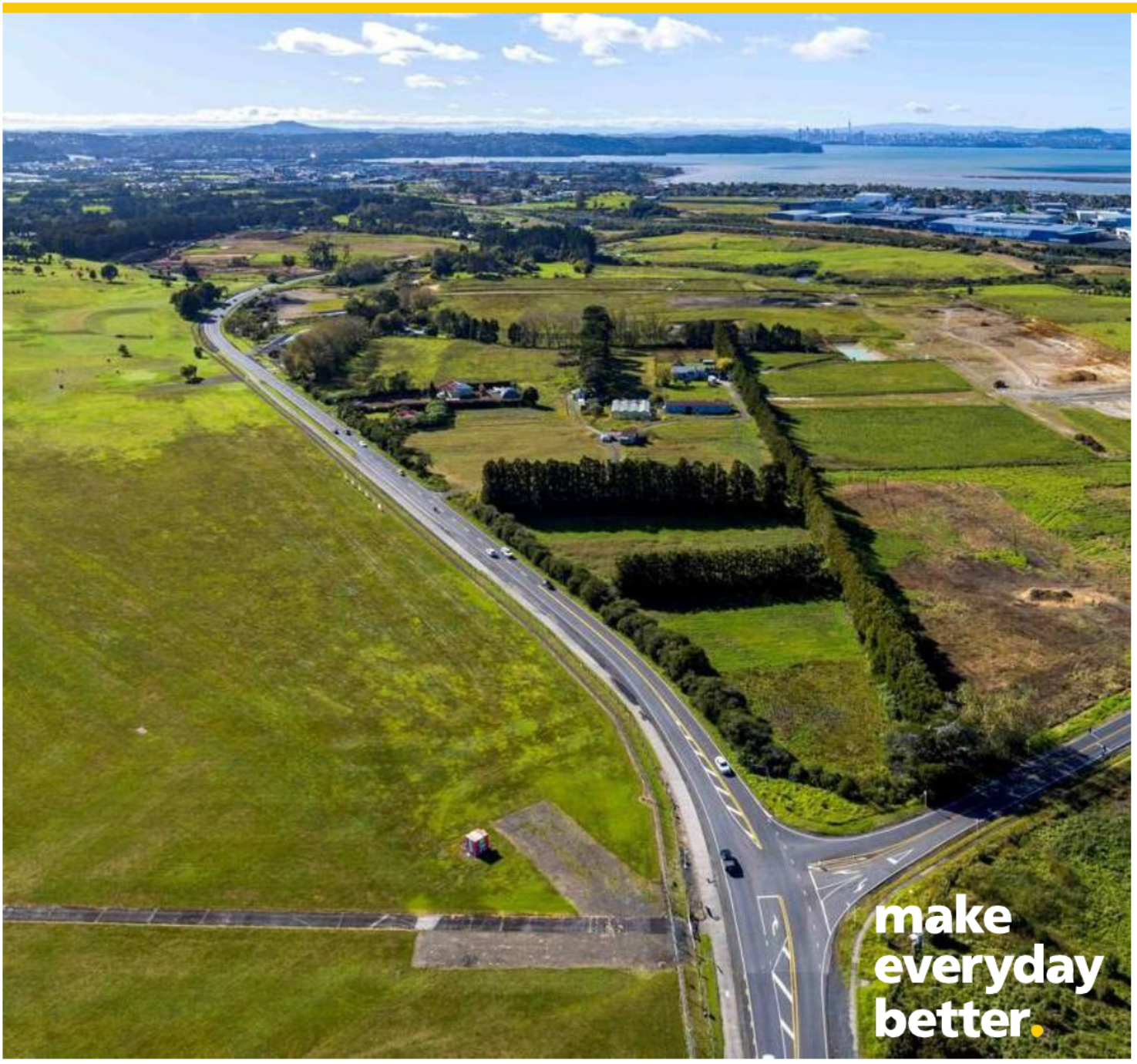
Greenfields Generic Cost Allowances and Rates

