plan.

4.3.3 Both Precincts

Evolving raingarden design specifications

Another cost consideration is the recent standardised engineering design and construction specifications, published in the Western Sydney Engineering Design Manual (WSEDM) in 2020. This was prepared in collaboration with nine western Sydney councils, including Liverpool Council, and we understand may be applied by each Council as part of the next round of updates to LEP's and DCP's.

[refer https://www.wscd.sydney/planning-housing under the heading of "P4 - Uniform local government engineering design standards and telecommunications planning"]

For Raingardens, the WSEDM adopts Blacktown City Council's recently revised standard specifications for these works. This involves the provision of a complex inflow and outflow drainage system, provides a full perimeter paved maintenance access road, and adopts a 3-phase construction process that will likely take many years to implement. Our recent experiences with end of pipe raingarden construction in Sydney's Northwest Growth Centre precincts within the Blacktown LGA has found that the costs of meeting this specification are in the order of $1400 to $1500 per sqm on average. This is around 3 times higher than the costs of raingardens in other western Sydney LGA's and those from other Australian jurisdictions.

It is unclear at this stage whether Liverpool Council will require this standard of construction for systems to be implemented across the ALN or EL precincts as development proceeds over the next decades. It is important to note that this potential cost increase was not allowed in this cost review.

5 NEXUS

Nexus refers to the connection between the development and the demand created by that development. The requirement to satisfy nexus is based on ensuring that there is a link between the development and increased demand and cost for infrastructure.

In greenfield development areas which generally typifies the Austral, Leppington North and East Leppington Precincts, the new development results in an increase in the impervious area resulting in an increased rate of stormwater runoff, a concentration of runoff and deterioration in water quality. These changes necessitate additional stormwater infrastructure to ameliorate the impacts and specifically to meet Development Control Plan water quality targets. The need for infrastructure is supported by technical studies which both establish and map the infrastructure items. There is consistency between the Contributions plan and the supporting technical study. Together it is a clear nexus.

5.1 Austral and Leppington North

While there is a nexus for ALN the question must be asked whether it is necessary to increase the total amount of bio-filter area required by 385% and to spend around 3-4 times the money on a cost per square meter basis to get the outcomes of closer to source WSUD controls in the streetscape. While there are generally accepted broader intangible benefits of achieving close to source water quality treatment, both systems would be configured to achieve the same specific water quality performance criteria and hence it would be appropriate to consider them in comparative cost terms.

The capital cost increase of the works alone is substantial (an extra $36,765/lot) and it is still unclear whether the strategy change works in principle (that is the true costs may even be greater - refer to Section 6.2 for further discussion). The changed strategy also imposes substantial additional ongoing maintenance requirements that may be unaffordable for Council. The cost-benefit of this change in strategy as well as consideration of viable alternatives may be warranted but is beyond the scope of this review.

The draft *Liverpool Contributions Plan 2021 – Austral and Leppington North Precincts* (Liverpool City Council, A&LN CP21) contributions plan articulates that the expected increase in population with an equivalent net developable area of 1,217 ha across the precincts will require management of stormwater. Section 4.4.1 of the A&LN CP21 correctly notes that the increase of impermeable surfaces will exacerbate flooding issues and impact on the quality of stormwater and potentially affect the riparian corridors – these issues being directly caused by the development of the precinct. It is also noted that section 4.4.2 of the plan indicates that the amount of the contribution for stormwater infrastructure is calculated based on the equivalent net developable area (ha) that will generate demand for the facilities. On this basis, it is our opinion that nexus has been established for the Austral and Leppington North Contributions Plan 2021.

5.2 East Leppington

Section 3 of the *Liverpool Contributions Plan 2021 – East Leppington* (Liverpool City Council, EL CP21) provides an outline of the demand for public amenities and public services. Table 3.2-2 refers to the East Leppington WCM report (Cardno, 2013), however, there is no discussion regarding any increased demand on stormwater infrastructure due to increased development. Section 4.3 of EL CP21 provides discussion on Water Cycle Management Infrastructure, with Section 4.3.1 discussing existing watercourses and water management, and Section 4.3.2 discusses the proposed water cycle management infrastructure. However, it does not articulate that the proposed stormwater infrastructure is needed due to a proposed increase in development.

Nevertheless, it is evident from the supporting East Leppington Water Cycle Management Strategy (Cardno, May 2013) that the urban development of East Leppington will increase the demand on stormwater infrastructure, and it is noted that the amount of the contribution for stormwater infrastructure in Section 4.3.3 is calculated based on the equivalent net developable area (ha) that will generate demand for the facilities. While the EL CP21 does not justify the need for stormwater management infrastructure, our view is that a nexus for the stormwater management infrastructure for the East Leppington Precinct does exist.

6 TECHNICAL REVIEW OF STORMWATER STUDIES

It is noted that the previous WCM Strategy for ALN (Cardno, 2011) has been superseded by the ALN CP21. However, our review of the technical studies highlighted some technical concerns regarding device sizing from the earlier Cardno Strategies (2011, 2013), and concerns regarding the safety and function of the alternate street-level control stormwater management approach proposed by SMEC (2019/2021).

6.1 Previous WCM Strategies (Cardno, 2011 and 2013)

Residential catchments are generally broken down into roads, roofs, and remaining urban pervious and impervious areas which have differing pollutant loadings.

In both the ALN (Cardno, 2011) and EL (Cardno, 2013) stormwater quality modelling analysis, the modelling appears to be very high level, with a single node representing each urban catchment. It is noted this approach was common at the time, however, is now inconsistent with modern modelling techniques required by most Councils in Western Sydney.

If the earlier Cardno strategies (2011, 2013) had adopted a more refined catchment breakdown, we expect the raingarden sizing would likely have been closer to the 0.7% to 1.0% of catchment generally delivered in the Sydney Growth Centre Precincts, rather than the adopted 0.3% catchment which is unlikely to achieve the statutory pollution reduction targets if modern modelling techniques were adopted.

It is our view that the undersized devices determined in these previous strategies (Cardno, 2011, 2013) have resulted in an underestimation of the costs required for stormwater works in ALN CP14 and EL CP14. It is noted that for ALN CP21 the previous undersized devices are no longer a relevant concern (in terms of the achievement of the DCP water quality performance objectives).

6.2 Austral and Leppington North

6.2.1 SMEC Strategy 2019, 2021

Under the revised strategy (SMEC, 2019), GPTs are only required on the 19 catchments with basins. Given that these catchments also include streetscape raingardens which will collect the bulk of the gross pollutants, it is unclear what benefit the supplementary ‘end of pipe’ GPTs would provide, and we question whether these GPTs could be reduced or removed from the current WSUD strategy (SMEC, 2019).

The MUSIC model assumptions (SMEC, 2019) assume a typical 85% residential catchment. It is unclear how the surrounding roads have been considered, as only 10% of the catchment is assumed to be roads. In our experience, roads make up approximately 30% of a typical residential catchment, in addition to an assumed 10% of the lot areas to account for driveways. Notwithstanding, amending the modelling to include the roads (if not already considered) would only put upward pressure on the size of the devices required.

The streetscape masterplan (SMEC, 2021) provides a fixed amount of bio-filter area at each intersection which is more than the required filter area (refer to Table 3-1). There is no suggestion in the strategy (SMEC, 2019) that it would be okay to build smaller devices at each intersection if the catchments are smaller upstream of that location, rather it indicates that if the overall required bio-filter area is provided, the required pollution reduction targets are met.

The total allocated raingarden area (138,927 m²) is a significant increase when compared with the likely undersized raingarden filter areas (34,770 m²) under the previous (Cardno, 2011) strategy. These differences go some way in explaining the significant difference in the stormwater works costs reflected in ALN CP21 and ALN CP14.

It is uncertain as to whether the street level controls presented in the concept report (SMEC, 2019) or the masterplan (SMEC, 2021) have considered the safety aspects of managing flow widths within the local streets. The typical MUSIC (stormwater quality model) catchment in the Concept Report (SMEC, 2019) suggests that the bio-filters at intersections will cater for full upstream street catchments entering the raingardens as surface flow. In our experience as civil and stormwater design engineers, numerous pits and pipes are required within the street network to ensure gutter flow widths in the road comply with Council safety standards and that flow depths and velocities are safe for pedestrians and vehicles up to 1% AEP storm event. If these traditional road safety standards are to be complied with (which would be expected as part of any development application

assessment), a traditional pit/pipe system upstream of each intersection would be needed to manage this safety risk. This would render the street level treatment obsolete as the treatable stormwater would now be underground, below the at-surface raingardens.

The alternative approach would be to provide a streetscape raingarden at the location of every gully pit upstream of the intersections, which would further increase the maintenance burden applicable to Council as the ultimate asset owner. There would also be an increased capital cost in addressing this issue, as while intersection raingarden footprints could be reduced, the cost of providing a larger number of smaller devices would nevertheless increase substantially. This is demonstrated in the Melbourne Water WSUD cost schedule presented in Table 4-6 which indicates that smaller devices would likely cost around double that of the SMEC proposed devices on a costs per square metre basis.

6.2.2 Case study

As a case study, we have considered an example catchment from the Streetscape Masterplan (SMEC, 2021) study which drains to the corner of Eighth Avenue and Pyncheon Street in Austral. The catchment has an area of approximately 2.1 ha and is bound by Polbar Street to the north, Eighth Avenue to the south, Pyncheon Street to the West and Edmondson Avenue to the east. Plate 5-1 below provides an overview of the location as shown in the Masterplan, and Plate 5-2 provides an overview of the catchment extent, elevation contours, and current land zoning.

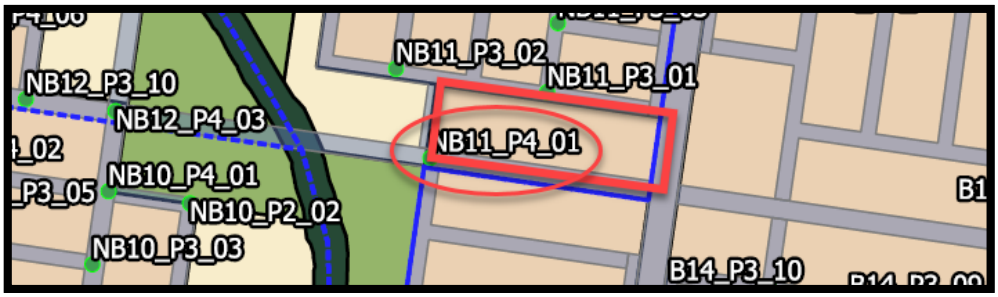

Plate 6-1 – Case Study Catchment Drainage System NB11_P4_01 (SMEC 2021)

Plate 6-2 – Approximate Catchment Area System NB11_P4_01 (Mecone Mosaic)

Liverpool City Council's engineering guideline requires a maximum gutter flow width in the roads of 2.5 m in the 20% AEP (5-year ARI) storm event, and for the velocity x depth product to be less than 0.4 m²/s in a 1% AEP (100-year ARI) storm event which is a measurement indicative of pedestrian and vehicle safety. An assessment for a typical 9 m wide carriageway was undertaken. Details are provided in Table 6-1 below.

Table 6-1 – Typical Carriageway Flow Width and Velocity Depth Assessment

Typical 9 m Carriageway Assessment (Half Road)					
Catchment Area	2.1	ha	Manning's Roughness	0.015	
Road Longitudinal Slope	3.0	%	Time of Concentration	10	minutes
Road Crossfall	3.0	%	20% AEP Flow	490	L/s
Gutter Crossfall	8.8	%	20% AEP Flow Width	4.3	m
Gutter Height	0.150	m	1% AEP Flow	1030	L/s
Gutter Width	0.450	m	1% AEP V x D	0.42	m²/s

The assessment indicates that the half road gutter flow width would be approximately 4.3 m by the time surface flows reached intersection raingarden NB11_P4_01. This is well over the maximum 2.5 m gutter flow width required by Liverpool City Council's Engineering Guide for development. In a 1% AEP event, the velocity x depth (V x D) product would be just more than Council Standards.

To ameliorate these significant street flows, it is not possible to apply the normal practices of implementing additional pits and pipes upstream of the streetscape raingardens, as these would allow baseflows to bypass treatment. A potential solution would involve the introduction of additional streetscape devices in the upper catchment just ahead of the point at which a pit is required in the street to limit flow widths to the required 2.5 m. This approach has the potential to significantly increase the number of streetscape controls needed (additional to the 1519 devices proposed).

It was beyond the scope of the current review to estimate the number of additional devices required and to contemplate how the remaining devices could potentially be reduced in size. Consequently, there is no allowance for these factors in the updated cost estimates presented in this report.

7 CONCLUSIONS

This review of stormwater infrastructure costs with the draft contributions plans for ALN and EL has considered cost, underlying assumptions, stormwater management strategy approach, and identified a few technical issues. The key conclusions drawn from this review are summarised in the following groupings:

Key cost issues with ALN Contributions Plan are:

- Recent cost increases for stormwater works in the Sydney market.
- The exclusion of a range of on-costs that should be included in determining likely overall costs for the delivery of drainage infrastructure proposed.
- insufficient consideration of costs of construction staging and utility design and construction requirements to accommodate streetscape raingardens.

The net cost impact represents a further **$179 M shortfall in the proposed CP21 rates** for stormwater works. This equates to an additional $10,566 /lot to be added to the $25,599 /lot increases proposed by Council in the draft Contributions Plan.

Key cost issues with EL Contributions Plan are:

- Council has indicated the cost increases arise from the need to index the costs from the base date of 2013 to 2021 and is also due to the need to prepare more detailed drainage design elements for drainage as the development of the East Leppington precinct evolves. However, indexing represents an increase of 18.4 % since 2013, whereas Council is seeking a 3-fold cost increase in the draft Contributions plan for stormwater works.
- CPI increases over the last 9 years do not accurately present the true cost of stormwater works. Many construction rates have risen dramatically over this period. As an example, the cost of constructing a raingarden has increased by 40.8 % over this period.
- If the detail design of biofilter devices is required by approval agencies to be undertaken using the current Council and best practice modelling standards, the bio-filters would need to increase in size by around 2.3 times (from 0.3% to 0.7% of catchment). The significant impact on construction costs for these devices would result in a significant funding gap in the Contribution plan rates for these works.

The net cost impact represents an **$11.8 M excess in the proposed CP21 rates** for stormwater works. This equates to a $10,480 /lot saving on the increases proposed by Council in the draft Contributions Plan.

Considering the above, the total costs for both ALN and EP can unfortunately not be considered as a reasonable representation of likely costs.

Other Cost Considerations

Several additional factors affect the stormwater works costs in the draft ALN and EL Contributions Plans that need to be considered. These are:

- Cost relativities for streetscape raingardens which are less efficient than end of pipe systems (requiring larger bed areas for the same performance) and cost around three times the rate, on a square metre basis, compared to the more traditional end of pipe solutions.
- Lack of consideration of the cost of additional streetscape controls needed to ensure compliance with normal design specifications for street drainage systems (public safety considerations).
- The evolving design specifications for raingardens (as embodied by the new Western Sydney Engineering Design Manual) that have the potential to double or even triple construction costs
- The excessive maintenance costs required for the ALN streetscape raingardens (interim and final stages) are estimated to be around 3 times the cost of maintaining traditional end of pipe raingardens.
- The potential ability for streetscape raingardens to substitute for some of the separate 19 GPTs proposed in the ALN precinct. This is offset by the need to ensure each GPT has a catchment that limits GPT maintenance frequencies to a manageable level.

Nexus

The new development in the ALN and EL precincts will increase impervious areas resulting in an increased rate of stormwater runoff, a concentration of runoff and deterioration in water quality. These changes necessitate additional stormwater infrastructure to ameliorate the impacts.

