Notice of Meeting

Infrastructure Advisory Committee Meeting

An Infrastructure Advisory Committee Meeting of Byron Shire Council will be held as follows:

Venue	Conference Room, Station Street, Mullumbimby
Date	Thursday, 29 February 2024
Time	11.30am

Phil Holloway Director Infrastructure Services

l2024/264 Distributed 22/02/24



CONFLICT OF INTERESTS

What is a "Conflict of Interests" - A conflict of interests can be of two types:

Pecuniary - an interest that a person has in a matter because of a reasonable likelihood or expectation of appreciable financial gain or loss to the person or another person with whom the person is associated.

Non-pecuniary – a private or personal interest that a Council official has that does not amount to a pecuniary interest as defined in the Code of Conduct for Councillors (eg. A friendship, membership of an association, society or trade union or involvement or interest in an activity and may include an interest of a financial nature).

Remoteness – a person does not have a pecuniary interest in a matter if the interest is so remote or insignificant that it could not reasonably be regarded as likely to influence any decision the person might make in relation to a matter or if the interest is of a kind specified in the Code of Conduct for Councillors.

Who has a Pecuniary Interest? - a person has a pecuniary interest in a matter if the pecuniary interest is the interest of the person, or another person with whom the person is associated (see below).

Relatives, Partners - a person is taken to have a pecuniary interest in a matter if:

- The person's spouse or de facto partner or a relative of the person has a pecuniary interest in the matter, or
- The person, or a nominee, partners or employer of the person, is a member of a company or other body that has a pecuniary interest in the matter.

N.B. "Relative", in relation to a person means any of the following:

- (a) the parent, grandparent, brother, sister, uncle, aunt, nephew, niece, lineal descends or adopted child of the person or of the person's spouse;
- (b) the spouse or de facto partners of the person or of a person referred to in paragraph (a)

No Interest in the Matter - however, a person is not taken to have a pecuniary interest in a matter:

- If the person is unaware of the relevant pecuniary interest of the spouse, de facto partner, relative or company or other body, or
- Just because the person is a member of, or is employed by, the Council.
- Just because the person is a member of, or a delegate of the Council to, a company or other body that has a pecuniary interest in the matter provided that the person has no beneficial interest in any shares of the company or body.

Disclosure and participation in meetings

- A Councillor or a member of a Council Committee who has a pecuniary interest in any matter with which the Council is concerned and who is present at a meeting of the Council or Committee at which the matter is being considered must disclose the nature of the interest to the meeting as soon as practicable.
- The Councillor or member must not be present at, or in sight of, the meeting of the Council or Committee:
 - (a) at any time during which the matter is being considered or discussed by the Council or Committee, or

(b) at any time during which the Council or Committee is voting on any question in relation to the matter.

No Knowledge - a person does not breach this Clause if the person did not know and could not reasonably be expected to have known that the matter under consideration at the meeting was a matter in which he or she had a pecuniary interest.

Non-pecuniary Interests - Must be disclosed in meetings.

There are a broad range of options available for managing conflicts & the option chosen will depend on an assessment of the circumstances of the matter, the nature of the interest and the significance of the issue being dealt with. Non-pecuniary conflicts of interests must be dealt with in at least one of the following ways:

- It may be appropriate that no action be taken where the potential for conflict is minimal. However, Councillors should consider providing an explanation of why they consider a conflict does not exist.
- Limit involvement if practical (eg. Participate in discussion but not in decision making or viceversa). Care needs to be taken when exercising this option.
- Remove the source of the conflict (eg. Relinquishing or divesting the personal interest that creates the conflict)
- Have no involvement by absenting yourself from and not taking part in any debate or voting on the issue as of the provisions in the Code of Conduct (particularly if you have a significant non-pecuniary interest)

Committee members are reminded that they should declare and manage all conflicts of interest in respect of any matter on this Agenda, in accordance with the <u>Code of Conduct</u>.