Prepared for Auckland Council
Prepared by Beca Limited

27 June 2024



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Revision History

Revision N°	Prepared By	Description	Date
1	Nipuna Mohottige	Issued for Council Comment	14/06/24
2	Nipuna Mohottige	Final Draft for Consultation	27/06/24

Document Acceptance

Action	Name	Signed	Date
Prepared by	Nipuna Mohottige		27/06/24
Reviewed by	Varshen Pillay		27/06/24
Approved by	Rob Mason		27/06/24
on behalf of	Beca Limited		

1 Introduction

The purpose of this report is to set out the process and cost allowances adopted to inform Auckland Council's considerations of funding and financing of transport infrastructure in greenfield environments. The cost allowances outlined in this report are intended to be referenced and applied to greenfield programmes to obtain an indicative cost.

A greenfield environment refers to an area of undeveloped land, usually in a rural setting with minimal infrastructure in place.

For cost allowances adopted for brownfield environments, refer to the brownfield report.

The report has been developed in collaboration with Auckland Council and Auckland Transport (AT).

2 Methodology for Developing Cost Allowances

The process for developing the cost allowances for projects within a greenfield context can use specific detailed designs where available. Where these designs are not available, reasonable engineering and cost judgement has been applied. Accordingly, generic cost rates have been developed for a greenfield environment to establish a consistent approach that allows project costs to be directly compared.

The cost allowances that have been developed are consistent with the requirements of the Cost Estimation Manual (CEM)[1] for preparation of a Programme Business Case Estimate (PBE). These are normally prepared as part of a Programme Business Case (PBC) and used to provide budgets for forward works programming. Usually, the PBE is based on limited knowledge of the project, with a broad range. The estimate life cycle of a project is illustrated below (Figure 2-1), together with the perceived amount of risk at each stage.

The cost allowances provide an indication of infrastructure funding requirements at a base date and do not reflect programming over time. Therefore, escalation is not included directly in these cost allowances.

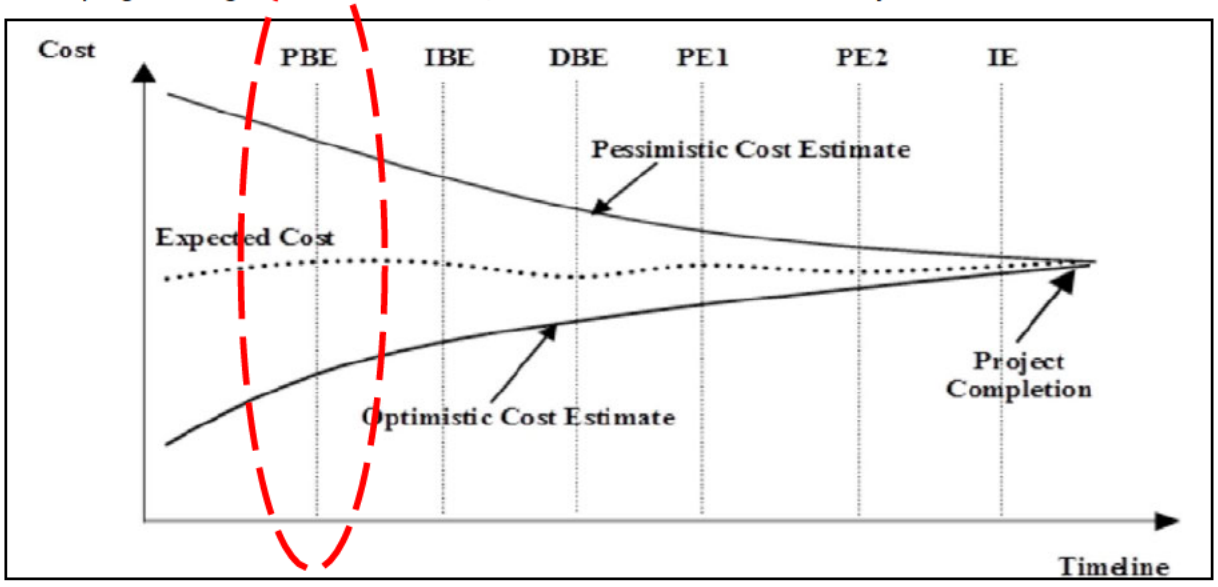

Figure 2-1: Estimate Lifecycle (extracted from section 3.4.1 of the CEM)