While there is a nexus for ALN the question must be asked whether it is necessary to increase the total amount of bio-filter area required by 385% and to spend around 3 times the cost on a square metre rate basis to get the outcomes of a close to source control in the streetscape. The capital cost increase of the works alone is substantial at an additional **$145.2M** (an extra $8,546/lot) and there is a question as to whether the SMEC strategy fully accounts for all the streetscape controls required to ensure the system operates safely and effectively. It also imposes a substantial additional maintenance burden that may be unaffordable and unachievable for Council. The cost-benefit equation of this alternate stormwater strategy needs to be considered, along with a closer look at viable alternatives

The urban development of East Leppington will increase the demand on stormwater infrastructure, and it is noted that the amount of the contribution for stormwater infrastructure is calculated based on the equivalent net developable area (ha) that will generate demand for the facilities. While EL CP21 does not justify the need for stormwater management infrastructure, our view is that a nexus for the stormwater management infrastructure for the East Leppington Precinct does exist.

APPENDIX A SMEC COST SCHEDULES (Basins B22, B08, drainage system without basins NB33 and Culvert b_fourth)

B22 Drainage System - Preliminary Construction Cost Estimate Thursday, 24 January 2019

Drawing set: 30011388-DDR-1012 to 30011388-DDR-B2286

	ITEM NO. DESCRIPTION OF WORK	QUANTITY	UNIT	BASE RATE	CONTIGENCY LOWEST (%)	CONTIGENCY LOWEST COST	CONTIGENCY HIGHEST (%)	CONTIGENCY HIGHEST COST	COST	INHERENT CONTINGENCY	COST + CONTINGENCY
1.0	**GENERAL AND PRELIMINARIES**										
1.1	Site establishment, facilities & de-establishment	1	item	$100,000.00	70%	$70,000	160%	$160,000	$100,000	$15,000	$115,000
1.2	Traffic management	1	item	$5,000.00	70%	$3,500	160%	$8,000	$5,000	$750	$5,750
1.3	Temporary site fencing incl gates, supports etc	1,500	lin. m	$16.25	80%	$19,506	140%	$34,135	$24,383	$2,437	$26,820
1.4	Provision and maintenance of sediment & erosion control	1	item	$40,000.00	70%	$28,000	160%	$64,000	$40,000	$6,000	$46,000
1.5	Clean water diversions, per month	6	months	$10,000.00	70%	$42,000	160%	$96,000	$60,000	$9,000	$69,000
	SUBTOTAL								**$229,383**	**$33,187**	**$262,570**
2.0	**DEMOLITION, CLEARING AND GRUBBING**										
2.1	Clearing & grubbing incl. clearing of existing creek, tree removal etc	25,458	sq. m	$0.53	60%	$8,096	180%	$24,287	$13,493	$2,698	$16,191
2.2	Demolish existing buildings	2,385	sq. m	$62.10	70%	$103,676	160%	$236,974	$148,109	$22,216	$170,325
2.3	Demolish roads/access paths/driveways within proposed footprint	850	sq. m	$49.50	70%	$29,453	160%	$67,320	$42,075	$6,311	$48,386
2.4	Strip topsoil, stockpile, respread as per landscape plans (excludes any topsoil improvement works.)	3,819	cu. m	$18.00	80%	$54,988	140%	$96,230	$68,736	$6,873	$75,609
2.5	Dispose of excess/unsuitable topsoil (nominal 10% allowance)	420	tonne	$54.18	80%	$18,207	140%	$31,863	$22,760	$2,275	$25,035
2.5	Cartage	7,637	cu. m	$0.57	80%	$3,483	140%	$6,095	$4,354	$435	$4,789
	SUBTOTAL								**$299,527**	**$40,808**	**$340,335**
3.0	**EARTHWORKS**										
3.1	**Cut to fill or disposal in all classes of material**										
3.2	**Basin Earthworks**										
3.2.1	Basin 22: Total cut to disposal (assume no contaminated)	23,654	cu. m	$8.05	60%	$114,249	180%	$342,746	$190,415	$38,083	$228,498
3.2.2	Basin 22: Total fill (assume all fill from cut)	823	cu. m	$13.55	60%	$6,691	180%	$20,073	$11,152	$2,230	$13,382
3.2.3	Basin areas with no structures above (biofilter area excluded): Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum).	8,708	sq. m	$5.00	60%	$26,125	180%	$78,374	$43,541	$8,708	$52,249
3.2.4	Basin areas with structures above: Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum). Place granular fill (DGB20 or similar) in layers <200 mm and compact with roller above). Place/compact clean fill in layers. Compact upper 500 mm of subgrade to min. DDR of 100%. Level 1 Earthworks Control used in fill placement	3,163	sq. m	$20.00	60%	$37,954	180%	$113,861	$63,256	$12,651	$75,907
3.3	**Channel Earthworks**										
3.3.1	Total cut to disposal - channel earthworks (assume no contaminated)	6,660	cu. m	$8.05	60%	$32,168	180%	$96,503	$53,613	$10,723	$64,336
3.3.2	Total fill - channel earthworks (assume all fill from cut)	386	cu. m	$13.55	60%	$3,138	180%	$9,415	$5,231	$1,045	$6,276
3.3.3	Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum).	9,348	sq. m	$5.00	60%	$28,044	180%	$84,132	$46,740	$9,348	$56,088
3.4	**Pipe Excavation**										
3.4.1	Total Cut	0	cu. m	$70.00	70%	$-	160%	$-	$-	$-	$-
3.5	**Disposal cost**										
3.5.1	Cost of disposal of soil as "No Contamination" at an approved landfill within 10km	18528	cu.m	$80.00	60%	$889,344	180%	$2,668,032	$1,482,240	$296,448	$1,778,688
3.5.2	Cost of disposal of soil as "Low Level Contamination" (i.e. General Solid Waste) at an approved landfill within 10km	12965	tonne	$350.00	60%	$2,722,566	180%	$8,167,698	$4,537,610	$907,522	$5,445,132
3.5.3	Additional allowance for cartage of contaminated soil to Eastern Creek Landfill an additional 10km (i.e. 20km one-way total distance)	235720	cu.m / km	$0.57	70%	$94,052	160%	$214,977	$134,361	$20,153	$154,514
3.6	**Trim, consolidation and final shaping of batters, basins, berms, channels, swales, wetland etc**	21,219	sq. m	$2.95	70%	$43,817	160%	$100,154	$62,597	$9,388	$71,985
3.7	**Installation and compaction of clay liner as specified**										
3.7.1	Clay liner provided to base and to top of batters of basin, compacted to specified density, thickness and permeability	9,491	sq. m	$21.67	70%	$143,987	160%	$329,112	$205,696	$30,853	$236,549
3.8	**Dewatering of existing onsite dams, including allowance for management of discharge water**	620	sq. m	$66.50	70%	$28,861	160%	$65,968	$41,230	$6,185	$47,415
	SUBTOTAL								**$6,877,682**	**$1,353,338**	**$8,231,020**
4.0	**BASIN INLET, OUTLET AND BIOFILTER DRAINAGE**										
4.1	**Pipes/Culverts**										
4.1.1	2 x 1200 x 600 RCBC (GPT Outlet)	11	lin. m	$1,000.00	70%	$7,560	160%	$17,280	$10,800	$1,620	$12,420
4.1.2	2 x 1200 x 900 RCBC (Basin outlet pipes)	160	lin. m	$1,270.00	70%	$142,240	160%	$325,120	$203,200	$30,480	$233,680
4.1.3	2 x 1200 x 300 RCBC (From CHN B22 to Junction Pit)	8	lin. m	$550.00	70%	$3,080	160%	$7,040	$4,400	$660	$5,060
4.1.4	2 x 1200 x 300 RCBC (From Junction Pit to GPT)	45	lin. m	$550.00	70%	$17,402	160%	$39,776	$24,860	$3,729	$28,589
4.2	**Headwall(s) with wingwalls to suit**										
4.2.1	2 x 1200 x 900 RCBC (Basin outlet pipes)	1	each	$12,000.00	70%	$8,400	160%	$19,200	$12,000	$1,800	$13,800
4.4	**Base slab(s) to suit**										
4.4.1	2 x 1200 x 600 RCBC (GPT Outlet)	2	cu. m	$333.00	80%	$647	140%	$1,133	$810	$80	$890
4.4.2	2 x 1200 x 900 RCBC (Basin outlet pipes)	36	cu. m	$333.00	80%	$9,590	140%	$16,783	$11,988	$1,199	$13,187
4.4.3	2 x 1200 x 300 RCBC (From CHN B22 to Junction Pit)	2	cu. m	$333.00	80%	$480	140%	$839	$600	$59	$659
4.4.4	2 x 1200 x 300 RCBC (From Junction Pit to GPT)	10	cu. m	$333.00	80%	$2,709	140%	$4,741	$3,387	$338	$3,725
4.5	**Bedding material to suit**										
4.5.1	2 x 1200 x 600 RCBC (GPT Outlet)	4	cu. m	$63.00	80%	$204	140%	$357	$256	$25	$281
4.5.2	2 x 1200 x 900 RCBC (Basin outlet pipes)	60	cu. m	$63.00	80%	$3,024	140%	$5,292	$3,780	$378	$4,158
4.5.3	2 x 1200 x 300 RCBC (From CHN B22 to Junction Pit)	3	cu. m	$63.00	80%	$151	140%	$265	$189	$19	$208
4.5.4	2 x 1200 x 300 RCBC (From Junction Pit to GPT)	17	cu. m	$63.00	80%	$854	140%	$1,495	$1,068	$107	$1,175
4.6	**Pits**										
4.6.1	Junction Pit (upstream of basin and GPT) - 0.8 m deep (Reinforced concrete junction pits (RMS Standard DRG R0220-35))	1	each	$2,550.00	70%	$1,785	160%	$4,080	$2,550	$383	$2,933
4.6.2	Pit depth increments in excess of 900 mm	0	each	$152.00	70%	$-	160%	$-	$-	$-	$-
4.6.3	Pit cover	1	each	$340.00	70%	$238	160%	$544	$340	$51	$391
4.7	**Gross Pollutant Trap(s)**										
4.7.1	GPT pit (treatment flow 2.07 m^3/s)	1	each	$175,000.00	80%	$140,000	140%	$245,000	$175,000	$17,500	$192,500
4.8	**Gabion Walls**										
4.8.1	n/a	0	cu. m		80%	$-	140%	$-	$-	$-	$-
4.9	**Channels**										
4.9.1	Rock lined pilot distribution channel	115	sq. m	$72.00	70%	$5,806	160%	$13,271	$8,295	$1,244	$9,539
4.9.2	High flow bypass channel	0	cu. m	$333.00	80%	$-	140%	$-	$-	$-	$-
4.10	**Biofiltration cells (0 m^2 total area)**										
4.10.1	Filter media layer at 400 mm depth	0	cu. m	$49.00	70%	$-	160%	$-	$-	$-	$-
4.10.2	Transition layer at 450 mm depth	0	cu. m	$49.00	70%	$-	160%	$-	$-	$-	$-
4.10.3	Drainage layer at 150 mm depth	0	cu. m	$75.00	70%	$-	160%	$-	$-	$-	$-
4.10.4	Biofiltration cells vegetation	0	sq. m	$24.00	80%	$-	140%	$-	$-	$-	$-
4.10.5	Backflow/overflow weirs	0	cu. m	$333.00	70%	$-	160%	$-	$-	$-	$-
4.10.6	Wetland Distribution channel batters vegetation	0	sq. m	$24.00	80%	$-	140%	$-	$-	$-	$-
4.11	**Maintenance Path**										
4.11.1	Maintenance Path - along crest of south batter of basin - concrete	16	cu. m	$333.00	80%	$4,196	140%	$7,343	$5,245	$524	$5,769
4.12	**Inlet Spillway**										
4.12.1	Scour protection	270	sq. m	$72.00	80%	$15,540	140%	$27,196	$19,426	$1,942	$21,368
4.12.2	Geotextile	270	sq. m	$8.75	80%	$1,889	140%	$3,305	$2,361	$236	$2,597
4.13	**Outlet Spillway**										
4.13.1	Scour protection	69	sq. m	$72.00	70%	$3,478	160%	$7,949	$4,968	$745	$5,713
4.13.2	Geotextile	69	sq. m	$8.75	80%	$483	140%	$845	$604	$60	$664
4.14	**Multiple outlet structure**										
4.14.1	Cylindrical structure to spillway level - concrete (10 m circumference, 150 mm thick, 1.9 m high)	3	cu. m	$341.00	80%	$777	140%	$1,361	$972	$97	$1,069
4.14.2	Formwork (sides of walls)	38	sq. m	$231.00	80%	$7,022	140%	$12,289	$8,778	$878	$9,656
4.15	**Sandstone Wall**										
4.15.1	Staggered sandstone stepwall	832	cu. m	$240.00	60%	$119,808	180%	$359,424	$199,680	$39,936	$239,616
4.16	**Subsoil Drainage**										
4.16.1	Subsoil drainage (slotted flexible coil pipe) linear along the length of the biofilter basin at 1 m spacings	960	lin. m	$16.25	80%	$12,480	140%	$21,840	$15,600	$1,560	$17,160
	SUBTOTAL								**$721,157**	**$105,649**	**$826,806**
5.0	**STORMWATER DRAINAGE (U/S OF BASIN)**										
5.1	**Pipes/Culverts**										
5.1.1	n/a	0	lin. m		80%	$-	140%	$-	$-	$-	$-
5.2	**Headwall(s) with wingwalls to suit**										
5.2.1	n/a	0	each		80%	$-	140%	$-	$-	$-	$-
5.4	**Base slab(s) to suit**										
5.4.1	n/a	0	cu. m		80%	$-	140%	$-	$-	$-	$-
5.5	**Pits**										
5.5.1	N/a										
5.6	**Channels**										
5.6.1	Rock lined low flow channel	2,448	sq. m	$72.00	70%	$123,379	160%	$282,010	$176,256	$26,438	$202,694
5.6.2	Geotextile under rock (2,448 m^2)	2,448	sq. m	$8.75	80%	$17,136	140%	$29,988	$21,420	$2,142	$23,562
5.6.3	Vegetated channel (either side of rock lined lo-flow) (refer dwg B2286) assume grassed (half of vegetated channel area)	2,181	sq. m	$14.80	70%	$22,592	160%	$51,639	$32,275	$4,841	$37,116
5.6.4	Channel batters vegetation, assumed half of area vegetated, other than grassed (mix tube stock - 200 mm potted plants)	2,181	sq. m	$108.00	70%	$164,861	160%	$376,825	$235,516	$35,327	$270,843
5.6.5	Maintenance path/berm (390 m left bank length, 4.5 m width) - concrete	263	cu m	$333.00	80%	$70,130	140%	$122,727	$87,663	$8,765	$96,428
	SUBTOTAL								**$553,130**	**$77,513**	**$630,643**

6.0	**STORMWATER DRAINAGE (D/S OF BASIN)**										
6.1	**Pipes/Culverts**										
6.1.1	n/a	0	lin. m		80%	$-	140%	$-	$-	$-	$-
6.2	**Headwall(s) with wingwalls to suit**										
6.2.1	n/a	0	each		80%	$-	140%	$-	$-	$-	$-
6.4	**Base slab(s) to suit**										
6.4.1	n/a	0	lin. m		80%	$-	140%	$-	$-	$-	$-
6.5	**Pits**										
6.5.1	n/a	0	each		80%	$-	140%	$-	$-	$-	$-
6.6	**Channels**										
6.6.1	n/a	0	sq. m		80%	$-	140%	$-	$-	$-	$-
6.7	**Scour Protection**										
6.7.1	Scour protection at Basin Outlet Pipes (2 x 1200 x 900 RCBC)	17	sq. m	$72.00	70%	$837	160%	$1,912	$1,196	$178	$1,374
	SUBTOTAL								**$1,196**	**$178**	**$1,374**
7.0	**MINOR LANDSCAPING**										
	SUBTOTAL								**$-**	**$-**	**$-**
	CONSTRUCTION TOTAL								**$8,682,075**	**$1,610,674**	**$10,292,749**
8.0	**PROJECT MANAGEMENT AND SUPERVISION**										
8.1	15% construction cost								**$1,543,912**		
9.0	**CONTINGENCIES**										
9.1	Inherent contingency									**$1,610,674**	**$1,610,674**
9.2				$-	60%	$-	180%	$-	$-	$-	**$-**
9.3				$-	70%	$-	160%	$-	$-	$-	$-
	CONSTRUCTION TOTAL, excluding GST										**$11,836,661**
	GST										**$1,183,666**
	CONSTRUCTION TOTAL, including GST										**$13,020,327**
	CONSTRUCTION TOTAL, rounded										**$13,021,000**