RECORDING OF VOTING ON PLANNING MATTERS

Clause 375A of the Local Government Act 1993 – Recording of voting on planning matters

- (1) In this section, **planning decision** means a decision made in the exercise of a function of a council under the Environmental Planning and Assessment Act 1979:
 - (a) including a decision relating to a development application, an environmental planning instrument, a development control plan or a development contribution plan under that Act, but
 - (b) not including the making of an order under that Act.
- (2) The general manager is required to keep a register containing, for each planning decision made at a meeting of the council or a council committee, the names of the councillors who supported the decision and the names of any councillors who opposed (or are taken to have opposed) the decision.
- (3) For the purpose of maintaining the register, a division is required to be called whenever a motion for a planning decision is put at a meeting of the council or a council committee.
- (4) Each decision recorded in the register is to be described in the register or identified in a manner that enables the description to be obtained from another publicly available document and is to include the information required by the regulations.
- (5) This section extends to a meeting that is closed to the public.

OATH AND AFFIRMATION FOR COUNCILLORS

Councillors are reminded of the oath of office or affirmation of office made at or before their first meeting of the council in accordance with Clause 233A of the Local Government Act 1993. This includes undertaking the duties of the office of councillor in the best interests of the people of Byron Shire and the Byron Shire Council and faithfully and impartially carrying out the functions, powers, authorities and discretions vested under the Act or any other Act to the best of one's ability and judgment.

BUSINESS OF MEETING

1. APOLOGIES

2. DECLARATIONS OF INTEREST – PECUNIARY AND NON-PECUNIARY

3. ADOPTION OF MINUTES FROM PREVIOUS MEETINGS

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	Myocum Quarry Precinct Update Capital Works Program 2023/24 Deficient Inspection Budget- Australian Defence Force Modular Steel Bridge . Operations and Maintenance Works Update

ADOPTION OF MINUTES FROM PREVIOUS MEETINGS

ADOPTION OF MINUTES FROM PREVIOUS MEETINGS

Report No. 3.1	Adoption of Minutes from Previous Meeting
Directorate:	Infrastructure Services
File No:	12024/255

RECOMMENDATION:

10 That the minutes of the Infrastructure Advisory Committee Meeting held on 21 September 2023 be confirmed.

Attachments:

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1 Minutes 21/09/2023 Infrastructure Advisory Committee, I2023/1441, page 81 🛣

3.1

ADOPTION OF MINUTES FROM PREVIOUS MEETINGS

Report

The attachment to this report provides the minutes of the Infrastructure Advisory Committee Meeting of 21 September 2023 .

5 Report to Council

The minutes were reported to Council on

Comments

- 10 In accordance with the Committee Recommendations, Council resolved the following:
 - **23-478 Resolved** that Council adopts the following Committee Recommendation:

Report No. 4.1 Shire Wide Pedestrian Crossing Upgrades

Committee Recommendation 4.1.1:

That Council endorses the proposed upgrade program for Byron Shire zebra crossings, subject to funding availability.

Minutes of Meeting Infrastructure Advisory Committee Meeting

Venue	Conference Room, Station Street, Mullumbimby
Date	Thursday, 21 September 2023
Time	4.30pm



INFRASTRUCTURE ADVISORY COMMITTEE MEETING MINUTES 21 SEPTEMBER 2023

Minutes of the Infrastructure Advisory Committee Meeting held on Thursday, 21 September 2023

File No: 12023/1441

PRESENT: Cr Michael Lyon (Mayor), Cr Duncan Dey, Cr Mark Swivel

Staff: Phil Holloway (Director Infrastructure Services)

Samuel Frumpui (Manger Works)

Judd Cornwall (Traffic Engineer)

Shelley Flower (Road Safety Officer)

Kimberley van Soest (Minute Taker)

Kirk Weallans (Operations Coordinator)

Community Representatives: Anthony Pangallo, Gareth James

ATTENDANCE VIA AUDIO-VISUAL LINK:

Anthony Pangallo

Cr Lyon (Chair) opened the meeting at 4:32pm and acknowledged that the meeting was being held on Bundjalung Country.

APOLOGIES:

Andrew Winton-Brown

DECLARATIONS OF INTEREST – PECUNIARY AND NON-PECUNIARY

There were no declarations of interest.