[1] "Cost Estimation Manual", Waka Kotahi, version 2 - August 2021

2.1 Cost Allowances for Generic Projects adopted for use within a Greenfield Environment

The accuracy of a cost estimate is dependent on the level of design detail that is available. For projects within a greenfield environment, where the final design solution is not known, the cost allowances need to be based on a several assumptions that are summarised in this report.

The cost allowances have been developed to align with the requirements of the CEM and includes an assessment of the total sum of all the elements that make up the estimate. This value includes:

- Property Costs where relevant
- Project Development Phase
- Pre-Implementation Phase
- Implementation Phase Costs
    - Physical Works Costs
- Construction Management and supervision (MSQA)
- Environmental Compliance
- Traffic Management and Temporary Works
- Preliminary and General (P&G)

For projects within a greenfield Development Contributions (DC) programme that doesnt have any cost information readily available, generic linear rates and interventions have been developed which can be applied across the length of the respective project. This report documents each of these generic costs and how they can be applied.

The application of linear rates can be subjective and requires an assessment of potential project scope. As there is minimal scope definition for each of the projects, a number of assumptions have been made, which can have a significant impact on the overall cost allowance.

In the absence of any specific design, there are a number of other design elements that are unknown, each with varying degress of influence on the overall cost allowance. These include (but are not limited to):

- Extent, height, and form of retaining walls
- Desired cross sectional elements
- Realignment/ protection of utility services
- Stormwater treatment requirements such as wetlands
- Pavement Design
- Extent of subgrade stabilisation

The majority of the unit rates adopted for Greenfields as indicated in Table 2-1 were based on the Drury Infrastructure Funding and Financing (DIFF) work. The only exceptions are rates 8, 9 and 10 which are new rates developed by AT. All the rates have been reviewed by AT for appropriateness for use within a greenfield context.

These rates reflect the cost to be allowed for physical construction works only, excluding any allowance for Traffic Management, Environmental Compliance or P&G (additional allowances for these items are identified in Section 2.1.6). Client managed costs are also excluded from these linear rates (additional allowances identified in Section 2.1.7). The above were based on Auckland Transports Cost Estimation Guide.

The detailed assumptions, used to develop these cost allowances are included in the sections below.

Table 2-1: Generic Linear Rates for Transport Elements (Greenfield)

Ref	Description	Rate	Unit	Assessment year (Baseline)
1	2-lane transport corridor	$10,220	m	2021
2	2-lane interim transport corridor	$12,630	m	2021
3	Extra over for future 4-lane corridor	$5,000	m	2021
4	4-lane transport corridor – new road	$15,130	m	2021
5	Roadside Berm Construction – level topography	$2,020	m	2021
6	Roadside Berm Construction – rolling topography	$2,850	m	2021
7	Roadside Berm Construction – steep topography	$4,290	m	2021
8	2-Lane collector	$9,550	m	2024
9	Urban frontage	$4,610	m	2024
10	Footpath only	$370	m	2024
11	Footpath/cycle path retrofit	$480	m	2024
12	4-lane transport corridor – converting rural road	$15,490	m	2021

2.1.1 2-Lane Transport Corridor

The linear unit rate for construction of a new 2-lane corridor is based on the cost estimate prepared for the Ponga Road upgrade included within the Drury Arterial Network DBC. The cost estimate was based on a preliminary design, with specific quantities measured and costed. This was also independently Peer Reviewed.