B08 Drainage System - Preliminary Construction Cost Estimate Thursday, 24 January 2019
Drawing set: 30011388-DDR-2012 to 30011388-DDR-B0886

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	BASE RATE	CONTIGENCY LOWEST (%)	CONTIGENCY LOWEST COST	CONTIGENCY HIGHEST (%)	CONTIGENCY HIGHEST COST	COST	INHERENT CONTINGENCY	COST + CONTINGENCY
1.0	**GENERAL AND PRELIMINARIES**										
1.1	Site establishment, facilities & de-establishment	1	item	$100,000.00	70%	$70,000	160%	$160,000	$100,000	$15,000	$115,000
1.2	Traffic management	1	item	$5,000.00	70%	$3,500	160%	$8,000	$5,000	$750	$5,750
1.3	Temporary site fencing incl gates, supports etc	1,300	lin. m	$16.25	80%	$16,905	140%	$29,584	$21,132	$2,112	$23,244
1.4	Provision and maintenance of sediment & erosion control	1	item	$40,000.00	70%	$28,000	160%	$64,000	$40,000	$6,000	$46,000
1.5	Clean water diversions, per month	6	months	$10,000.00	70%	$42,000	160%	$96,000	$60,000	$9,000	$69,000
	SUBTOTAL								**$226,132**	**$32,862**	**$258,994**
2.0	**DEMOLITION, CLEARING AND GRUBBING**										
2.1	Clearing & grubbing incl. clearing of existing creek, tree removal etc	10,492	sq. m	$0.53	60%	$3,336	180%	$10,009	$5,561	$1,112	$6,673
2.2	Demolish existing buildings	1,100	sq. m	$62.10	80%	$54,648	140%	$95,634	$68,310	$6,831	$75,141
2.2	Demolish access path/driveway across channel	370	sq. m	$49.50	70%	$12,821	160%	$29,304	$18,315	$2,747	$21,062
2.3	Strip topsoil, stockpile, respread as per landscape plans (excludes any topsoil improvement works.)	1,574	cu. m	$18.00	70%	$19,830	160%	$45,325	$28,329	$4,249	$32,578
2.4	Dispose of excess/unsuitable topsoil (nominal 10% allowance, assume 150mm depth)	173	tonne	$54.18	80%	$7,504	140%	$13,132	$9,380	$938	$10,318
2.5	Cartage	3,148	cu. m	$0.57	80%	$1,435	140%	$2,512	$1,795	$179	$1,974
	SUBTOTAL								**$131,690**	**$16,055**	**$147,745**
3.0	**EARTHWORKS**										
3.1	**Cut to fill or disposal in all classes of material**										
3.1.1	**Basin Earthworks**										
3.1.1.1	Total Cut to disposal - Basin 08 (assume all contaminated)	12,444	cu. m	$8.05	60%	$60,105	180%	$180,314	$100,175	$20,034	$120,209
3.1.1.2	Total Fill - Basin 08 (assume all fill from cut)	611	cu. m	$13.55	60%	$4,967	180%	$14,902	$8,280	$1,655	$9,935
3.2.3	Basin areas with no structures above (biofilter area excluded): Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum).	2,498	sq. m	$5.00	60%	$7,495	180%	$22,484	$12,492	$2,497	$14,989
3.1.1.3	Basin areas with structures above: Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum). Place granular fill (DGB20 or similar) in layers <200 mm and compact with roller above). Place/compact clean fill in layers. Compact upper 500 mm of subgrade to min. DDR of 100%. Level 1 Earthworks Control used in fill placement	4,460	sq. m	$20.00	60%	$53,517	180%	$160,551	$89,196	$17,838	$107,034
3.1.2	**Channel Earthworks**				80%	$-	140%	$-	$-	$-	$-
3.1.2.1	Total Cut to disposal - Channel 08-1 (assume all contaminated)	1,694	cu. m	$8.05	60%	$8,182	180%	$24,546	$13,637	$2,727	$16,364
3.1.2.2	Total Cut to Fill - Channel 08-1 (assume all fill from cut)	13	cu. m	$13.55	60%	$106	180%	$317	$177	$34	$211
3.1.2.3	Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum).	1,927	sq. m	$5.00	60%	$5,781	180%	$17,343	$9,635	$1,927	$11,562
3.1.3	**Pipe Earthworks**				80%	$-	140%	$-	$-	$-	$-
3.1.3.1	Total Cut - Pipe B8	2,911	cu. m	$70.00	80%	$163,016	140%	$285,278	$203,770	$20,377	$224,147
3.1.4	**Disposal cost**										
3.1.4.1	Cost of disposal of soil as "No Contamination" at an approved landfill within 10km	8,427	cu.m	$80.00	60%	$404,496	180%	$1,213,488	$674,160	$134,832	$808,992
3.1.4.2	Cost of disposal of soil as "Low Level Contamination" (i.e. General Solid Waste) at an approved landfill within 10km	6,282	tonne	$350.00	60%	$1,319,241	180%	$3,957,723	$2,198,735	$439,747	$2,638,482
3.1.4.3	Additional allowance for cartage of contaminated soil to Eastern Creek Landfill an additional 10km (i.e. 20km one-way total distance)	114,220	cu.m / km	$0.57	70%	$45,574	160%	$104,169	$65,106	$9,765	$74,871
3.2	**Trim, consolidation and final shaping of batters, basins, berms, channels, swales, wetland etc**	10,492	sq. m	$2.95	70%	$21,666	160%	$49,522	$30,952	$4,642	$35,594
3.3	**Installation and compaction of clay liner**				80%	$-	140%	$-	$-	$-	$-
3.3.1	Clay liner provided to base and to top of batters of basin, compacted to specified density, thickness and permeability	7,001	sq. m	$21.67	70%	$106,213	160%	$242,772	$151,733	$22,759	$174,492
3.4	**Dewatering of existing onsite dams, including allowance for management of discharge water**	0	sq. m	$66.50	70%	$-	160%	$-	$-	$-	$-
	SUBTOTAL								**$3,558,048**	**$678,835**	**$4,236,883**
4.0	**BASIN INLET, OUTLET AND BIOFILTER DRAINAGE**										
4.1	**Pipes/Culverts**										
4.1.1	(2x) 900 x 300 RCBC (refer dwg B0803) - low flow outlet to biofilter	92	lin. m	$457.00	70%	$29,431	160%	$67,270	$42,044	$6,307	$48,351
4.1.1	DN900 RCP (refer dwg B0803) - upto 50% flows to basin	16	lin. m	$630.00	70%	$7,056	160%	$16,128	$10,080	$1,512	$11,592
4.1.3	DN225 pipe (biofilter connection)	26	lin. m	$102.00	70%	$1,856	160%	$4,243	$2,652	$398	$3,050
4.1.4	DN300 pipe (early discharge)	17	lin. m	$170.00	70%	$2,023	160%	$4,624	$2,890	$434	$3,324
4.1.5	DN600 pipe (biofilter outlet)	100	lin. m	$340.00	70%	$23,800	160%	$54,400	$34,000	$5,100	$39,100
4.1.6	DN525 (low flow outlet under spillway)	12	lin. m	$290.00	70%	$2,436	160%	$5,568	$3,480	$522	$4,002
4.1.7	DN300 pipe (submerged distribution pipes through gabions, 10 x 1 m lengths)	10	lin. m	$170.00	70%	$1,190	160%	$2,720	$1,700	$255	$1,955
4.2	**Headwall(s) with wingwalls to suit:**				80%	$-	140%	$-	$-	$-	$-
4.1.1	(2x) 900 x 300 RCBC (refer dwg B0803) - low flow outlet to biofilter	1	each	$5,000.00	70%	$3,500	160%	$8,000	$5,000	$750	$5,750
4.1.1	DN900 RCP (refer dwg B0803) - upto 50% flows to basin	1	each	$3,500.00	60%	$2,151	180%	$6,454	$3,586	$717	$4,303
4.4	**Baseslab(s) to suit**				80%	$-	140%	$-	$-	$-	$-
4.4.1	(2x) 900 x 300 RCBC (refer dwg B0803) - low flow outlet to biofilter	12	cu. m	$333.00	70%	$2,895	160%	$6,617	$4,136	$620	$4,756
4.5	**Bedding material to suit**				80%	$-	140%	$-	$-	$-	$-
4.5.1	(2x) 900 x 300 RCBC (refer dwg B0803) - low flow outlet to biofilter	17	cu. m	$63.00	70%	$730	160%	$1,669	$1,044	$156	$1,200
	DN900 RCP (refer dwg B0803) - upto 50% flows to basin	3	cu. m	$63.00							
4.5.3	DN225 pipe (biofilter connection)	2	cu. m	$63.00	70%	$83	160%	$189	$118	$18	$136
4.5.4	DN300 pipe (early discharge)	1	cu. m	$63.00	70%	$56	160%	$129	$81	$11	$92
4.5.5	DN600 pipe (biofilter outlet)	11	cu. m	$63.00	70%	$496	160%	$1,134	$709	$106	$815
4.5.6	DN525 (low flow outlet under spillway)	1	cu. m	$63.00	70%	$54	160%	$122	$77	$11	$88
4.5.7	DN300 pipe (submerged distribution pipes through gabions, 10 x 1 m lengths)	1	cu. m	$63.00	70%	$33	160%	$76	$48	$6	$54
4.6	**Pits**				80%	$-	140%	$-	$-	$-	$-
4.6.1	Reinforced concrete junction pits (RMS Standard DRG R0220-35)				70%	$-	160%	$-	$-	$-	$-
4.6.2	Diversion Pit (Pit B08.5) - 2.17 m deep	1	each	$2,550.00	70%	$1,785	160%	$4,080	$2,550	$383	$2,933
	Pit depths in excess of 900 mm (100 mm increments)	13	each	$152.00	70%	$1,351	160%	$3,089	$1,931	$289	$2,220
4.6.3	Pit Cover	1	each	$340.00	70%	$238	160%	$544	$340	$51	$391
4.7	**Gross Pollutant Trap(s)**										
4.7.1	GPT pit (treatment flow 1.43 m^3/s)	1	each	$55,000.00	60%	$33,000	180%	$99,000	$55,000	$11,000	$66,000
4.8	**Gabion Walls**				80%	$-	140%	$-	$-	$-	$-
4.8.1	1m x 1m x 1m depth gabion baskets for 112 m^2 area	112	each	$306.42	70%	$24,023	160%	$54,910	$34,320	$5,147	$39,467
4.8.2	Rock filling for baskets (112 m^3)	112	cu. m	$77.35	70%	$6,064	160%	$13,861	$8,664	$1,299	$9,963
4.9	**Channels**				80%	$-	140%	$-	$-	$-	$-
4.9.1	Rock lined pilot distrubition channel (660 mm width x 50 mm depth x 156.6 m total length)	5	cu. m	$72.00	70%	$260	160%	$595	$373	$55	$428
4.9.2	High flow bypass channel (concrete, 150mm deep)	155	cu. m	$333.00	70%	$36,119	160%	$82,557	$51,599	$7,739	$59,338
4.10	**Biofiltration cells (1607 m^2 total area)**				80%	$-	140%	$-	$-	$-	$-
4.10.1	Filter media layer at 400 mm depth (Top Soil)	643	cu. m	$49.00	70%	$22,048	160%	$50,396	$31,498	$4,724	$36,222
4.10.2	Transition layer at 450 mm depth - Sand media (General Notes)	723	cu. m	$49.00	70%	$24,804	160%	$56,695	$35,435	$5,315	$40,750
4.10.3	Drainage layer at 150 mm depth (Blue metal)	241	cu. m	$75.00	70%	$12,655	160%	$28,926	$18,079	$2,712	$20,791
4.10.4	Biofiltration cells vegetation (mix tube stock - 200 mm potted plants)	1,607	sq. m	$24.00	80%	$30,854	140%	$53,995	$38,568	$3,857	$42,425
4.10.5	Backflow/overflow weirs (concrete, 150mm deep)	9	cu. m	$333.00	70%	$2,203	160%	$5,035	$3,147	$472	$3,619
4.10.6	Wetland Distribution channel batters vegetation (assume 0.6 * channel area of 171.5 m^2) (mix tube stock - 200 mm potted plants)	103	sq. m	$24.00	80%	$1,976	140%	$3,457	$2,470	$247	$2,717
4.1	**Maintenance Path**				80%	$-	140%	$-	$-	$-	$-
4.11.1	Maintenance Path - concrete, within base of basin	167	cu. m	$333.00	70%	$38,846	160%	$88,791	$55,495	$8,324	$63,819
4.11.2	Maintenance Path - concrete around top of basin batter	43	cu. m	$333.00	70%	$9,911	160%	$22,654	$14,159	$2,124	$16,283
4.12	**Multiple outlet structure**										
4.12.1	Cylindrical structure to spillway level - concrete (5 m circumference, 150 mm thick, 1.22 m high)	1	cu. m	$341.00	80%	$250	140%	$437	$313	$30	$343
4.12.2	Formwork (sides of walls)	12	sq. m	$231.00	80%	$2,255	140%	$3,945	$2,819	$281	$3,100
4.12	**Inlet Spillway**				80%	$-	140%	$-	$-	$-	$-
4.12.1	Scour protection	78	sq. m	$72.00	70%	$3,931	160%	$8,986	$5,616	$842	$6,458
4.12.2	Geotextile	78	sq. m	$8.75	80%	$546	140%	$956	$683	$68	$751
4.1	**Outlet Spillway**				80%	$-	140%	$-	$-	$-	$-
4.13.1	Concrete 25 MPa (concrete spillway, 8.5 m length x 150 mm thick)	8	cu. m	$333.00	70%	$1,958	160%	$4,476	$2,798	$419	$3,217
4.13.2	Scour protection - rock mattress 230 mm depth thickness	165	sq. m	$72.00	70%	$8,316	160%	$19,008	$11,880	$1,782	$13,662
4.13.3	Scour protection - rock mattress 2 x 230 mm depth thickness	39	sq. m	$144.00	70%	$3,931	160%	$8,986	$5,616	$842	$6,458
4.13.4	Geotextile	204	sq. m	$8.75	80%	$1,428	140%	$2,499	$1,785	$179	$1,964
4.15	**Subsoil Drainage**										
4.15.1	Subsoil drainage (slotted flexible coil pipe) linear along the length of the biofilter basin at 1 m spacings	300	lin. m	$16.25	80%	$3,900	140%	$6,825	$4,875	$488	$5,363
4.16	**Sandstone Wall**										
4.16.1	Staggered sandstone stepwall - n/a	0	cu. m	$240.00	60%	$-	180%	$-	$-	$-	$-
	SUBTOTAL								**$501,658**	**$75,587**	**$577,245**
5.0	**STORMWATER DRAINAGE (U/S OF BASIN)**										
5.1	**Pipes/Culverts**				80%	$-	140%	$-	$-	$-	$-
5.1.1	1800 x 900 RCBC Class 4 - Pipe B8.1	71	lin. m	$1,500.00	70%	$74,057	160%	$169,272	$105,795	$15,869	$121,664
5.1.2	2100 x 900 RCBC Class 4 - Pipe B8.2	70	lin. m	$1,700.00	70%	$83,300	160%	$190,400	$119,000	$17,850	$136,850
5.1.2	2100 x 900 RCBC Class 4 - Pipe B8.3	70	lin. m	$1,700.00	70%	$83,300	160%	$190,400	$119,000	$17,850	$136,850