IAC Infrastructure Advisory Committee Meeting

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3.1 - ATTACHMENT 1

BYRON SHIRE COUNCIL

INFRASTRUCTURE ADVISORY COMMITTEE MEETING MINUTES 21 SEPTEMBER 2023

ADOPTION OF MINUTES FROM PREVIOUS MEETINGS

Report No. 3.1Adoption of Minutes from Previous MeetingFile No:I2023/1390

Committee Recommendation:

That the minutes of the Infrastructure Advisory Committee Meeting held on 20 April 2023 be confirmed.

(Lyon/Pangallo)

The recommendation was put to the vote and declared carried

BUSINESS ARISING FROM PREVIOUS MINUTES

There was no business arising from previous minutes.

STAFF REPORTS - INFRASTRUCTURE SERVICES

Report No. 4.1	Shire Wide Pedestrian Crossing Upgrades
File No:	12023/1142

Committee Recommendation:

That Council endorses the proposed upgrade program for Byron Shire zebra crossings, subject to funding availability.

The recommendation was put to the vote and declared carried.

Report No. 4.2Maintenance Programs 23/24 FY – Sealed Road, Stormwater
Drainage and Grading ProgramsFile No:12023/1265

Committee Recommendation:

That the Infrastructure Advisory Committee note the report.

The recommendation was put to the vote and declared carried.

(Lyon/Swivel)

(Dey/Swivel)

IAC Infrastructure Advisory Committee Meeting

page 4

ADOPTION OF MINUTES FROM PREVIOUS MEETINGS

<u>3.1 - ATTACHMENT 1</u>

BYRON SHIRE COUNCIL

INFRASTRUCTURE ADVISORY COMMITTEE MEETING MINUTES 21 SEPTEMBER 2023

Report No. 4.3Capital Works Program 2023/24File No:12023/1368

Committee Recommendation:

That the Committee notes the 2023/24 Capital Works Program and 10-year Capital Works program.

The recommendation was put to the vote and declared carried.

(Lyon/Swivel)

There being no further business the meeting concluded at 5:33PM.

IAC Infrastructure Advisory Committee Meeting

page 5

STAFF REPORTS - INFRASTRUCTURE SERVICES

STAFF REPORTS - INFRASTRUCTURE SERVICES

Report No. 4.1	Myocum Quarry Precinct Update						
Directorate:	Infrastructure Services						
Report Author:	Nikki Bourke, Project Officer						
File No:	12024/17						

Summary:

This update addresses status of projects and the allocation of resources relating to the Myocum Quarry Precinct.

10 Lot 1 and Lot 4 quarries both have pressing needs. Lot 1 investigations have commenced with geotechnical studies. The Lot 4 lease has been extended to June 2025 and Council has dedicated resources to ensure that the site is returned in a suitably remediated state.

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RECOMMENDATION:

That the contents of the report are noted.

STAFF REPORTS - INFRASTRUCTURE SERVICES

Report

Myocum Quarry Precinct

As a recap, the Myocum Quarry Precinct comprises three quarries:

- Lot 1 Quarry Byron Shire Council's owned and operated quarry at Lot 1 DP591441. The site has ceased quarry operations and requires a modified DA to rehabilitate the site;
 - Lot 4 Quarry Council owned Lot 4 DP1052900, leased to Leela Plantations P/L, and operated by J&M Bashforth & Sons P/L. The lease is due for completion in June 2024.
- 10 Lot 17 Quarry Lot 17 DP1178892 owned and operated by Leela Plantations P/L.



The Myocum Quarry Precinct Project Control Group (PCG) has continued to convene every two months to coordinate and progress matters relating to the Myocum Quarry lots.

5

Myocum Quarry Precinct

Figure 1:

STAFF REPORTS - INFRASTRUCTURE SERVICES

These meetings have just moved to a monthly frequency to support an increase in project delivery and decision making requirements.