The Ponga Road upgrade project included a 24m wide transport corridor, with the typical cross section identified in Figure 2-2.

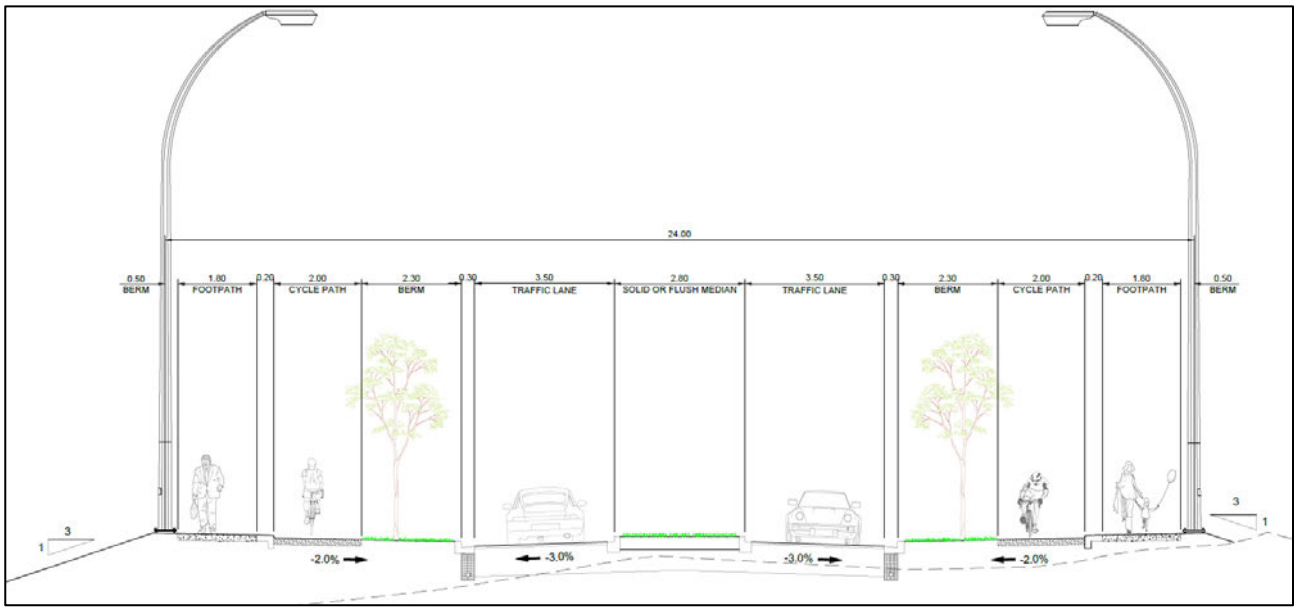

Figure 2-2 Typical Cross Section for Ponga Road included within the Drury Arterial Network DBC

As the Drury Arterial Network DBC was focussed on a future transport Network with construction beyond a 10-year period, there is little certainty around the scope. Therefore, specific assumptions were made in developing the DBC costs estimates. An example is the removal of the existing pavement. As site investigations have not been carried out, a conservative assumption is that the existing pavement will need to be removed, with potential stabilisation of the subgrade required.

The resultant physical works cost for the 2-lane Ponga Road Upgrade (excluding bridges, environmental compliance, temporary traffic management, and P&G) was determined to be $9,290 per linear metre. However, the topography for the Ponga Road Corridor is generally level, so an additional 10% allowance was added for potential retaining walls that may be required in other projects.

The unit rate adopted for a 2-lane transport corridor is $10,220 per linear metre.