5.1.3	2700 x 900 RCBC Class 4 - Pipe B8.4	53	lin. m	$1,900.00	70%	$70,490	160%	$161,120	$100,700	$15,105	$115,805
5.1.3	2700 x 900 RCBC Class 4 - Pipe B8.5	64	lin. m	$1,900.00	70%	$85,120	160%	$194,560	$121,600	$18,240	$139,840
5.2	**Headwall(s) with wingwalls to suit:**				80%	$-	140%	$-	$-	$-	$-
	2700 x 900 RCBC Class 4 - Pipe B8.5	1	each	$17,000.00	70%	$11,900	160%	$27,200	$17,000	$2,550	$19,550
5.4	**Baseslab(s) to suit**				80%	$-	140%	$-	$-	$-	$-
5.1.1	1800 x 900 RCBC Class 4 - Pipe B8.1	19	cu.m	$333.00	80%	$5,073	140%	$8,878	$6,342	$633	$6,975
5.1.2	2100 x 900 RCBC Class 4 - Pipe B8.2	22	cu.m	$333.00	80%	$5,874	140%	$10,280	$7,343	$734	$8,077
5.1.3	2100 x 900 RCBC Class 4 - Pipe B8.3	22	cu.m	$333.00	80%	$5,874	140%	$10,280	$7,343	$734	$8,077
5.1.2	2700 x 900 RCBC Class 4 - Pipe B8.4	21	cu.m	$333.00	80%	$5,718	140%	$10,007	$7,148	$715	$7,863
5.1.3	2700 x 900 RCBC Class 4 - Pipe B8.5	26	cu.m	$333.00	80%	$6,905	140%	$12,084	$8,632	$862	$9,494
5.5	**Bedding material to suit**										
5.1.1	1800 x 900 RCBC Class 4 - Pipe B8.1	22	cu.m	$63.00	70%	$980	160%	$2,239	$1,400	$210	$1,610
5.1.2	2100 x 900 RCBC Class 4 - Pipe B8.2	25	cu.m	$63.00	70%	$1,111	160%	$2,540	$1,588	$238	$1,826
5.1.3	2100 x 900 RCBC Class 4 - Pipe B8.3	25	cu.m	$63.00	70%	$1,111	160%	$2,540	$1,588	$238	$1,826
5.1.2	2700 x 900 RCBC Class 4 - Pipe B8.4	24	cu.m	$63.00	70%	$1,052	160%	$2,404	$1,503	$225	$1,728
5.1.3	2700 x 900 RCBC Class 4 - Pipe B8.5	29	cu.m	$63.00	70%	$1,270	160%	$2,903	$1,815	$272	$2,087
5.6	**Pits**				80%	$-	140%	$-	$-	$-	$-
4.6.1	Reinforced concrete junction pits (RMS Standard DRG R0220-35)										
4.6.2	Junction Pit (Pit B08.1) - 2.56 m deep	1	each	$2,550.00	70%	$1,785	160%	$4,080	$2,550	$383	$2,933
4.6.2	Junction Pit (Pit B08.2) - 2.39 m deep	1	each	$2,550.00	70%	$1,785	160%	$4,080	$2,550	$383	$2,933
4.6.2	Junction Pit (Pit B08.3) - 3.08 m deep	1	each	$2,550.00	70%	$1,785	160%	$4,080	$2,550	$383	$2,933
4.6.2	Junction Pit (Pit B08.4) - 3.38 m deep	1	each	$2,550.00	70%	$1,785	160%	$4,080	$2,550	$383	$2,933
	Pit depths in excess of 900 mm (100 mm increments)	78	each	$152.00	70%	$8,310	160%	$18,994	$11,872	$1,780	$13,652
4.6.3	Pit Cover	4	each	$340.00	70%	$952	160%	$2,176	$1,360	$204	$1,564
5.7	**Channels**				80%	$-	140%	$-	$-	$-	$-
	n/a										
	SUBTOTAL								**$651,229**	**$95,838**	**$747,067**
6.0	**STORMWATER DRAINAGE (D/S OF BASIN)**										
6.1	**Pipes/Culverts**				80%	$-	140%	$-	$-	$-	$-
6.1.1	n/a		lin. m		70%	$-	160%	$-	$-	$-	$-
6.2	**Headwall(s) with wingwalls to suit:**				80%	$-	140%	$-	$-	$-	$-
	n/a				80%	$-	140%	$-	$-	$-	$-
6.4	**Baseslab(s) to suit**				80%	$-	140%	$-	$-	$-	$-
5.4.1	n/a		cu. m	$333.00	80%	$-	140%	$-	$-	$-	$-
5.5	**Bedding material to suit**										
5.5.1	n/a		cu. m	$63.00	70%	$-	160%	$-	$-	$-	$-
5.6	**Pits**				80%	$-	140%	$-	$-	$-	$-
	n/a		each								
5.7	**Channels**				80%	$-	140%	$-	$-	$-	$-
5.7.1	Rock lined low flow channel (refer dwg B0886)	519	sq. m	$72.00	70%	$26,163	160%	$59,802	$37,377	$5,605	$42,982
5.7.2	Geotextile under rock	519	sq. m	$8.75	80%	$3,634	140%	$6,359	$4,543	$453	$4,996
5.7.3	Vegetated channel (either side of rock lined lo-flow) (refer dwg B0886), grassed (half of vegetated channel area)	850	sq. m	$14.80	80%	$10,064	140%	$17,612	$12,580	$1,258	$13,838
5.7.4	Channel batters vegetation, assumed half of area vegetated, other than grassed (mix tube stock - 200 mm potted plants)	850	sq. m	$24.00	80%	$16,320	140%	$28,560	$20,400	$2,040	$22,440
5.7.5	Maintenance path/berm - concrete	0	cu. m	$333.00	70%	$-	160%	$-	$-	$-	$-
6.8	**Scour Protection**										
6.8.1	Scour protection at Basin Outlet Pipes	117	sq. m	$72.00	70%	$5,897	160%	$13,478	$8,424	$1,264	$9,688
	SUBTOTAL								**$83,324**	**$10,621**	**$93,945**
7.0	**MINOR LANDSCAPING**										
	SUBTOTAL								**$-**	**$-**	**$-**
	CONSTRUCTION TOTAL								**$5,152,081**	**$909,799**	**$6,061,880**
8.0	**PROJECT MANAGEMENT AND SUPERVISION**										
8.1	15% construction cost								**$909,281.94**		
9.0	**CONTINGENCIES**										
9.1	Inherent contingency									**$909,799**	
9.2				$-	60%	$-	180%	$-	$-	$-	$-
9.3				$-	70%	$-	160%	$-	$-	$-	$-
	CONSTRUCTION TOTAL, excluding GST										**$6,971,162**
	GST										**$697,116**
	CONSTRUCTION TOTAL, including GST										**$7,668,278**
	CONSTRUCTION TOTAL, rounded										**$7,669,000**

NB33 Drainage System - Preliminary Construction Cost Estimate Thursday, 24 January 2019

Drawing sets:

	ITEM NO. DESCRIPTION OF WORK	QUANTITY	UNIT	BASE RATE	CONTIGENCY LOWEST (%)	CONTIGENCY LOWEST COST	CONTIGENCY HIGHEST (%)	CONTIGENCY HIGHEST COST	COST	INHERENT CONTINGENCY	COST + CONTINGENCY
1.0	**GENERAL AND PRELIMINARIES**										
1.1	Site establishment, facilities & de-establishment	1	item	$100,000.00	70%	$70,000	160%	$160,000	$100,000	$15,000	$115,000
1.2	Traffic management	1	item	$5,000.00	70%	$3,500	160%	$8,000	$5,000	$750	$5,750
1.3	Temporary site fencing incl gates, supports etc	2,412	lin. m	$16.25	80%	$31,362	140%	$54,883	$39,203	$3,919	$43,122
1.4	Provision and maintenance of sediment & erosion control	1	item	$40,000.00	70%	$28,000	160%	$64,000	$40,000	$6,000	$46,000
1.5	Clean water diversions, per month	3	months	$10,000.00	70%	$21,000	160%	$48,000	$30,000	$4,500	$34,500
	SUBTOTAL								**$214,203**	**$30,169**	**$244,372**
2.0	**DEMOLITION, CLEARING AND GRUBBING**										
2.1	Clearing & grubbing incl. clearing of existing creek, tree removal etc	573	sq. m	$0.53	60%	$182	180%	$547	$304	$60	$364
2.2	Demolish existing buildings	0	sq. m	$62.10	70%	$-	160%	$-	$-	$-	$-
2.3	Demolish roads/access paths/driveways within proposed footprint	80	sq. m	$49.50	70%	$2,772	160%	$6,336	$3,960	$594	$4,554
2.4	Strip topsoil, stockpile, respread as per landscape plans (excludes any topsoil improvement works.)	86	cu. m	$18.00	80%	$1,238	140%	$2,166	$1,548	$154	$1,702
2.5	Dispose of excess/unsuitable topsoil (nominal 10% allowance)	9	tonne	$54.18	80%	$410	140%	$717	$513	$50	$563
2.6	Cartage	172	cu. m / km	$0.57	80%	$78	140%	$137	$98	$10	$108
	SUBTOTAL								**$6,423**	**$869**	**$7,292**
3.0	**EARTHWORKS**										
3.1	**Cut to fill or disposal in all classes of material**										
3.2	**Basin Earthworks**										
3.3	**Channel Earthworks**										
3.3.1	Channel NB33 Total cut to disposal - channel earthworks (assume all contaminated)	459	cu. m	$8.05	60%	$2,217	180%	$6,651	$3,695	$739	$4,434
3.3.2	Channel NB33 Total fill - channel earthworks (assume all fill from cut)	0	cu. m	$13.55	60%	$-	180%	$-	$-	$-	$-
3.3.3	All channels: Rolling of exposed surface	5	sq. m	$5.00	60%	$15	180%	$45	$25	$5	$30
3.4	**Disposal cost**										
3.4.1	Cost of disposal of soil as "No Contamination" at an approved landfill within 10km	0	cu.m	$80	80%	$-	140%	$-	$-	$-	$-
3.4.2	Cost of disposal of soil as "Low Level Contamination" (i.e. General Solid Waste) at an approved landfill within 10km	829	tonne	$350	80%	$232,232	140%	$406,406	$290,290	$29,029	$319,319
3.4.3	Additional allowance for cartage of contaminated soil to Eastern Creek Landfill an additional 10km (i.e. 20km one-way total distance)	15080	cu.m / km	$0.57	80%	$6,876	140%	$12,034	$8,596	$859	$9,455
3.5	**Pipe Excavation**										
3.5.1	Total Cut from 12D model	295	cu. m	$70.00	70%	$14,455	160%	$33,040	$20,650	$3,098	$23,748
3.6	**Trim, consolidation and final shaping of batters, basins, berms, channels, swales, wetland etc**	459	sq. m	$3.55	70%	$1,141	160%	$2,607	$1,630	$244	$1,874
3.7	**Installation and compaction of clay liner as specified**										
3.8	**Dewatering of onsite dams, including allowance for management of discharge water**										
	SUBTOTAL								**$324,886**	**$33,973**	**$358,859**
4.0	**STORMWATER DRAINAGE**										
4.1	**Pipes/Culverts**										
4.1.1	2x2400x600 mm RCBC	180	lin. m	$1,000.00	70%	$126,000	160%	$288,000	$180,000	$27,000	$207,000
4.2	**Headwall(s) and wingwall(s) to suit**										
4.2.1	Headwall to suit 2x2400x600 RCBC	1	no	$12,000.00	70%	$8,400	160%	$19,200	$12,000	$1,800	$13,800
4.3	**Base slab(s) to suit**										
4.3.1	Baseslab to suit 2x2400x600 RCBC	27	cu. m	$333.00	80%	$7,193	140%	$12,587	$8,991	$899	$9,890
4.4	**Bedding material to suit**										
4.4.1	Bedding to suit 2x2400x600 RCBC	180	cu. m	$63.00	80%	$9,072	140%	$15,876	$11,340	$1,134	$12,474
4.5	**Pits**										
4.5.1	Reinforced concrete junction pits (RMS Standard DRG R0220-35)	2	each	$2,550.00	70%	$3,570	160%	$8,160	$5,100	$765	$5,865
4.5.2	Pit depth increments in excess of 900 mm (Depths : 2.13 m ; 2.14 m ; 2.60 m ; 1.78 m ; 1.84 m)	8	each	$152.00	70%	$802	160%	$1,834	$1,147	$171	$1,318
4.5.3	Pit cover	2	each	$340.00	70%	$476	160%	$1,088	$680	$102	$782
4.5.4	**Channels**										
4.5.5	Rock lined low flow channel	1,600	sq. m	$72.00	70%	$80,640	160%	$184,320	$115,200	$17,280	$132,480
4.5.6	Geotextile under rock (11,549 m^2)	1,600	sq. m	$8.75	80%	$11,200	140%	$19,600	$14,000	$1,400	$15,400
4.5.7	Vegetated channel (either side of rock lined low-flow) assume grassed (half of vegetated channel area)	1,000	sq. m	$8.75	70%	$6,125	160%	$14,000	$8,750	$1,313	$10,063
4.5.8	Channel batters vegetation, assumed half of area vegetated, other than grassed (mix tube stock - 200 mm potted plants)	6,000	no	$18.00	80%	$86,400	140%	$151,200	$108,000	$10,800	$118,800
	SUBTOTAL								**$465,208**	**$62,664**	**$527,872**
5.0	**MINOR LANDSCAPING**										
	SUBTOTAL								**$-**	**$-**	**$-**
	CONSTRUCTION TOTAL								**$1,010,720**	**$127,675**	**$1,138,395**
6.0	**PROJECT MANAGEMENT AND SUPERVISION**										
6.1	15% construction cost								**$170,759**		
7.0	**CONTINGENCIES**										
7.1	Inherent contingency									**$127,675**	
7.2			tonne	$350.00	80%	$-	140%	$-	$-	$-	$-
7.3			cu. m / km	$0.57	80%	$-	140%	$-	$-	$-	$-
	CONSTRUCTION TOTAL, excluding GST										**$1,309,154**
	GST										**$130,915**
	CONSTRUCTION TOTAL, including GST										**$1,440,070**
	CONSTRUCTION TOTAL, rounded										**$1,441,000**

B_Fourth Draft Detailed concept design culverts — Thursday, 29 November 2018

Drawing sets:

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	BASE RATE	CONTIGENCY LOWEST (%)	CONTIGENCY LOWEST COST	CONTIGENCY HIGHEST (%)	CONTIGENCY HIGHEST COST	COST	INHERENT CONTINGENCY	COST + CONTINGENCY
1.0	**GENERAL AND PRELIMINARIES**										
1.1	Site establishment, facilities & de-establishment	0	item	$100,000.00	70%	$-	160%	$-	$-	$-	$-
1.2	Traffic management	0	item	$5,000.00	70%	$-	160%	$-	$-	$-	$-
1.3	Temporary site fencing incl gates, supports etc	0	lin. m	$16.25	80%	$-	140%	$-	$-	$-	$-
1.4	Provision and maintenance of sediment & erosion control	0	item	$40,000.00	70%	$-	160%	$-	$-	$-	$-
1.5	Clean water diversions, per month	0	months	$10,000.00	70%	$-	160%	$-	$-	$-	$-
	SUBTOTAL								**$-**	**$-**	**$-**
2.0	**DEMOLITION, CLEARING AND GRUBBING**										
2.1	Clearing & grubbing incl. clearing of existing creek, tree removal etc	0	sq. m	$0.53	60%	$-	180%	$-	$-	$-	$-
2.2	Demolish existing buildings	0	sq. m	$62.10	70%	$-	160%	$-	$-	$-	$-
2.3	Demolish roads/access paths/driveways within proposed footprint	0	sq. m	$49.50	70%	$-	160%	$-	$-	$-	$-
2.4	Strip topsoil, stockpile, respread as per landscape plans (excludes any topsoil improvement works.)	0	cu. m	$18.00	80%	$-	140%	$-	$-	$-	$-
2.5	Dispose of excess/unsuitable topsoil (nominal 10% allowance)	0	tonne	$54.18	80%	$-	140%	$-	$-	$-	$-
2.5	Cartage	0	cu.m / km	$0.57	80%	$-	140%	$-	$-	$-	$-
	SUBTOTAL								**$-**	**$-**	**$-**
3.0	**EARTHWORKS**										
3.1	**Cut to fill or disposal in all classes of material**										
3.2	**Basin Earthworks**										
3.3	**Channel Earthworks**										
3.4	**Pipe Excavation**										
3.4.1	Total Cut (estimate)	1,374	cu. m	$5.00	70%	$4,809	160%	$10,991	$6,870	$1,030	$7,900
3.5	**Trim, consolidation and final shaping of batters, basins, berms, channels, swales, wetland etc**				70%	$-	160%	$-	$-	$-	$-
3.6	**Installation and compaction of clay liner as specified**										
3.7	**Dewatering of onsite dams, including allowance for management of discharge water**	0	sq. m	$66.50	60%	$-	180%	$-	$-	$-	$-
	SUBTOTAL								**$6,870**	**$1,030**	**$7,900**
4.0	**STORMWATER DRAINAGE**										
4.1	**Pipes/Culverts**										
4.1.1	3 x 3300 x 2400 mm RCBC	81	lin. m	$7,170.00	70%	$404,431	160%	$924,414	$577,759	$86,663	$664,422
4.1.2			lin. m	$3,000.00	70%	$-	160%	$-	$-	$-	$-
4.1.3	2 x 3300 mm link slab	54	lin. m	$985.00	70%	$37,040	160%	$84,663	$52,915	$7,936	$60,851
4.1.4			cu.m.	$456.00	60%	$-	180%	$-	$-	$-	$-
4.2	**Headwall(s) and wingwalls to suit**										
	2 headwalls with wingwalls to suit	2	no	$25,000.00	60%	$30,000	180%	$90,000	$50,000	$10,000	$60,000
4.3	**Wingwall(s) to suit**										
4.4	**Base slab(s) to suit**										
4.4.1	2 x base slab to support 1x3300x2400	27	cu. m	$333.00	70%	$6,198	160%	$14,168	$8,855	$1,328	$10,183
4.4.2	1 x base slab to support 1 x 3300 x 2700 mm RCBC and 2 x 3300 link slab	40	cu. m	$333.00	70%	$9,298	160%	$21,252	$13,283	$1,992	$15,275
4.5	**Pits**										
4.6	**Channels**										
4.6.1	Scour protection - rock mattress 230 mm thickness at 16.5 m length and 50 m	1,634	sq.m	$144.00	70%	$164,657	160%	$376,358	$235,224	$35,284	$270,508
	SUBTOTAL								**$938,036**	**$143,203**	**$1,081,239**
5.0	**DISPOSAL COSTS**										
5.1	Cost of disposal of soil as "No Contamination" at an approved landfill within 10km	811	cu.m	$80	80%	$51,897	140%	$90,820	$64,872	$6,486	$71,358
5.2	Cost of disposal of soil as "Low Level Contamination" (i.e. General Solid Waste) at an approved landfill within 10km	619	tonne	$350	80%	$173,404	140%	$303,457	$216,755	$21,676	$238,431
5.3	Additional allowance for cartage of contaminated soil to Eastern Creek Landfill an additional 10km (i.e. 20km one-way total distance)	11260	cu.m / km	$0.57	80%	$5,135	140%	$8,985	$6,419	$641	$7,060
	SUBTOTAL								**$288,046.00**	**$28,802.75**	**$316,848.75**
6.0	**MINOR LANDSCAPING**										
	SUBTOTAL								**$-**	**$-**	**$-**
	CONSTRUCTION TOTAL								**$1,232,952**	**$173,036**	**$1,405,988**
7.0	**PROJECT MANAGEMENT AND SUPERVISION**										
7.1	15% construction cost								**$210,898**		
8.0	**CONTINGENCIES**										
8.1	Inherent contingency									**$173,036**	
8.2			tonne	$350.00	80%	$-	140%	$-	$-	$-	$-
8.3			cu.m / km	$0.57	80%	$-	140%	$-	$-	$-	$-
	CONSTRUCTION TOTAL, excluding GST										**$1,616,886**
	GST										**$161,689**
	CONSTRUCTION TOTAL, including GST										**$1,778,575**
	CONSTRUCTION TOTAL, rounded										**$1,779,000**

APPENDIX B JWP MODIFIED COSTS OF REPRESENTATIVE BASINS (B22, B08, Drainage System Without Basins Nb33 And Culvert B_Fourth).

B22 Drainage System - Preliminary Construction Cost Estimate Thursday, 24 January 2019

Drawing set: 30011388-DDR-1012 to 30011388-DDR-B2286

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	BASE RATE	CONTIGENCY				COST	INHERENT CONTINGENCY	COST + CONTINGENCY
					LOWEST (%)	LOWEST COST	HIGHEST (%)	HIGHEST COST			
1.0	**GENERAL AND PRELIMINARIES**										
1.1	Site establishment, facilities & de-establishment	1	item	$ 100,000.00	70%	$ 70,000	160%	$ 160,000	$ 100,000	$ 15,000	$ 115,000
1.2	Traffic management	1	item	$ 10,000.00	70%	$ 7,000	160%	$ 16,000	$ 10,000	$ 1,500	$ 11,500
1.3	Temporary site fencing incl gates, supports etc	1,500	lin. m	$ 20.00	80%	$ 24,000	140%	$ 42,000	$ 30,000	$ 3,000	$ 33,000
1.4	Provision and maintenance of sediment & erosion control	1	item	$ 50,000.00	70%	$ 35,000	160%	$ 80,000	$ 50,000	$ 7,500	$ 57,500
1.5	Clean water diversions, per month	6	months	$ 15,000.00	70%	$ 63,000	160%	$ 144,000	$ 90,000	$ 13,500	$ 103,500
	SUBTOTAL								**$ 280,000**	**$ 40,500**	**$ 320,500**
2.0	**DEMOLITION, CLEARING AND GRUBBING**										
2.1	Clearing & grubbing incl. clearing of existing creek, tree removal etc	25,458	sq. m	$ 2.50	60%	$ 38,186	180%	$ 114,559	$ 63,644	$ 12,729	$ 76,373
2.2	Demolish existing buildings	2,385	sq. m	$ 62.10	70%	$ 103,676	160%	$ 236,974	$ 148,109	$ 22,216	$ 170,325
2.3	Demolish roads/access paths/driveways within proposed footprint	850	sq. m	$ 49.50	70%	$ 29,453	160%	$ 67,320	$ 42,075	$ 6,311	$ 48,386
2.4	Strip topsoil, stockpile, respread as per landscape plans (excludes any topsoil improvement works.)	3,819	cu. m	$ 18.00	80%	$ 54,988	140%	$ 96,230	$ 68,736	$ 6,873	$ 75,609
2.5	Dispose of excess/unsuitable topsoil (nominal 10% allowance)	420	tonne	$ 54.18	80%	$ 18,207	140%	$ 31,863	$ 22,760	$ 2,275	$ 25,035
2.5	Cartage	7,637	cu. m	$ 0.80	80%	$ 4,888	140%	$ 8,554	$ 6,110	$ 611	$ 6,721
	SUBTOTAL								**$ 351,434**	**$ 51,015**	**$ 402,449**
3.0	**EARTHWORKS**										
3.1	**Cut to fill or disposal in all classes of material**										
3.2	**Basin Earthworks**										
3.2.1	Basin 22: Total cut to disposal (assume no contaminated)	23,654	cu. m	$ 8.05	60%	$ 114,249	180%	$ 342,746	$ 190,415	$ 38,083	$ 228,498
3.2.2	Basin 22: Total fill (assume all fill from cut)	823	cu. m	$ 13.55	60%	$ 6,691	180%	$ 20,073	$ 11,152	$ 2,230	$ 13,382
3.2.3	Basin areas with no structures above (biofilter area excluded): Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum).	8,708	sq. m	$ 5.00	60%	$ 26,125	180%	$ 78,374	$ 43,541	$ 8,708	$ 52,249
3.2.4	Basin areas with structures above: Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum). Place granular fill (DGB20 or similar) in layers <200 mm and compact with roller above). Place/compact clean fill in layers. Compact upper 500 mm of subgrade to min. DDR of 100%. Level 1 Earthworks Control used in fill placement	3,163	sq. m	$ 27.00	60%	$ 51,237	180%	$ 153,712	$ 85,396	$ 17,079	$ 102,475
3.3	**Channel Earthworks**										
3.3.1	Total cut to disposal - channel earthworks (assume no contaminated)	6,660	cu. m	$ 8.05	60%	$ 32,168	180%	$ 96,503	$ 53,613	$ 10,723	$ 64,336
3.3.2	Total fill - channel earthworks (assume all fill from cut)	386	cu. m	$ 13.55	60%	$ 3,138	180%	$ 9,415	$ 5,231	$ 1,045	$ 6,276
3.3.3	Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum).	9,348	sq. m	$ 5.00	60%	$ 28,044	180%	$ 84,132	$ 46,740	$ 9,348	$ 56,088
3.4	**Pipe Excavation**										
3.4.1	Total Cut	0	cu. m	$ 70.00	70%	$ -	160%	$ -	$ -	$ -	$ -
3.5	**Disposal cost**										
3.5.1	Cost of disposal of soil as "No Contamination" at an approved landfill within 10km	18528	cu.m	$ 80.00	60%	$ 889,344	180%	$ 2,668,032	$ 1,482,240	$ 296,448	$ 1,778,688
3.5.2	Cost of disposal of soil as "Low Level Contamination" (i.e. General Solid Waste) at an approved landfill within 10km	12965	tonne	$ 370.00	60%	$ 2,878,141	180%	$ 8,634,424	$ 4,796,902	$ 959,380	$ 5,756,282
3.5.3	Additional allowance for cartage of contaminated soil to Eastern Creek Landfill an additional 10km (i.e. 20km one-way total distance)	235720	cu.m / km	$ 0.80	70%	$ 132,003	160%	$ 301,722	$ 188,576	$ 28,286	$ 216,862
3.6	**Trim, consolidation and final shaping of batters, basins, berms,**	21,219	sq. m	$ 2.95	70%	$ 43,817	160%	$ 100,154	$ 62,597	$ 9,388	$ 71,985
3,7	**Installation and compaction of clay liner as specified**										
3.7.1	Clay liner provided to base and to top of batters of basin, compacted to specified density, thickness and permeability	9,491	sq. m	$ 21.67	70%	$ 143,987	160%	$ 329,112	$ 205,696	$ 30,853	$ 236,549
3.8	**Dewatering of existing onsite dams, including allowance for**	620	sq. m	$ 66.50	70%	$ 28,861	160%	$ 65,968	$ 41,230	$ 6,185	$ 47,415
	SUBTOTAL								**$ 7,213,329**	**$ 1,417,757**	**$ 8,631,086**
4.0	**BASIN INLET, OUTLET AND BIOFILTER DRAINAGE**										
4.1	**Pipes/Culverts**										
4.1.1	2 x 1200 x 600 RCBC (GPT Outlet)	11	lin. m	$ 2,000.00	70%	$ 15,120	160%	$ 34,560	$ 21,600	$ 3,240	$ 24,840
4.1.2	2 x 1200 x 900 RCBC (Basin outlet pipes)	160	lin. m	$ 2,500.00	70%	$ 280,000	160%	$ 640,000	$ 400,000	$ 60,000	$ 460,000
4.1.3	2 x 1200 x 300 RCBC (From CHN B22 to Junction Pit)	8	lin. m	$ 1,000.00	70%	$ 5,600	160%	$ 12,800	$ 8,000	$ 1,200	$ 9,200
4.1.4	2 x 1200 x 300 RCBC (From Junction Pit to GPT)	45	lin. m	$ 1,000.00	70%	$ 31,640	160%	$ 72,320	$ 45,200	$ 6,780	$ 51,980
4.2	**Headwall(s) with wingwalls to suit**										
4.2.1	2 x 1200 x 900 RCBC (Basin outlet pipes)	1	each	$ 18,000.00	70%	$ 12,600	160%	$ 28,800	$ 18,000	$ 2,700	$ 20,700
4.4	**Base slab(s) to suit**										
4.4.1	2 x 1200 x 600 RCBC (GPT Outlet)	2	cu. m	$ 750.00	80%	$ 1,458	140%	$ 2,552	$ 1,823	$ 182	$ 2,005
4.4.2	2 x 1200 x 900 RCBC (Basin outlet pipes)	36	cu. m	$ 750.00	80%	$ 21,600	140%	$ 37,800	$ 27,000	$ 2,700	$ 29,700
4.4.3	2 x 1200 x 300 RCBC (From CHN B22 to Junction Pit)	2	cu. m	$ 750.00	80%	$ 1,080	140%	$ 1,890	$ 1,350	$ 135	$ 1,485
4.4.4	2 x 1200 x 300 RCBC (From Junction Pit to GPT)	10	cu. m	$ 750.00	80%	$ 6,102	140%	$ 10,679	$ 7,628	$ 762	$ 8,390
4.5	**Bedding material to suit**										
4.5.1	2 x 1200 x 600 RCBC (GPT Outlet)	4	cu. m	$ 63.00	80%	$ 204	140%	$ 357	$ 256	$ 25	$ 281
4.5.2	2 x 1200 x 900 RCBC (Basin outlet pipes)	60	cu. m	$ 63.00	80%	$ 3,024	140%	$ 5,292	$ 3,780	$ 378	$ 4,158
4.5.3	2 x 1200 x 300 RCBC (From CHN B22 to Junction Pit)	3	cu. m	$ 63.00	80%	$ 151	140%	$ 265	$ 189	$ 19	$ 208
4.5.4	2 x 1200 x 300 RCBC (From Junction Pit to GPT)	17	cu. m	$ 63.00	80%	$ 854	140%	$ 1,495	$ 1,068	$ 107	$ 1,175
4.6	**Pits**										
4.6.1	Junction Pit (upstream of basin and GPT) - 0.8 m deep (Reinforced concrete junction pits (RMS Standard DRG R0220-35))	1	each	$ 2,550.00	70%	$ 1,785	160%	$ 4,080	$ 2,550	$ 383	$ 2,933
4.6.2	Pit depth increments in excess of 900 mm	0	each	$ 200.00	70%	$ -	160%	$ -	$ -	$ -	$ -
4.6.3	Pit cover	1	each	$ 340.00	70%	$ 238	160%	$ 544	$ 340	$ 51	$ 391
4.7	**Gross Pollutant Trap(s)**										
4.7.1	GPT pit (treatment flow 2.07 m^3/s)	1	each	$ 175,000.00	80%	$ 140,000	140%	$ 245,000	$ 175,000	$ 17,500	$ 192,500
4.8	**Gabion Walls**										
4.8.1	n/a	0	cu. m		80%	$ -	140%	$ -	$ -	$ -	$ -
4.9	**Channels**										
4.9.1	Rock lined pilot distribution channel	115	sq. m	$ 195.00	70%	$ 15,725	160%	$ 35,942	$ 22,464	$ 3,370	$ 25,834
4.9.2	High flow bypass channel	0	cu. m	$ 333.00	80%	$ -	140%	$ -	$ -	$ -	$ -
4.10	**Biofiltration cells (0 m^2 total area)**										
4.10.1	Filter media layer at 400 mm depth	0	cu. m	$ 105.00	70%	$ -	160%	$ -	$ -	$ -	$ -
4.10.2	Transition layer at 450 mm depth	0	cu. m	$ 125.00	70%	$ -	160%	$ -	$ -	$ -	$ -
4.10.3	Drainage layer at 150 mm depth	0	cu. m	$ 130.00	70%	$ -	160%	$ -	$ -	$ -	$ -
4.10.4	Biofiltration cells vegetation	0	sq. m	$ 32.00	80%	$ -	140%	$ -	$ -	$ -	$ -
4.10.5	Backflow/overflow weirs	0	cu. m	$ 333.00	70%	$ -	160%	$ -	$ -	$ -	$ -
4.10.6	Wetland Distribution channel batters vegetation	0	sq. m	$ 32.00	80%	$ -	140%	$ -	$ -	$ -	$ -
4.11	**Maintenance Path**										
4.11.1	Maintenance Path - along crest of south batter of basin - concrete	16	cu. m	$ 780.00	80%	$ 9,828	140%	$ 17,199	$ 12,285	$ 1,229	$ 13,514
4.12	**Inlet Spillway**										
4.12.1	Scour protection	270	sq. m	$ 195.00	80%	$ 42,089	140%	$ 73,655	$ 52,611	$ 5,261	$ 57,872
4.12.2	Geotextile	270	sq. m	$ 8.75	80%	$ 1,889	140%	$ 3,305	$ 2,361	$ 236	$ 2,597
4.13	**Outlet Spillway**										