Key issues

Progress for matters relating to each site is as follows:

5 Lot 1 Myocum Quarry

The Lot 1 Quarry is no longer used for quarrying and there are no plans to do so in the future as the material source is largely exhausted. The site currently has non-compliances with the Development Approvals specified rehabilitation plan.

A meeting with Council's Sustainable Environmental and Economy Directorate
 Development Assistance Panel (DAP) advised that to rectify the site compliance issues, a modified DA will be required supported by the following studies: Statement of Environmental Effects (SEE), Geotechnical Assessment, Hydrology Assessment, and an updated Stormwater Management and Rehabilitation Plan that is achievable with the current landform.

- 15 The investigations commenced with the Geotechnical Assessment which will:
 - Assess slope stability and safety matters present on the site;
 - Investigate the haul road integrity;
 - Assess the quantity and characterisation of material remaining in the south-western corner, should it be beneficial for Council to modify this area to win material for rehabilitation/rectification works or utilise that area of the site; and
 - Propose mitigation measures and indicative costs.

Preliminary advice from the consulting geotechnical engineers has indicated that there are some areas of concern, of which risk mitigation and rectification measures are possible.
Staff are awaiting the results of the modelling and reporting to understand the magnitude and cost of these in order to plan for their implementation and incorporate them in a revised rehabilitation plan.

The Executive Team (ET) has also recently endorsed a proposal that the Lot 1, Myocum Quarry site be further investigated and costed as the preferred site for spoil management activities supporting the Flood Recovery restoration works (ET report I2024/17). The geotechnical investigation will inform this project.

A NSW EPA approval is currently in place (as special conditions to the site's Environmental Protection Licence – EPL12600) to use the site for road materials stockpiling and transfer for the 2022 Flood Road Work Recovery program.

An amended Environmental Protection Licence has been secured from EPA in February 2024 for Lot 1 that now permits the importation, exportation, drying and processing of various material types.

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STAFF REPORTS - INFRASTRUCTURE SERVICES

Planning advice has been sought confirming the placement of suitable spoil materials for rehabilitation purposes.

The need to amend the current rehabilitation plan and management plan is also required to maximise the opportunity to reuse spoil materials at this site.

5 Lot 4 Myocum Quarry

The Lot 4 Quarry is currently leased to Leela Plantations P/L (Leela) and quarried by J&M Bashforths P/L (Bashforths) contracted to Leela. The initial 21 year lease was due to expire in June 2024. The previous update to IAC detailed the approvals and lease history of the site.

10 Since the last update to IAC, a one year extension to June 2025 was granted to enable the lessee to rehabilitate the site.

The DA for the site is an older one (1995) giving only general text guidance as to the rehabilitation requirements to support four possible end uses: sports field; wetlands/reafforestation; wildlife lake; and equestrian centre. No final site land profile

- 15 contours are specified in the DA. In order to achieve site that is rehabilitated for flexibility of possible future uses, Council has communicated that we wish for the 'sports facility' end use to be achieved to maximise the floor space area. The following has occurred to support the lessee working towards a rehabilitated site:
 - A drone survey of the current quarried Lot 4 landform;
- 3D landform survey provided to Bashforths for their use in designing the rehabilitated site;
 - A request for the proposed rehabilitated site design to be submitted by the lessee to Council for our information;
 - Meetings with relevant SEE and IS staff to plan for assessing the rehabilitation plan and working with the lessee and Bashforths for refinement of the plan (if required);
 - Meetings with SEE staff to plan for auditing the site during the rehabilitation phase;
 - A pegged boundary survey of Lot 4 to assist Bashforths on-ground rehabilitation operations; and
- A quote has been sought for a geotechnical assessment of the eastern wall of the
 Lot 4 site as it relates to the safe operation of the adjacent Resource Recovery
 Centre's stormwater lagoon.

All stakeholders are currently working cooperatively towards the rehabilitation of the Lot 4 site.

Lot 17 Leela Quarry

35 Leela owns and operates the Lot 17 DP1178892 Quarry. Development consent 95/0241 covers operations at this site.

STAFF REPORTS - INFRASTRUCTURE SERVICES

SEE directorate staff were consulted to propose that this site should be considered for inspections whilst audits for the leased Lot 4 rehabilitation are taking place.