In addition, the above rate has been adjusted to capture the following situations:

- Greenfield collector roads – where there are no solid or flush medians. The unit rate adopted for collector roads is $9,550 per linear metre.
- Urban frontage which includes a footpath, cycle path, berm, and a single lane of traffic. The unit rate adopted for an urban frontage is $4610 per linear metre

2.1.2 Staged Construction of 4-lane Corridor

The Drury Arterial Network DBC has identified the future network for the area, which mostly involves provision of a 4-lane network with high quality bus services (Frequent Transit Network – FTN). The transport network generally develops alongside adjacent land development. Therefore, staging can impact on the cost forecast, and in some instances, it will be preferable to construct a 2-lane transport corridor initially.

Interim 2-lane Transport Corridor

The concept would be to construct 2 lanes in the interim period such that the additional 2 lanes can be added in future without the need to reconstruct the pavement. An example of how this can be achieved is identified in Figure 2-3.

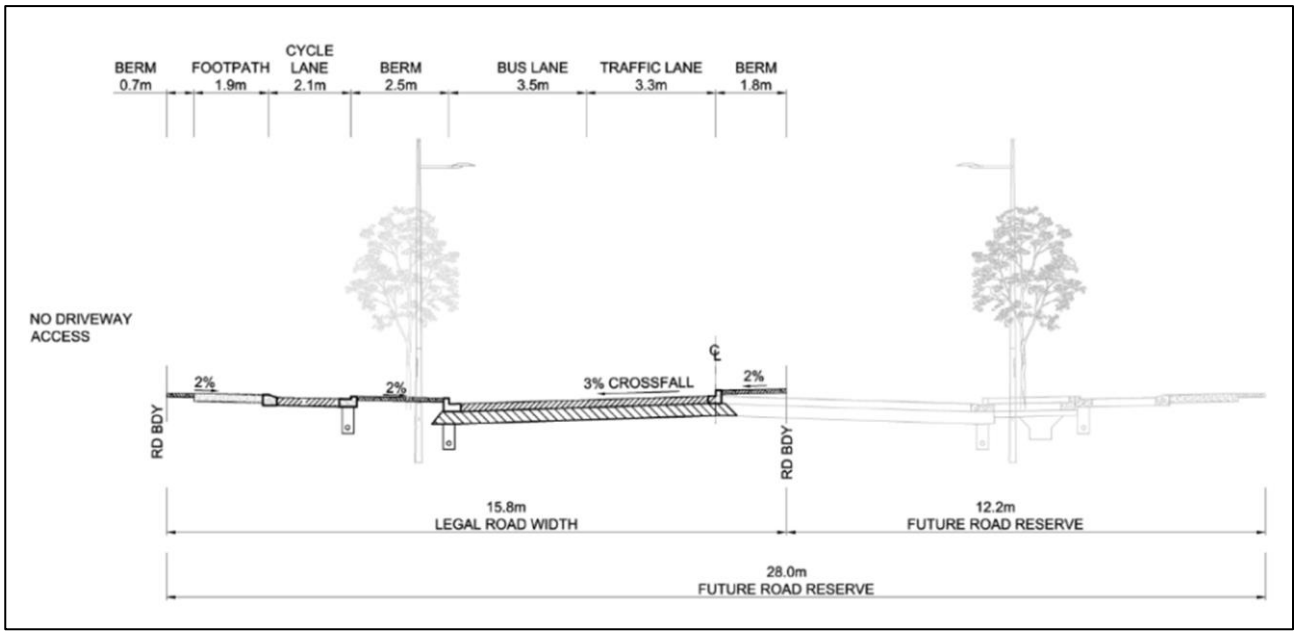

Figure 2-3 Indicative Cross section for interim 2-lane construction

A high-level cost estimate was prepared based on a typical linear metre length. This included rates for specific roading elements that could be expected in the road corridor. The resultant physical works cost for the interim 2-lane corridor was determined to be $11,483 per linear metre.

While this provides an indication of the cost, there are likely to be other contributing factors, such as retaining walls and additional earthworks. Therefore, an additional 10% allowance was added, and the unit rate adopted for a 2-lane interim corridor was $12,630 per linear metre.