4.13.1	Scour protection	69	sq. m	$ 195.00	70%	$ 9,419	160%	$ 21,528	$ 13,455	$ 2,018	$ 15,473
4.13.2	Geotextile	69	sq. m	$ 8.75	80%	$ 483	140%	$ 845	$ 604	$ 60	$ 664
4.14	**Multiple outlet structure**										
4.14.1	Cylindrical structure to spillway level - concrete (10 m	3	cu. m	$ 750.00	80%	$ 1,710	140%	$ 2,993	$ 2,138	$ 213	$ 2,351
4.14.2	Formwork (sides of walls)	38	sq. m	$ 231.00	80%	$ 7,022	140%	$ 12,289	$ 8,778	$ 878	$ 9,656
4.15	**Sandstone Wall**										
4.15.1	Staggered sandstone stepwall	832	cu. m	$ 240.00	60%	$ 119,808	180%	$ 359,424	$ 199,680	$ 39,936	$ 239,616
4.16	**Subsoil Drainage**										
4.16.1	Subsoil drainage (slotted flexible coil pipe) linear along the length of the biofilter basin at 1 m spacings	960	lin. m	$ 49.00	80%	$ 37,632	140%	$ 65,856	$ 47,040	$ 4,704	$ 51,744
	SUBTOTAL								**$ 1,075,200**	**$ 154,065**	**$ 1,229,265**
5.0	**STORMWATER DRAINAGE (U/S OF BASIN)**										
5.1	**Pipes/Culverts**										
5.1.1	n/a	0	lin. m		80%	$ -	140%	$ -	$ -	$ -	$ -
5.2	**Headwall(s) with wingwalls to suit**										
5.2.1	n/a	0	each		80%	$ -	140%	$ -	$ -	$ -	$ -
5.4	**Base slab(s) to suit**										
5.4.1	n/a	0	cu. m		80%	$ -	140%	$ -	$ -	$ -	$ -
5.5	**Pits**										
5.5.1	N/a										
5.6	**Channels**										
5.6.1	Rock lined low flow channel	2,448	sq. m	$ 195.00	70%	$ 334,152	160%	$ 763,776	$ 477,360	$ 71,604	$ 548,964
5.6.2	Geotextile under rock (2,448 m^2)	2,448	sq. m	$ 8.75	80%	$ 17,136	140%	$ 29,988	$ 21,420	$ 2,142	$ 23,562
5.6.3	Vegetated channel (either side of rock lined lo-flow) (refer dwg B2286) assume grassed (half of vegetated channel area)	2,181	sq. m	$ 14.80	70%	$ 22,592	160%	$ 51,639	$ 32,275	$ 4,841	$ 37,116
5.6.4	Channel batters vegetation, assumed half of area vegetated, other than grassed (mix tube stock - 200 mm potted plants)	2,181	sq. m	$ 108.00	70%	$ 164,861	160%	$ 376,825	$ 235,516	$ 35,327	$ 270,843
5.6.5	Maintenance path/berm (390 m left bank length, 4.5 m width) - concrete	263	cu m	$ 750.00	80%	$ 157,950	140%	$ 276,413	$ 197,438	$ 19,743	$ 217,181
	SUBTOTAL								**$ 964,009**	**$ 133,657**	**$ 1,097,666**
6.0	**STORMWATER DRAINAGE (D/S OF BASIN)**										
6.1	**Pipes/Culverts**										
6.1.1	n/a	0	lin. m		80%	$ -	140%	$ -	$ -	$ -	$ -
6.2	**Headwall(s) with wingwalls to suit**										
6.2.1	n/a	0	each		80%	$ -	140%	$ -	$ -	$ -	$ -
6.4	**Base slab(s) to suit**										
6.4.1	n/a	0	lin. m		80%	$ -	140%	$ -	$ -	$ -	$ -
6.5	**Pits**										
6.5.1	n/a	0	each		80%	$ -	140%	$ -	$ -	$ -	$ -
6.6	**Channels**										
6.6.1	n/a	0	sq. m		80%	$ -	140%	$ -	$ -	$ -	$ -
6.7	**Scour Protection**										
6.7.1	Scour protection at Basin Outlet Pipes (2 x 1200 x 900 RCBC)	17	sq. m	$ 195.00	70%	$ 2,266	160%	$ 5,179	$ 3,237	$ 486	$ 3,723
	SUBTOTAL								**$ 3,237**	**$ 486**	**$ 3,723**
7.0	**MINOR LANDSCAPING**										
	SUBTOTAL								**$ -**	**$ -**	**$ -**
								CONSTRUCTION TOTAL	**$ 9,887,209**	**$ 1,797,479**	**$ 11,684,688**
8.0	**PROJECT MANAGEMENT AND SUPERVISION**										
8.1	15% construction cost								**$ 1,752,703**		
9.0	**CONTINGENCIES**										
9.1	Inherent contingency									**$1,797,479**	**$1,797,479**
9.2				$ -	60%	$ -	180%	$ -	$ -	$ -	**$ -**
9.3				$ -	70%	$ -	160%	$ -	$ -	$ -	$ -
										CONSTRUCTION TOTAL, excluding GST	**$13,437,391**
										GST	**$1,343,739**
										CONSTRUCTION TOTAL, including GST	**$14,781,130**
										CONSTRUCTION TOTAL, rounded	**$14,782,000**

B08 Drainage System - Preliminary Construction Cost Estimate — Thursday, 24 January 2019

Drawing set: 30011388-DDR-2012 to 30011388-DDR-B0886

	ITEM NO. DESCRIPTION OF WORK	QUANTITY	UNIT	BASE RATE	CONTIGENCY LOWEST (%)	CONTIGENCY LOWEST COST	CONTIGENCY HIGHEST (%)	CONTIGENCY HIGHEST COST	COST	INHERENT CONTINGENCY	COST + CONTINGENCY
1.0	**GENERAL AND PRELIMINARIES**										
1.1	Site establishment, facilities & de-establishment	1	item	$ 100,000.00	70%	$ 70,000	160%	$ 160,000	$ 100,000	$ 15,000	$ 115,000
1.2	Traffic management	1	item	$ 10,000.00	70%	$ 7,000	160%	$ 16,000	$ 10,000	$ 1,500	$ 11,500
1.3	Temporary site fencing incl gates, supports etc	1,300	lin. m	$ 20.00	80%	$ 20,800	140%	$ 36,400	$ 26,000	$ 2,600	$ 28,600
1.4	Provision and maintenance of sediment & erosion control	1	item	$ 50,000.00	70%	$ 35,000	160%	$ 80,000	$ 50,000	$ 7,500	$ 57,500
1.5	Clean water diversions, per month	6	months	$ 15,000.00	70%	$ 63,000	160%	$ 144,000	$ 90,000	$ 13,500	$ 103,500
	SUBTOTAL								**$ 276,000**	**$ 40,100**	**$ 316,100**
2.0	**DEMOLITION, CLEARING AND GRUBBING**										
2.1	Clearing & grubbing incl. clearing of existing creek, tree removal etc	10,492	sq. m	$ 2.50	60%	$ 15,738	180%	$ 47,214	$ 26,230	$ 5,246	$ 31,476
2.2	Demolish existing buildings	1,100	sq. m	$ 62.10	80%	$ 54,648	140%	$ 95,634	$ 68,310	$ 6,831	$ 75,141
2.2	Demolish access path/driveway across channel	370	sq. m	$ 49.50	70%	$ 12,821	160%	$ 29,304	$ 18,315	$ 2,747	$ 21,062
2.3	Strip topsoil, stockpile, respread as per landscape plans (excludes any topsoil	1,574	cu. m	$ 18.00	70%	$ 19,830	160%	$ 45,325	$ 28,329	$ 4,249	$ 32,578
2.4	Dispose of excess/unsuitable topsoil (nominal 10% allowance, assume 150mm depth)	173	tonne	$ 54.18	80%	$ 7,504	140%	$ 13,132	$ 9,380	$ 938	$ 10,318
2.5	Cartage	3,148	cu. m	$ 0.80	80%	$ 2,014	140%	$ 3,525	$ 2,519	$ 251	$ 2,770
	SUBTOTAL								**$ 153,083**	**$ 20,262**	**$ 173,345**
3.0	**EARTHWORKS**										
3.1	**Cut to fill or disposal in all classes of material**										
3.1.1	**Basin Earthworks**										
3.1.1.1	Total Cut to disposal - Basin 08 (assume all contaminated)	12,444	cu. m	$ 8.05	60%	$ 60,105	180%	$ 180,314	$ 100,175	$ 20,034	$ 120,209
3.1.1.2	Total Fill - Basin 08 (assume all fill from cut)	611	cu. m	$ 13.55	60%	$ 4,967	180%	$ 14,902	$ 8,280	$ 1,655	$ 9,935
3.2.3	Basin areas with no structures above (biofilter area excluded): Rolling of exposed surface	2,498	sq. m	$ 5.00	60%	$ 7,495	180%	$ 22,484	$ 12,492	$ 2,497	$ 14,989
3.1.1.3	Basin areas with structures above: Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum). Place granular fill (DGB20 or similar) in layers <200 mm and compact with roller above). Place/compact clean fill in layers. Compact upper 500 mm of subgrade to min. DDR of 100%. Level 1 Earthworks Control used in fill placement	4,460	sq. m	$ 27.00	60%	$ 72,248	180%	$ 216,744	$ 120,414	$ 24,082	$ 144,496
3.1.2	**Channel Earthworks**				80%	$ -	140%	$ -	$ -	$ -	$ -
3.1.2.1	Total Cut to disposal - Channel 08-1 (assume all contaminated)	1,694	cu. m	$ 8.05	60%	$ 8,182	180%	$ 24,546	$ 13,637	$ 2,727	$ 16,364
3.1.2.2	Total Cut to Fill - Channel 08-1 (assume all fill from cut)	13	cu. m	$ 13.55	60%	$ 106	180%	$ 317	$ 177	$ 34	$ 211
3.1.2.3	Rolling of exposed surface (vibrating smooth drum 10 t+, 8 passes minimum).	1,927	sq. m	$ 5.00	60%	$ 5,781	180%	$ 17,343	$ 9,635	$ 1,927	$ 11,562
3.1.3	**Pipe Earthworks**				80%	$ -	140%	$ -	$ -	$ -	$ -
3.1.3.1	Total Cut - Pipe B8	2,911	cu. m	$ 70.00	80%	$ 163,016	140%	$ 285,278	$ 203,770	$ 20,377	$ 224,147
3.1.4	**Disposal cost**										
3.1.4.1	Cost of disposal of soil as "No Contamination" at an approved landfill within 10km	8,427	cu.m	$ 80.00	60%	$ 404,496	180%	$ 1,213,488	$ 674,160	$ 134,832	$ 808,992
3.1.4.2	Cost of disposal of soil as "Low Level Contamination" (i.e. General Solid Waste) at an approved landfill within 10km	6,282	tonne	$ 370.00	60%	$ 1,394,626	180%	$ 4,183,879	$ 2,324,377	$ 464,875	$ 2,789,252
3.1.4.3	Additional allowance for cartage of contaminated soil to Eastern Creek Landfill an additional 10km (i.e. 20km one-way total distance)	114,220	cu.m / km	$ 0.80	70%	$ 63,963	160%	$ 146,202	$ 91,376	$ 13,706	$ 105,082
3.2	**Trim, consolidation and final shaping of batters, basins, berms, channels, swales, wetland etc**	10,492	sq. m	$ 2.95	70%	$ 21,666	160%	$ 49,522	$ 30,952	$ 4,642	$ 35,594
3.3	**Installation and compaction of clay liner**				80%	$ -	140%	$ -	$ -	$ -	$ -
3.3.1	Clay liner provided to base and to top of batters of basin, compacted to specified density, thickness and permeability	7,001	sq. m	$ 21.67	70%	$ 106,213	160%	$ 242,772	$ 151,733	$ 22,759	$ 174,492
3.4	**Dewatering of existing onsite dams, including allowance for management of discharge water**	0	sq. m	$ 66.50	70%	$ -	160%	$ -	$ -	$ -	$ -
	SUBTOTAL								**$ 3,741,178**	**$ 714,149**	**$ 4,455,327**
4.0	**BASIN INLET, OUTLET AND BIOFILTER DRAINAGE**										
4.1	**Pipes/Culverts**										
4.1.1	(2x) 900 x 300 RCBC (refer dwg B0803) - low flow outlet to biofilter	92	lin. m	$ 600.00	70%	$ 38,640	160%	$ 88,320	$ 55,200	$ 8,280	$ 63,480
4.1.1	DN900 RCP (refer dwg B0803) - upto 50% flows to basin	16	lin. m	$ 630.00	70%	$ 7,056	160%	$ 16,128	$ 10,080	$ 1,512	$ 11,592
4.1.3	DN225 pipe (biofilter connection)	26	lin. m	$ 102.00	70%	$ 1,856	160%	$ 4,243	$ 2,652	$ 398	$ 3,050
4.1.4	DN300 pipe (early discharge)	17	lin. m	$ 170.00	70%	$ 2,023	160%	$ 4,624	$ 2,890	$ 434	$ 3,324
4.1.5	DN600 pipe (biofilter outlet)	100	lin. m	$ 340.00	70%	$ 23,800	160%	$ 54,400	$ 34,000	$ 5,100	$ 39,100
4.1.6	DN525 (low flow outlet under spillway)	12	lin. m	$ 290.00	70%	$ 2,436	160%	$ 5,568	$ 3,480	$ 522	$ 4,002
4.1.7	DN300 pipe (submerged distribution pipes through gabions, 10 x 1 m lengths)	10	lin. m	$ 240.00	70%	$ 1,680	160%	$ 3,840	$ 2,400	$ 360	$ 2,760
4.2	**Headwall(s) with wingwalls to suit:**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.1.1	(2x) 900 x 300 RCBC (refer dwg B0803) - low flow outlet to biofilter	1	each	$ 5,000.00	70%	$ 3,500	160%	$ 8,000	$ 5,000	$ 750	$ 5,750
4.1.1	DN900 RCP (refer dwg B0803) - upto 50% flows to basin	1	each	$ 3,500.00	60%	$ 2,151	180%	$ 6,454	$ 3,586	$ 717	$ 4,303
4.4	**Baseslab(s) to suit**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.4.1	(2x) 900 x 300 RCBC (refer dwg B0803) - low flow outlet to biofilter	12	cu. m	$ 750.00	70%	$ 6,521	160%	$ 14,904	$ 9,315	$ 1,397	$ 10,712
4.5	**Bedding material to suit**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.5.1	(2x) 900 x 300 RCBC (refer dwg B0803) - low flow outlet to biofilter	17	cu. m	$ 63.00	70%	$ 730	160%	$ 1,669	$ 1,044	$ 156	$ 1,200
	DN900 RCP (refer dwg B0803) - upto 50% flows to basin	3	cu. m	$ 63.00							
4.5.3	DN225 pipe (biofilter connection)	2	cu. m	$ 63.00	70%	$ 83	160%	$ 189	$ 118	$ 18	$ 136
4.5.4	DN300 pipe (early discharge)	1	cu. m	$ 63.00	70%	$ 56	160%	$ 129	$ 81	$ 11	$ 92
4.5.5	DN600 pipe (biofilter outlet)	11	cu. m	$ 63.00	70%	$ 496	160%	$ 1,134	$ 709	$ 106	$ 815
4.5.6	DN525 (low flow outlet under spillway)	1	cu. m	$ 63.00	70%	$ 54	160%	$ 122	$ 77	$ 11	$ 88
4.5.7	DN300 pipe (submerged distribution pipes through gabions, 10 x 1 m lengths)	1	cu. m	$ 63.00	70%	$ 33	160%	$ 76	$ 48	$ 6	$ 54
4.6	**Pits**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.6.1	Reinforced concrete junction pits (RMS Standard DRG R0220-35)				70%	$ -	160%	$ -	$ -	$ -	$ -
4.6.2	Diversion Pit (Pit B08.5) - 2.17 m deep	1	each	$ 2,550.00	70%	$ 1,785	160%	$ 4,080	$ 2,550	$ 383	$ 2,933
	Pit depths in excess of 900 mm (100 mm increments)	13	each	$ 200.00	70%	$ 1,778	160%	$ 4,064	$ 2,540	$ 381	$ 2,921
4.6.3	Pit Cover	1	each	$ 340.00	70%	$ 238	160%	$ 544	$ 340	$ 51	$ 391
4.7	**Gross Pollutant Trap(s)**										
4.7.1	GPT pit (treatment flow 1.43 m^3/s)	1	each	$ 55,000.00	60%	$ 33,000	180%	$ 99,000	$ 55,000	$ 11,000	$ 66,000
4.8	**Gabion Walls**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.8.1	1m x 1m x 1m depth gabion baskets for 112 m^2 area	112	each	$ 306.42	70%	$ 24,023	160%	$ 54,910	$ 34,320	$ 5,147	$ 39,467
4.8.2	Rock filling for baskets (112 m^3)	112	cu. m	$ 77.35	70%	$ 6,064	160%	$ 13,861	$ 8,664	$ 1,299	$ 9,963
4.9	**Channels**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.9.1	Rock lined pilot distrubition channel (660 mm width x 50 mm depth x 156.6 m total length)	5	cu. m	$ 195.00	70%	$ 705	160%	$ 1,612	$ 1,008	$ 151	$ 1,159
4.9.2	High flow bypass channel (concrete, 150mm deep)	155	cu. m	$ 750.00	70%	$ 81,349	160%	$ 185,940	$ 116,213	$ 17,431	$ 133,644
4.10	**Biofiltration cells (1607 m^2 total area)**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.10.1	Filter media layer at 400 mm depth (Top Soil)	643	cu. m	$ 105.00	70%	$ 47,246	160%	$ 107,990	$ 67,494	$ 10,124	$ 77,618
4.10.2	Transition layer at 450 mm depth - Sand media (General Notes)	723	cu. m	$ 125.00	70%	$ 63,276	160%	$ 144,630	$ 90,394	$ 13,559	$ 103,953
4.10.3	Drainage layer at 150 mm depth (Blue metal)	241	cu. m	$ 130.00	70%	$ 21,936	160%	$ 50,138	$ 31,337	$ 4,700	$ 36,037
4.10.4	Biofiltration cells vegetation (mix tube stock - 200 mm potted plants)	1,607	sq. m	$ 32.00	80%	$ 41,139	140%	$ 71,994	$ 51,424	$ 5,142	$ 56,566
4.10.5	Backflow/overflow weirs (concrete, 150mm deep)	9	cu. m	$ 750.00	70%	$ 4,961	160%	$ 11,340	$ 7,088	$ 1,063	$ 8,151
4.10.6	Wetland Distribution channel batters vegetation (assume 0.6 * channel area of 171.5 m^2) (mix tube stock - 200 mm potted plants)	103	sq. m	$ 32.00	80%	$ 2,634	140%	$ 4,610	$ 3,293	$ 329	$ 3,622
4.1	**Maintenance Path**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.11.1	Maintenance Path - concrete, within base of basin	167	cu. m	$ 750.00	70%	$ 87,491	160%	$ 199,980	$ 124,988	$ 18,748	$ 143,736
4.11.2	Maintenance Path - concrete around top of basin batter	43	cu. m	$ 750.00	70%	$ 22,322	160%	$ 51,023	$ 31,890	$ 4,783	$ 36,673
4.12	**Multiple outlet structure**										
4.12.1	Cylindrical structure to spillway level - concrete (5 m circumference, 150 mm thick, 1.22 m high)	1	cu. m	$ 750.00	80%	$ 549	140%	$ 961	$ 687	$ 68	$ 755
4.12.2	Formwork (sides of walls)	12	sq. m	$ 231.00	80%	$ 2,255	140%	$ 3,945	$ 2,819	$ 281	$ 3,100
4.12	**Inlet Spillway**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.12.1	Scour protection	78	sq. m	$ 195.00	70%	$ 10,647	160%	$ 24,336	$ 15,210	$ 2,282	$ 17,492
4.12.2	Geotextile	78	sq. m	$ 8.75	80%	$ 546	140%	$ 956	$ 683	$ 68	$ 751
4.1	**Outlet Spillway**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.13.1	Concrete 25 MPa (concrete spillway, 8.5 m length x 150 mm thick)	8	cu. m	$ 750.00	70%	$ 4,410	160%	$ 10,080	$ 6,300	$ 945	$ 7,245
4.13.2	Scour protection - rock mattress 230 mm depth thickness	165	sq. m	$ 195.00	70%	$ 22,523	160%	$ 51,480	$ 32,175	$ 4,826	$ 37,001
4.13.3	Scour protection - rock mattress 2 x 230 mm depth thickness	39	sq. m	$ 195.00	70%	$ 5,324	160%	$ 12,168	$ 7,605	$ 1,141	$ 8,746
4.13.4	Geotextile	204	sq. m	$ 8.75	80%	$ 1,428	140%	$ 2,499	$ 1,785	$ 179	$ 1,964
4.15	**Subsoil Drainage**										
4.15.1	Subsoil drainage (slotted flexible coil pipe) linear along the length of the biofilter basin at 1 m spacings	300	lin. m	$ 49.00	80%	$ 11,760	140%	$ 20,580	$ 14,700	$ 1,470	$ 16,170
4.16	**Sandstone Wall**										
4.16.1	Staggered sandstone stepwall - n/a	0	cu. m	$ 240.00	60%	$ -	180%	$ -	$ -	$ -	$ -
	SUBTOTAL								**$ 841,187**	**$ 125,326**	**$ 966,513**
5.0	**STORMWATER DRAINAGE (U/S OF BASIN)**										
5.1	**Pipes/Culverts**				80%	$ -	140%	$ -	$ -	$ -	$ -
5.1.1	1800 x 900 RCBC Class 4 - Pipe B8.1	71	lin. m	$ 1,750.00	70%	$ 86,399	160%	$ 197,484	$ 123,428	$ 18,514	$ 141,942