Next steps

Detailed investigations will proceed on Lot 1 to inform a revised rehabilitation plan and
 modified DA. The site will be further investigated as the preferred site for spoil
 management associated with the Flood Recovery works.

Collaboration with the lessee and their contractors Bashforths will continue with a view to rehabilitating the Lot 4 site by June 2025.

10 **The Strategic Considerations**

Community Strategic Plan and Operational Plan

CSP Objective	CSP Strategy	DP Action	Code	OP Activity
5: Connected Infrastructure	5.1: Provide a safe, reliable, and accessible transport network			
5: Connected Infrastructure	5.1: Provide a safe, reliable, and accessible transport network	5.1.5: Restore road network - Restore the affected parts of the road network that were impacted by the 2022 flood events		
3: Nurtured Environment	3.5: Minimise waste and encourage recycling and resource recovery practices	3.5.5: Facilities and services - Provide resource recovery facilities and	3.5.5.1	Maintain compliance with NSW Environmental Protection Licences for the Byron Resource Recovery Centre and Myocum Landfill

STAFF REPORTS - INFRASTRUCTURE SERVICES

	services that meet statutory requirements		

Recent Resolutions

Infrastructure Advisory Committee

Resolved that Council adopts the following Committee Recommendation:

Report No. 4.3 Myocum Quarry Update

5 File No: I2022/1341

Committee Recommendation 4.3.1

That Council notes the contents of the report and support the rehabilitation of Lots 1 (DP591441) and 4 (DP1052900). (Hunter/Lyon)

The motion was put to the vote and carried unanimously.

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Infrastructure Advisory Committee

Resolved that Council adopts the following Committee Recommendations:

Report No. 3.3 Myocum Quarry DA Compliance and Options Report

File No: I2022/656

15 Committee Recommendation 3.3.1

That Council supports:

1. The actions as recommended in the report "DA Compliance and Options Assessment for Myocum Quarry" (E2021/155252) in response to resolution 21-098 and including preparation of a section 4.55(2) modification to the original development consent.

- 20 2. The provision of six monthly updates to the Infrastructure Advisory Committee.
 - 3. The first six monthly update to include consideration of budget implications.

(Lyon/Ndiaye).

STAFF REPORTS - INFRASTRUCTURE SERVICES

Legal/Statutory/Policy Considerations

As per a previous report (I2022/656), it is considered that the Lot 1 Myocum Quarry currently contains a high level of regulatory risk, and potentially high levels of financial, reputational, environmental and workplace health and safety risk operating the quarry in its

5 current state and under the current DA. However, as the site is no longer being actively quarried, and that the NSW EPA has been consulted, visited site and approved a special EPL condition to use the site for road and flood materials storage and transfer, the matters are no longer considered urgent.

10 **Financial Considerations**

Comment by Manager Finance:

Council currently maintains a reserve for Quarry Operations that in theory has been built up over the years to eventually provide funding for rehabilitation once quarry operations cease.

- 15 The Quarry Reserve facilitated internal loans to other projects which have since been mostly repaid and the Quarry Reserve currently has a balance of \$1,185,766 at 30 June 2023. The reserve is projecting at 30 June 2024 to have a balance of \$934,400 after allowing for \$400,000 to be expended on an Operations, Management, Rehabilitation and Plan Reviews. A further \$148,600 is being transferred to the Quarry Reserve in 2023/24
- 20 to reimburse remaining historical internal borrowing but this is included in the \$934,300 reserve balance expected at 30 June 2024. The reserve balance will be higher again if the \$400,000 expenditure is not expended.

Consultation and Engagement

A Myocum Quarry Project Control Group (PCG) currently meets every 2 months and this is
 increasing to monthly to progress actions related to the Myocum Quarry Precinct. The
 PCG has representatives from the following Infrastructure Services branches: Works,
 Resource Recovery, and Assets and Major Projects; along with representatives from
 Corporate and Community Services and Strategic Economy and Environment as required.