Extra over for future 4-lane corridor

There are many unknown factors that would influence the cost to upgrade an interim 2-lane corridor to a 4-lane corridor. This would depend on the extent of redundant works, and consistency with future requirements, as well as the ability to integrate with future land use. Therefore, a specific cost estimate has not been prepared for this scenario. Rather an allowance of $5,000 per linear metre has been adopted.

This allowance reflects the fact that the earthworks are likely to have been carried out for the corridor, and the berm area is likely to have been completed on one side. Physical works would be limited to removal of an interim swale and footpath, site clearance, construction of a 2-lane pavement with associated kerb and channel, and formation of a new berm area with walking/cycling.

Therefore, the unit rate adopted for upgrading an interim 2-lane corridor to a 4-lane corridor was $5,000 per linear metre.

2.1.3 4-lane transport corridor

Construction of a 4-lane transport corridor within a greenfield environment would involve construction of a new pavement, where there is no existing pavement formation. While these projects wouldn't require removal of an existing pavement and infrastructure, they are likely to involve greater earthworks and ground improvements. To enable a consistent approach for cost allowances, the cost for a 4-lane transport corridor in a greenfield environment was developed based on the interim scenario set out in 0

The assumption made was that the initial cost to construct an interim 2-lane corridor could be applied, together with a portion of the cost allocated to complete the future stage 4-laning. A 50% portion was adopted as this would reflect the savings that could be expected if the final project was constructed rather than being staged.

Therefore, the unit rate adopted for constructing a 4-lane corridor in a greenfield environment was $15,130 per linear metre.

The linear rate to convert an existing rural road into a 4-lane transport corridor was developed based on the estimate prepared for the State Highway 22 (SH22) project included within the Drury Arterial Network DBC. The resultant physical works allowance for a 4-lane corridor (excluding bridges, environmental compliance, temporary traffic management, and P&G) was determined to be $14,080 per linear metre. An additional 10% allowance was added for potential retaining walls, and therefore, the unit rate adopted for a 4-lane corridor in a rural environment was $15,490 per linear metre.

2.1.4 Roadside Berm Construction (active modes)

In some circumstances, it may be feasible to retain the existing road pavement and limit construction works to the road berm, where upgraded pedestrian and cyclist facilities can be provided.

For these projects, it is assumed that the existing road edge is rural with side drains provided. The scope of works would include provision of a new kerb and channel, as well as provision of a more urbanised area with walking and cycling facilities and related infrastructure such as light poles. An indication of the typical cross section based on that developed for the Drury Arterial Network DBC is provided in Figure 2-4.

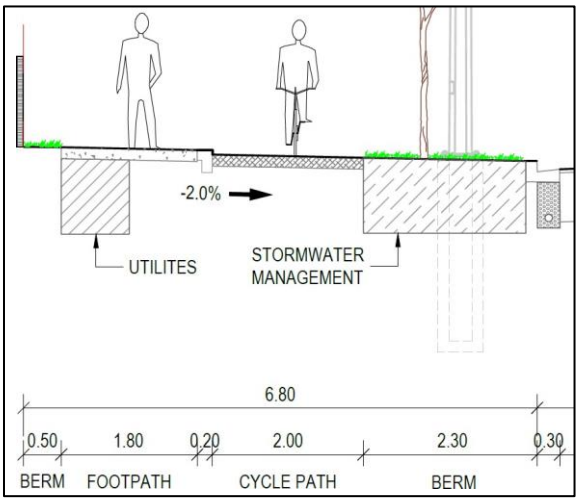

Figure 2-4: Roadside berm construction.

A high-level cost allowance was prepared based on a typical linear metre length. This included rates for specific roading elements that could be expected in the road corridor, such as earthworks, provision of new kerb and channel and associated drainage, and utilities relocation. The resultant physical works cost to provide active modes in the berm was determined to be $2,020 per linear metre.