5.1.2	2100 x 900 RCBC Class 4 - Pipe B8.2	70	lin. m	$ 1,900.00	70%	$ 93,100	160%	$ 212,800	$ 133,000	$ 19,950	$ 152,950
5.1.2	2100 x 900 RCBC Class 4 - Pipe B8.3	70	lin. m	$ 1,900.00	70%	$ 93,100	160%	$ 212,800	$ 133,000	$ 19,950	$ 152,950
5.1.3	2700 x 900 RCBC Class 4 - Pipe B8.4	53	lin. m	$ 2,300.00	70%	$ 85,330	160%	$ 195,040	$ 121,900	$ 18,285	$ 140,185
5.1.3	2700 x 900 RCBC Class 4 - Pipe B8.5	64	lin. m	$ 2,300.00	70%	$ 103,040	160%	$ 235,520	$ 147,200	$ 22,080	$ 169,280
5.2	**Headwall(s) with wingwalls to suit:**				80%	$ -	140%	$ -	$ -	$ -	$ -
	2700 x 900 RCBC Class 4 - Pipe B8.5	1	each	$ 20,000.00	70%	$ 14,000	160%	$ 32,000	$ 20,000	$ 3,000	$ 23,000
5.4	**Baseslab(s) to suit**				80%	$ -	140%	$ -	$ -	$ -	$ -
5.1.1	1800 x 900 RCBC Class 4 - Pipe B8.1	19	cu.m	$ 750.00	80%	$ 11,426	140%	$ 19,995	$ 14,283	$ 1,428	$ 15,711
5.1.2	2100 x 900 RCBC Class 4 - Pipe B8.2	22	cu.m	$ 750.00	80%	$ 13,230	140%	$ 23,153	$ 16,538	$ 1,653	$ 18,191
5.1.3	2100 x 900 RCBC Class 4 - Pipe B8.3	22	cu.m	$ 750.00	80%	$ 13,230	140%	$ 23,153	$ 16,538	$ 1,653	$ 18,191
5.1.2	2700 x 900 RCBC Class 4 - Pipe B8.4	21	cu.m	$ 750.00	80%	$ 12,879	140%	$ 22,538	$ 16,099	$ 1,610	$ 17,709
5.1.3	2700 x 900 RCBC Class 4 - Pipe B8.5	26	cu.m	$ 750.00	80%	$ 15,552	140%	$ 27,216	$ 19,440	$ 1,944	$ 21,384
5.5	**Bedding material to suit**										
5.1.1	1800 x 900 RCBC Class 4 - Pipe B8.1	22	cu.m	$ 63.00	70%	$ 980	160%	$ 2,239	$ 1,400	$ 210	$ 1,610
5.1.2	2100 x 900 RCBC Class 4 - Pipe B8.2	25	cu.m	$ 63.00	70%	$ 1,111	160%	$ 2,540	$ 1,588	$ 238	$ 1,826
5.1.3	2100 x 900 RCBC Class 4 - Pipe B8.3	25	cu.m	$ 63.00	70%	$ 1,111	160%	$ 2,540	$ 1,588	$ 238	$ 1,826
5.1.2	2700 x 900 RCBC Class 4 - Pipe B8.4	24	cu.m	$ 63.00	70%	$ 1,052	160%	$ 2,404	$ 1,503	$ 225	$ 1,728
5.1.3	2700 x 900 RCBC Class 4 - Pipe B8.5	29	cu.m	$ 63.00	70%	$ 1,270	160%	$ 2,903	$ 1,815	$ 272	$ 2,087
5.6	**Pits**				80%	$ -	140%	$ -	$ -	$ -	$ -
4.6.1	Reinforced concrete junction pits (RMS Standard DRG R0220-35)										
4.6.2	Junction Pit (Pit B08.1) - 2.56 m deep	1	each	$ 2,550.00	70%	$ 1,785	160%	$ 4,080	$ 2,550	$ 383	$ 2,933
4.6.2	Junction Pit (Pit B08.2) - 2.39 m deep	1	each	$ 2,550.00	70%	$ 1,785	160%	$ 4,080	$ 2,550	$ 383	$ 2,933
4.6.2	Junction Pit (Pit B08.3) - 3.08 m deep	1	each	$ 2,550.00	70%	$ 1,785	160%	$ 4,080	$ 2,550	$ 383	$ 2,933
4.6.2	Junction Pit (Pit B08.4) - 3.38 m deep	1	each	$ 2,550.00	70%	$ 1,785	160%	$ 4,080	$ 2,550	$ 383	$ 2,933
	Pit depths in excess of 900 mm (100 mm increments)	78	each	$ 200.00	70%	$ 10,934	160%	$ 24,992	$ 15,620	$ 2,343	$ 17,963
4.6.3	Pit Cover	4	each	$ 340.00	70%	$ 952	160%	$ 2,176	$ 1,360	$ 204	$ 1,564
5.7	**Channels**				80%	$ -	140%	$ -	$ -	$ -	$ -
	n/a										
	SUBTOTAL								**$ 796,500**	**$ 115,325**	**$ 911,825**
6.0	**STORMWATER DRAINAGE (D/S OF BASIN)**										
6.1	**Pipes/Culverts**				80%	$ -	140%	$ -	$ -	$ -	$ -
6.1.1	n/a		lin. m		70%	$ -	160%	$ -	$ -	$ -	$ -
6.2	**Headwall(s) with wingwalls to suit:**				80%	$ -	140%	$ -	$ -	$ -	$ -
	n/a				80%	$ -	140%	$ -	$ -	$ -	$ -
6.4	**Baseslab(s) to suit**				80%	$ -	140%	$ -	$ -	$ -	$ -
5.4.1	n/a		cu. m	$ 333.00	80%	$ -	140%	$ -	$ -	$ -	$ -
5.5	**Bedding material to suit**										
5.5.1	n/a		cu. m	$ 63.00	70%	$ -	160%	$ -	$ -	$ -	$ -
5.6	**Pits**				80%	$ -	140%	$ -	$ -	$ -	$ -
	n/a		each								
5.7	**Channels**				80%	$ -	140%	$ -	$ -	$ -	$ -
5.7.1	Rock lined low flow channel (refer dwg B0886)	519	sq. m	$ 195.00	70%	$ 70,859	160%	$ 161,963	$ 101,227	$ 15,184	$ 116,411
5.7.2	Geotextile under rock	519	sq. m	$ 8.75	80%	$ 3,634	140%	$ 6,359	$ 4,543	$ 453	$ 4,996
5.7.3	Vegetated channel (either side of rock lined lo-flow) (refer dwg B0886), grassed (half of vegetated channel area)	850	sq. m	$ 14.80	80%	$ 10,064	140%	$ 17,612	$ 12,580	$ 1,258	$ 13,838
5.7.4	Channel batters vegetation, assumed half of area vegetated, other than grassed (mix tube stock - 200 mm potted plants)	850	sq. m	$ 32.00	80%	$ 21,760	140%	$ 38,080	$ 27,200	$ 2,720	$ 29,920
5.7.5	Maintenance path/berm - concrete	0	cu. m	$ 750.00	70%	$ -	160%	$ -	$ -	$ -	$ -
6.8	**Scour Protection**										
6.8.1	Scour protection at Basin Outlet Pipes	117	sq. m	$ 195.00	70%	$ 15,971	160%	$ 36,504	$ 22,815	$ 3,422	$ 26,237
	SUBTOTAL								**$ 168,365**	**$ 23,038**	**$ 191,403**
7.0	**MINOR LANDSCAPING**										
									$ -	$ -	$ -
	SUBTOTAL								**$ -**	**$ -**	**$ -**
								CONSTRUCTION TOTAL	**$ 5,976,313**	**$ 1,038,199**	**$ 7,014,512**
8.0	**PROJECT MANAGEMENT AND SUPERVISION**										
8.1	15% construction cost								**$ 1,052,176.77**		
9.0	**CONTINGENCIES**										
9.1	Inherent contingency									**$1,038,199**	
9.2				$ -	60%	$ -	180%	$ -	$ -	$ -	$ -
9.3				$ -	70%	$ -	160%	$ -	$ -	$ -	$ -

CONSTRUCTION TOTAL, excluding GST	**$8,066,689**
GST	**$806,669**
CONSTRUCTION TOTAL, including GST	**$8,873,357**
CONSTRUCTION TOTAL, rounded	**$8,874,000**

NB33 Drainage System - Preliminary Construction Cost
Drawing sets:

Sunday, 24 March 2019

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	BASE RATE	CONTIGENCY LOWEST (%)	CONTIGENCY LOWEST COST	CONTIGENCY HIGHEST (%)	CONTIGENCY HIGHEST COST	COST	INHERENT CONTINGENCY	COST + CONTINGENCY
1.0	**GENERAL AND PRELIMINARIES**										
1.1	Site establishment, facilities & de-establishment	1	item	$ 100,000.00	70%	$ 70,000	160%	$ 160,000	$ 100,000	$ 15,000	$ 115,000
1.2	Traffic management	1	item	$ 10,000.00	70%	$ 7,000	160%	$ 16,000	$ 10,000	$ 1,500	$ 11,500
1.3	Temporary site fencing incl gates, supports etc	2,412	lin. m	$ 20.00	80%	$ 38,588	140%	$ 67,529	$ 48,235	$ 4,823	$ 53,058
1.4	Provision and maintenance of sediment & erosion control	1	item	$ 50,000.00	70%	$ 35,000	160%	$ 80,000	$ 50,000	$ 7,500	$ 57,500
1.5	Clean water diversions, per month	3	months	$ 15,000.00	70%	$ 31,500	160%	$ 72,000	$ 45,000	$ 6,750	$ 51,750
	SUBTOTAL								**$ 253,235**	**$ 35,573**	**$ 288,808**
2.0	**DEMOLITION, CLEARING AND GRUBBING**										
2.1	Clearing & grubbing incl. clearing of existing creek, tree removal etc	573	sq. m	$ 2.50	60%	$ 860	180%	$ 2,579	$ 1,433	$ 286	$ 1,719
2.2	Demolish existing buildings	0	sq. m	$ 62.10	70%	$ -	160%	$ -	$ -	$ -	$ -
2.3	Demolish roads/access paths/driveways within proposed footprint	80	sq. m	$ 49.50	70%	$ 2,772	160%	$ 6,336	$ 3,960	$ 594	$ 4,554
2.4	Strip topsoil, stockpile, respread as per landscape plans (excludes	86	cu. m	$ 18.00	80%	$ 1,238	140%	$ 2,166	$ 1,548	$ 154	$ 1,702
2.5	Dispose of excess/unsuitable topsoil (nominal 10% allowance)	9	tonne	$ 54.18	80%	$ 410	140%	$ 717	$ 513	$ 50	$ 563
2.6	Cartage	172	cu. m / km	$ 0.80	80%	$ 110	140%	$ 193	$ 138	$ 13	$ 151
	SUBTOTAL								**$ 7,592**	**$ 1,098**	**$ 8,690**
3.0	**EARTHWORKS**										
3.1	**Cut to fill or disposal in all classes of material**										
3.2	**Basin Earthworks**										
3.3	**Channel Earthworks**										
3.3.1	Channel NB33 Total cut to disposal - channel earthworks (assume all contaminated)	459	cu. m	$ 8.05	60%	$ 2,217	180%	$ 6,651	$ 3,695	$ 739	$ 4,434
3.3.2	Channel NB33 Total fill - channel earthworks (assume all fill from cut)	0	cu. m	$ 13.55	60%	$ -	180%	$ -	$ -	$ -	$ -
3.3.3	All channels: Rolling of exposed surface	5	sq. m	$ 5.00	60%	$ 15	180%	$ 45	$ 25	$ 5	$ 30
3.4	**Disposal cost**										
3.4.1	Cost of disposal of soil as "No Contamination" at an approved landfill within 10km	0	cu.m	$ 80	80%	$ -	140%	$ -	$ -	$ -	$ -
3.4.2	Cost of disposal of soil as "Low Level Contamination" (i.e. General Solid Waste) at an approved landfill within 10km	829	tonne	$ 370	80%	$ 245,502	140%	$ 429,629	$ 306,878	$ 30,688	$ 337,566
3.4.3	Additional allowance for cartage of contaminated soil to Eastern Creek Landfill an additional 10km (i.e. 20km one-way total distance)	15080	cu.m / km	$ 0.80	80%	$ 9,651	140%	$ 16,890	$ 12,064	$ 1,206	$ 13,270
3.5	**Pipe Excavation**										
3.5.1	Total Cut from 12D model	295	cu. m	$ 70.00	70%	$ 14,455	160%	$ 33,040	$ 20,650	$ 3,098	$ 23,748
3.6	**Trim, consolidation and final shaping of batters, basins, berms, channels, swales, wetland etc**	459	sq. m	$ 21.67	70%	$ 6,963	160%	$ 15,914	$ 9,947	$ 1,492	$ 11,439
3.7	**Installation and compaction of clay liner as specified**										
3.8	**Dewatering of onsite dams, including allowance for management of discharge water**										
	SUBTOTAL								**$ 353,259**	**$ 37,227**	**$ 390,486**
4.0	**STORMWATER DRAINAGE**										
4.1	**Pipes/Culverts**										
4.1.1	2x2400x600 mm RCBC	180	lin. m	$ 2,000.00	70%	$ 252,000	160%	$ 576,000	$ 360,000	$ 54,000	$ 414,000
4.2	**Headwall(s) and wingwall(s) to suit**										
4.2.1	Headwall to suit 2x2400x600 RCBC	1	no	$ 18,000.00	70%	$ 12,600	160%	$ 28,800	$ 18,000	$ 2,700	$ 20,700
4.3	**Base slab(s) to suit**										
4.3.1	Baseslab to suit 2x2400x600 RCBC	27	cu. m	$ 750.00	80%	$ 16,200	140%	$ 28,350	$ 20,250	$ 2,025	$ 22,275
4.4	**Bedding material to suit**										
4.4.1	Bedding to suit 2x2400x600 RCBC	180	cu. m	$ 63.00	80%	$ 9,072	140%	$ 15,876	$ 11,340	$ 1,134	$ 12,474
4.5	**Pits**										
4.5.1	Reinforced concrete junction pits (RMS Standard DRG R0220-35)	2	each	$ 2,550.00	70%	$ 3,570	160%	$ 8,160	$ 5,100	$ 765	$ 5,865
4.5.2	Pit depth increments in excess of 900 mm (Depths : 2.13 m ; 2.14 m ; 2.60 m ; 1.78 m ; 1.84 m)	8	each	$ 200.00	70%	$ 1,056	160%	$ 2,413	$ 1,508	$ 226	$ 1,734
4.5.3	Pit cover	2	each	$ 340.00	70%	$ 476	160%	$ 1,088	$ 680	$ 102	$ 782
4.5.4	**Channels**										
4.5.5	Rock lined low flow channel	1,600	sq. m	$ 195.00	70%	$ 218,400	160%	$ 499,200	$ 312,000	$ 46,800	$ 358,800
4.5.6	Geotextile under rock (11,549 m^2)	1,600	sq. m	$ 8.75	80%	$ 11,200	140%	$ 19,600	$ 14,000	$ 1,400	$ 15,400
4.5.7	Vegetated channel (either side of rock lined low-flow) assume grassed (half of vegetated channel area)	1,000	sq. m	$ 14.80	70%	$ 10,360	160%	$ 23,680	$ 14,800	$ 2,220	$ 17,020
4.5.8	Channel batters vegetation, assumed half of area vegetated, other than grassed (mix tube stock - 200 mm potted plants)	6,000	no	$ 32.00	80%	$ 153,600	140%	$ 268,800	$ 192,000	$ 19,200	$ 211,200
	SUBTOTAL								**$ 949,678**	**$ 130,572**	**$ 1,080,250**
5.0	**MINOR LANDSCAPING**										
	SUBTOTAL								**$ -**	**$ -**	**$ -**
								CONSTRUCTION TOTAL	**$ 1,563,764**	**$ 204,470**	**$ 1,768,234**
6.0	**PROJECT MANAGEMENT AND SUPERVISION**										
6.1	15% construction cost								**$ 265,235**		
7.0	**CONTINGENCIES**										
7.1	Inherent contingency									**$ 204,470**	
7.2			tonne	$ 350.00	80%	$ -	140%	$ -	$ -	$ -	$ -
7.3			cu. m / km	$ 0.57	80%	$ -	140%	$ -	$ -	$ -	$ -

CONSTRUCTION TOTAL, excluding GST	**$ 2,033,469**
GST	**$ 203,347**
CONSTRUCTION TOTAL, including GST	**$ 2,236,816**
CONSTRUCTION TOTAL, rounded	**$ 2,237,000**

B_Fourth Draft Detailed concept design culverts Drawing sets: Thursday, 29 November 2018

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	BASE RATE	CONTIGENCY LOWEST (%)	CONTIGENCY LOWEST COST	CONTIGENCY HIGHEST (%)	CONTIGENCY HIGHEST COST	COST	INHERENT CONTINGENCY	COST + CONTINGENCY
1.0	**GENERAL AND PRELIMINARIES**										
1.1	Site establishment, facilities & de-establishment	0	item	$ 100,000.00	70%	$ -	160%	$ -	$ -	$ -	$ -
1.2	Traffic management	0	item	$ 5,000.00	70%	$ -	160%	$ -	$ -	$ -	$ -
1.3	Temporary site fencing incl gates, supports etc	0	lin. m	$ 16.25	80%	$ -	140%	$ -	$ -	$ -	$ -
1.4	Provision and maintenance of sediment & erosion control	0	item	$ 40,000.00	70%	$ -	160%	$ -	$ -	$ -	$ -
1.5	Clean water diversions, per month	0	months	$ 10,000.00	70%	$ -	160%	$ -	$ -	$ -	$ -
	SUBTOTAL								**$ -**	**$ -**	**$ -**
2.0	**DEMOLITION, CLEARING AND GRUBBING**										
2.1	Clearing & grubbing incl. clearing of existing creek, tree removal etc	0	sq. m	$ 0.53	60%	$ -	180%	$ -	$ -	$ -	$ -
2.2	Demolish existing buildings	0	sq. m	$ 62.10	70%	$ -	160%	$ -	$ -	$ -	$ -
2.3	Demolish roads/access paths/driveways within proposed footprint	0	sq. m	$ 49.50	70%	$ -	160%	$ -	$ -	$ -	$ -
2.4	Strip topsoil, stockpile, respread as per landscape plans (excludes any topsoil improvement works.)	0	cu. m	$ 18.00	80%	$ -	140%	$ -	$ -	$ -	$ -
2.5	Dispose of excess/unsuitable topsoil (nominal 10% allowance)	0	tonne	$ 54.18	80%	$ -	140%	$ -	$ -	$ -	$ -
2.5	Cartage	0	cu.m / km	$ 0.57	80%	$ -	140%	$ -	$ -	$ -	$ -
	SUBTOTAL								**$ -**	**$ -**	**$ -**
3.0	**EARTHWORKS**										
3.1	**Cut to fill or disposal in all classes of material**										
3.2	**Basin Earthworks**										
3.3	**Channel Earthworks**										
3.4	**Pipe Excavation**										
3.4.1	Total Cut (estimate)	1,374	cu. m	**$ 8.05**	70%	$ 7,742	160%	$ 17,696	$ 11,060	$ 1,659	$ 12,719
3.5	**Trim, consolidation and final shaping of batters, basins, berms, channels, swales, wetland etc**				70%	$ -	160%	$ -	$ -	$ -	$ -
3.6	**Installation and compaction of clay liner as specified**										
3.7	**Dewatering of onsite dams, including allowance for management of discharge water**	0	sq. m	$ 66.50	60%	$ -	180%	$ -	$ -	$ -	$ -
	SUBTOTAL								**$ 11,060**	**$ 1,659**	**$ 12,719**
4.0	**STORMWATER DRAINAGE**										
4.1	**Pipes/Culverts**										
4.1.1	3 x 3300 x 2400 mm RCBC	81	lin. m	**$ 10,250.00**	70%	$ 578,162	160%	$ 1,321,512	$ 825,945	$ 123,892	$ 949,837
4.1.2			lin. m	$ 3,000.00	70%	$ -	160%	$ -	$ -	$ -	$ -
4.1.3	2 x 3300 mm link slab	54	lin. m	**$ 1,400.00**	70%	$ 52,646	160%	$ 120,333	$ 75,208	$ 11,281	$ 86,489
4.1.4			cu.m.	$ 456.00	60%	$ -	180%	$ -	$ -	$ -	$ -
4.2	**Headwall(s) and wingwalls to suit**										
	2 headwalls with wingwalls to suit	2	no	**$ 35,000.00**	60%	$ 42,000	180%	$ 126,000	$ 70,000	$ 14,000	$ 84,000
4.3	**Wingwall(s) to suit**										
4.4	**Base slab(s) to suit**										
4.4.1	2 x base slab to support 1x3300x2400	27	cu. m	**$ 750.00**	70%	$ 13,960	160%	$ 31,910	$ 19,944	$ 2,991	$ 22,935
4.4.2	1 x base slab to support 1 x 3300 x 2700 mm RCBC and 2 x 3300 link slab	40	cu. m	**$ 750.00**	70%	$ 20,941	160%	$ 47,865	$ 29,916	$ 4,487	$ 34,403
4.5	**Pits**										
4.6	**Channels**										
4.6.1	Scour protection - rock mattress 230 mm thickness at 16.5 m length and 50 m	1,634	sq.m	**$ 195.00**	70%	$ 222,973	160%	$ 509,652	$ 318,533	$ 47,779	$ 366,312
	SUBTOTAL								**$ 1,339,546**	**$ 204,430**	**$ 1,543,976**
5.0	**DISPOSAL COSTS**										
5.1	Cost of disposal of soil as "No Contamination" at an approved landfill within 10km	811	cu.m	$ 80	80%	$ 51,897	140%	$ 90,820	$ 64,872	$ 6,486	$ 71,358
5.2	Cost of disposal of soil as "Low Level Contamination" (i.e. General Solid Waste) at an approved landfill within 10km	619	tonne	**$ 370**	80%	$ 183,313	140%	$ 320,797	$ 229,141	$ 22,914	$ 252,055
5.3	Additional allowance for cartage of contaminated soil to Eastern Creek Landfill an additional 10km (i.e. 20km one-way total distance)	11260	cu.m / km	**$ 0.80**	80%	$ 7,206	140%	$ 12,611	$ 9,008	$ 901	$ 9,909
	SUBTOTAL								**$ 303,021.00**	**$ 30,301.13**	**$ 333,322.13**
6.0	**MINOR LANDSCAPING**										
	SUBTOTAL								**$ -**	**$ -**	**$ -**
	CONSTRUCTION TOTAL								**$ 1,653,627**	**$ 236,390**	**$ 1,890,017**
7.0	**PROJECT MANAGEMENT AND SUPERVISION**										
7.1	15% construction cost								**$ 283,503**		
8.0	**CONTINGENCIES**										
8.1	Inherent contingency									**$ 236,390**	
8.2			tonne	$ 350.00	80%	$ -	140%	$ -	$ -	$ -	$ -
8.3			cu.m / km	$ 0.57	80%	$ -	140%	$ -	$ -	$ -	$ -

CONSTRUCTION TOTAL, excluding GST	**$ 2,173,519**
GST	**$ 217,352**
CONSTRUCTION TOTAL, including GST	**$ 2,390,871**
CONSTRUCTION TOTAL, rounded	**$ 2,391,000**

ALN representative stormwater infrastructure - Additional costs inclusion

		B22 1% AEP	B08 50% AEP	NB33 NB System	B Fourth SIC Removed	Notes
	JWP Revised Construction Cost	$ 9,887,209	$ 5,976,313	$ 1,563,764	$ 1,653,627	Based on adjustment of rates (only) in SMEC cost sheet
SMEC Item Nunber	**Previously Excluded Items from Spreadsheet List**	**Estimated Additional Cost**	**Estimated Additional Cost**	**Estimated Additional Cost**	**Estimated Additional Cost**	
1	Consultant's fees	$ 741,541	$ 448,223	$ 117,282	$ 124,022	Based on 7.5% of construction cost
2	Utility/services investigation, relocation or protection	$ 74,154	$ 44,822	$ 11,728	$ 12,402	DBYD searches & Vacuum truck investigation only
3	Geotechnical investigations	$ 49,436	$ 29,882	$ 7,819	$ 8,268	Preliminary reports & investigation only, no testing
5	Detailed topographic survey	$ 29,662	$ 17,929	$ 4,691	$ 4,961	Estimated on known quantity & scope of works
7	Statutory and consultancy fees for all approvals (e.g. environmental etc.)	$ 98,872	$ 59,763	$ 15,638	$ 16,536	Based on 1% of construction cost
8	Construction setout & survey	$ 49,436	$ 29,882	$ 7,819	$ 8,268	Establish controls, pegging & electronic data
9	Work as executed survey & documentation	$ 24,718	$ 14,941	$ 3,909	$ 4,134	Survey pick up & marked drawings
12	All landscaping and planting (excluding bio-retention basin) for distribution channel batter slopes and trunk channel batter slopes	$ 138,421	$ 83,668	$ 21,893	$ 23,151	Estimated on known quantity & scope of works
13	Allowance for management or maintenance of the basins & structures	$ 59,323	$ 35,858	$ 9,383	$ 9,922	Estimated on 4 inspections & minor maintenance tasks
14	Preparation of a Site Management Plan or Environmental Management Plan	$ 5,000	$ 5,000	$ 5,000	$ 5,000	Estimate for preparing construction documentation
15	Rates for demolition do not include allowance for disposal of material off site, or disposal of contaminated waste	$ 148,109	$ 68,310	$ -	$ -	Provisional amount equivelent to demolition cost provided
	Total	**$ 1,418,672**	**$ 838,278**	**$ 205,162**	**$ 216,664**	
	Construction Cost with previously excluded Items added (JWP opinion)	**$11,305,881**	**$ 6,814,591**	**$ 1,768,926**	**$ 1,870,291**	