Mr Bruno Kortenhorst of Leela was contacted during 2022 to understand the status of the Lot 4 Quarry, to initiate conversations regarding the completion of the lease in 2024 and the return of the property to council, and to secure a lease extension. Council is currently liaising with Leela Plantations through their solicitor BVK Solicitors Attorneys. Council is communicating directly with Leela's contractor Bashforth's for investigations, rehabilitation planning and practical site matters.

STAFF REPORTS - INFRASTRUCTURE SERVICES

Report No. 4.2	Capital Works Program 2023/24						
Directorate:	Infrastructure Services						
Report Author:	Zach Fryer, Construction Coordinator James Flockton, Infrastructure Planning Coordinator Rodrigo Reolon, Works Engineer						
File No:	12024/176						

Summary:

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To provide the Committee a status report on the progress of the 2023/24 Capital Works Program in conjunction with the (10) year Capital Works Program.

10 Updates on all Infrastructure Services Capital Works projects will be provided at the meeting via Council's Project Management Control system, Pulse, as required.

15 **RECOMMENDATION:**

That the Committee notes the 2023/24 Capital Works Program and 10-year Capital Works program.

Attachments:

- 20 1 Works 10 Year Plan 2024-25 to 2033-34 Capital Budget for Infrastructure Advisory Committee, E2023/94997 , page 28 🗓 🖾
 - 2 Design & Construction Capital Works Program 2023/24, I2023/1401, page 34 🗓 🛣

STAFF REPORTS - INFRASTRUCTURE SERVICES

Report

Attached to this report is the 10 year plan from 2024/25 onwards (attachment 1) and the approved capital works program for 2023/24 (attachment 2).

Report also outlines projects/programs currently being delivered, completed and future works for this year.

10 Year Plan 2024/25 onwards

The works team maintain a 10-year plan that is updated each year as part of the annual budget process. The update process commences in August each year and is concluded in December each year. Following this the plan is escalated internally for consideration and then to Council and community consultation process.

Attachment 1 is not a completed review, the current review has commenced, but is not complete, therefore this document is a work in progress. The budget is not currently balanced against available budgets and will need to change to balance the budgets.

It is noted that this plan is balanced each year against available projected budgets. It does
 not reflect the real needs of our infrastructure network. It aims to strike a mix of renewals, upgrade and new assets, that allow staff to seek grant funds with Council's contributions for new works or upgrades while also completing essential renewal works.

Annual budgets are not sufficient to meet the renewal needs of Council, this is unlikely to change in the short term, therefore, staff have the difficult task of working out which are the

20 most urgent works and carry the most risk to Council. Staff also try to ensure the program represents the best value for money for Council, this may result in the program looking unusual, but it will represent the best way of spending Council funds.

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STAFF REPORTS - INFRASTRUCTURE SERVICES

Capital Works Program 2023/24

Completed Projects:

• Warrambool Road – Ocean Shores

Scope: Pavement rehabilitation-fixing local roads program



• Strand Avenue Pavement Rehabilitation – New Brighton

Scope: Pavement rehabilitation and new speed hump



STAFF REPORTS - INFRASTRUCTURE SERVICES

• North Head Road – New Brighton

Scope: Pavement rehabilitation and new speed hump



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• Linda Vidler Drainage Upgrade – Suffolk Park

Scope: Drainage upgrade.



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• Left Bank Road Pavement & Drainage Works - Mullumbimby

Scope: Replacement of culverts, installation of kerb and gutter, drainage upgrade and pavement rehabilitation.



• Yankee Creek Road – Mullumbimby

Scope: Pavement rehabilitation.



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Active Projects:

- Carlyle Street Road Renewal Byron Bay
- Mullumbimby Recreation Grounds Carpark Mullumbimby
- 5 Fern Street Shared Path Mullumbimby

Future Projects:

- Bayshore Drive Road Renewal and Shared Path Byron Bay
- Lawson Street Renewal Byron Bay
- River Terrace Pavement Rehabilitation Mullumbimby
- 10 Heritage Park Footpath Mullumbimby
 - Rajah Road Drainage Ocean Shores

Staff have also reviewed and allowed, in the interim, delivery of flood damage scope of works, pending approval outcomes from Transport NSW in the second half of the fiscal year, January to June 2024. However, this is all outside our control when those EPAR works will be approved and can be programmed accordingly.