This cross section would apply where the adjacent topography is level. However, there are circumstances where the adjoining land is rolling or steep and retaining walls may be required to accommodate the new berm areas. To reflect these scenarios, the linear rate has been increased to reflect the larger amount of earthworks anticipated and the provision of a retaining wall. Two additional scenarios have been developed as below.

- Rolling terrain with 1.0m high retaining walls - $2,850/m
- Steep terrain with 2.0m high retaining walls - $4,290/m

A further scenario has been identified where there may be a requirement to retrofit walking and cycling facilities to an existing urban berm area. The assumption here is that the existing kerb and channel can be remain in place, and all works occur within the existing berm. Minimal earthworks would be required with a new 2m cycleway and 1.8m footpath provided. The resultant unit rate adopted for providing active mode facilities within an existing berm was $480 per linear metre.

The rate adopted for a new 1.8m concrete footpath (without provision for cycling facilities) is $370 per linear meter.

2.1.5 Generic Unit Rates

There are some design elements that are difficult to scope individually, although these will add costs to any project. This includes bridge construction and installation of new intersections. Where appropriate, the linear rates applied to each corridor (identified above) would need to be supplemented with additional allowances for intersections or bridges as these will affect the final cost allowance.

Based on experienced judgement from Quantity Surveyors, generic unit rates have been developed that can be applied in addition to the linear corridor rates where applicable. These rates are set out in Table 2-2.

Table 2-2: Generic unit rates for transport elements

Description	Rate	Unit	Assessment year (Baseline)
Bridge Construction	**$4,500**	**m2**	2021
2-lane roundabout	**$2.5m**	**each**	2021
4-lane roundabout	**$4.5m**	**each**	2021
New signalised intersection – simple	**$2m**	**each**	2021
New signalised intersection – complex	**$4.5m**	**each**	2021
Rural road reseal (chipseal)	**$56**	**m2**	2024
Rural road pavement upgrade	**$116**	**m2**	2024

2.1.6 Physical Works Allowances

The physical works allowance includes both the construction costs for the project, as well as costs for setting up and managing the site. The additional components that are required for managing the site are:

- **Environmental Compliance:** Management of environmental compliance requirements, preparation and management of compliance management plans, construction of permanent erosion and sediment control measures, maintenance and monitoring, noise attenuation and earthworks bunds.

- **Traffic Management and Temporary Works:** Implementation of traffic management plans, public notification, lane changeovers, road diversions, temporary roads, plant, and equipment hire costs, temporary construction.
- **Preliminary and General (P&G):** Site establishment, operation, disestablishment, and clean-up; site management, bonds, and insurances, preparing and maintaining quality, health & safety, security, temporary erosion and sediment control, temporary traffic management plans, programming, and reporting.

The physcal works allowance adopted for greenfield environments are indicated in Table 2-3 and is consistent with DIFF, except for environmental compliance which has been increased from 2% to 6% as advised by AT to cater for the more intense erosion and sediment control when compared with brownfields.

Table 2-3: Physical Works Allowances

Phase	Allowance
Environmental Compliance	**6%**
Traffic Management and Temporary Works	**2%**
Preliminary and General	**25%**

2.1.7 Client Managed Costs

Client managed costs are incurred throughout the project lifecycle and would vary depending on each project. Basic elements that make up Client Managed Costs include:

- **Reviews:** Economics Peer Review, Cost Estimate Peer Review / Parallel Estimate, Technical Peer Reviews, Constructability Review, O&M Review, Road Safety Audit
- **Investigations:** Geotechnical Investigations, Utility Location, Pavement Investigations
- **Third Party Physical Works:** Enabling Works such as utilities
- **Communications and Engagement**: Open Days, Production of Engagement Collateral, Iwi Engagement, Communications Consultant
- **Third Party Professional Services**: Procurement Support, Property acquisition support, Investigation and Design, Specialist Advisors, Legal Review, Engineer to Contract, etc
- **Consenting:** Council lodgement and hearing fees, Environment Court / EPA Costs, Legal Advice, Consent Monitoring by Council, Building Consent
- **Post Construction Monitoring**: Noise Monitoring, Traffic counts, speed surveys, consent conditions
- **Miscellaneous Costs**: Insurances, Procurement Disbursements, Statutory Compliance, Revocation costs

A lower project-development allowance is applied to take into account that some projects would have pre-work already undertaken by developers, such as for collector road upgrades.

Table 2-4. Allowances for Client Managed Costs

Phase	Description	Allowance
Project Development	Preliminary Design, Implementation Business Case, Investigations, Engagement	**2%**
Pre-Implementation	Specimen/Detailed Design, Investigations, Statutory Applications	**9%**
Implementation	Procurement, Construction Monitoring and Supervision	**9%**

2.2 Allowance for Property Costs

Property costs allowances and the methodology for estimating land acquisition costs have been developed by Auckland Council. These are recorded in the separate methodology document for the council's Development Contributions policy.

2.3 Contingency and Risk Allowance

A contingency is required for cost estimation in accordance with the CEM and is added to the 'Base Estimate' to provide for uncertainty in relation to the estimate inputs and specific project related threats and opportunities with a cost impact.

For the greenfields, the cost estimates have been developed using linear rates. Therefore, they reflect a programme wide approach where the specific scope and extent of works is undefined, resulting in significant uncertainty in quantities. Therefore, the physical works cost allowances (to be added on top of the linear rates by council), include a 50% contingency, reflecting the uncertainty in the final form of the projects.

The property cost allowances include a 15% contingency for the property valuation and an additional 15% for the uncertainty in project scope. The actual extent of land acquisition and temporary lease required for the programme will be determined as each project moves into the detailed design phase.

The costs reflect the Expected Estimate as defined in the CEM for a programme level Business Case (PBE).

2.4 Renewals

Renewals relate to existing assets which are being replaced or renewed by a project prior to the end of its life or when it would typically get renewed. Where there are no existing assets being renewed, the renewal component is zero. The following methodology has been adopted for situations where they may be existing assets.

- Rural local roads (low volumes), renewals are expected to include reseal works only (no pavement upgrade). The rate adopted will be the typical reseal cost of $56/m2.
- Rural collector roads (high volumes), renewals are expected to include pavement upgrade works. The rate adopted will be the typical pavement cost of $116/m2.
- Urban areas – refer to Brownfield report.

2.5 Review and Verification

The following process was undertaken to review and verify the project costs that the generic rates were developed from.

The cost estimates prepared for the DBC were subject to verification by an "independent" person within Te Tupu Ngātahi (i.e. separate from the originator) with appropriate skills and experience to undertake the activities required. This review process was approved by NZTA as construction funding was not being sought for the Drury Arterial Network projects.

The verification activities included the following:

- Gain a satisfactory understanding of the project to permit the verification to proceed.
- Review the estimate scope for adequacy and completeness.
- Check that a bulk quantity check has been carried out by a suitably experienced person.
- Review the appropriateness of the rates and prices used.
- Verify that an arithmetical check has been undertaken.
- If the project has similarities to previous projects, undertake comparisons of estimate outputs with known costs.

- Verify that the checklist has been worked through.
- Review the estimate inclusions and exclusions.

The process for reviewing the cost allowances prepared for the DIFF schedule involved a comparative test of the cost allocations based on experience. This review was carried out by qualified Quantity Surveyors working within Te Tupu Ngātahi. This included a review workshop with Alta Consulting to test and challenge the assumptions that were used to develop the cost allowances.

The following process was adopted:

- Review of quantities and rates that make up the generic rates
- Comparative review of the final unit rates that are to be applied to check consistency
- Review of the cost allowance spreadsheet
- Detailed review of a sample of the projects to check assumptions and applications
- Workshop to test comparative costs and assumptions for individual projects.

Subsequently, AT cost estimators reviewed the generic rates for appropriateness of applying it within a generic greenfield DC policy.