Our intentions are to be well-prepared to deliver both the internal capital works program and a portion of the flood damage scope efficiently and effectively.

We are dedicated to resource allocation, staff development, and maintaining the flexibility required to respond promptly to any changes in funding or scope.

20 Key issues

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- NSW Reconstruction EPAR Approval impacts
- Grant Fundings and delivery timeframes
- Design shovel ready projects
- Resourcing
- 25 There are no negative impacts proposed in this report, except for the key issues already noted above which may impact the program.

Currently, with no approved EPAR for Construction Team to deliver, staff are working along with other directorates to ensure other grant funded projects can be delivered using internal capital works teams.

STAFF REPORTS - INFRASTRUCTURE SERVICES

Strategic Considerations

Community Strategic Plan and Operational Plan

CSP Objective	CSP Strategy	DP Action	Code	OP Activity				
5: Connected Infrastructure We have connected infrastructure, transport, and facilities that are safe, accessible, and reliable	5.1: Provide a safe, reliable, and accessible transport network	5.1.5: Restore road network - Restore the affected parts of the road network that were impacted by the 2022 flood events	5.1.5.1	Flood Damage Repair program				
5: Connected Infrastructure We have connected infrastructure, transport, and facilities that are safe, accessible, and reliable	5.2: Connect the Shire through integrated transport services	5.2.2: Public transport - Advocate for public transport services across Byron Shire that are convenient, regular, and easy to access	5.2.2.1	Advocate and apply for grants that improve accessibility to various transport options across the shire				

Recent Resolutions

Nil

5 Legal/Statutory/Policy Considerations

Nil

Financial Considerations

Capital Works 10-year program have been developed around balancing budgets within projected budget allocations.

10 Most projects are fully funded by Council for delivery in 2023/24, with additional funding from State and Federal.

STAFF REPORTS - INFRASTRUCTURE SERVICES

Adjustments to project budgets to reflect budget savings or additional costs are managed by either:

- Separate report to Council.
- Inclusion in September, December, March or June (end of year) Quarterly Financial Review.

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Consultation and Engagement

Nil

<u>4.2</u>

Project Description	Program	Asset class	Asset sub class	Locality	Expenditure Type	Year	Amount	Grants - RTR	Grants - State/ Contrib	Section 94	Loans	Stormwater Res	Funding IRR - Byron Bay	BBTCMP	IRR - Non Byron Res	serves	2017/18 SRV Allocation	Council Revenue
Capital Heavy Patching / Asphalt Overlay Program - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2024/25	460.000.00										460.000.00	
Canital Heavy Patching / Asnhalt Overlay Program - As ner inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2025/26	48 000 00										48 000 00	
Capital Honey Datching / Acabalt Ovorlay Program. As per inspection report	Local Roads and Drainage	Roade	Roads Soaled	SHIREWIDE	Ronowal	2026/27	500.000.00										500,000,00	
Capital Heavy Patching / Asphalt Overlay Program - As per inspection report	Local Roads and Drainage	Roade	Roads Scaled	SHIREWIDE	Renowal	2020/2/	530,000,00										530,000,00	
Capital Heavy Fatching / Asphale Overlay Program - As per inspection report	Local Roads and Drainage	Rodus	Roads Sealed	CHIPEWIDE	Deneval	2027/28	520,000.00										520,000.00	
Capital Heavy Patching / Asphalt Overlay Program - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2028/29	540,000.00										540,000.00	
Capital Heavy Patching / Aspnalt Overlay Program - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2029/30	560,000.00										560,000.00	
Capital Heavy Patching / Asphalt Overlay Program - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2030/31	580,000.00										580,000.00	
Capital Heavy Patching / Asphalt Overlay Program - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2031/32	600,000.00										600,000.00	
Capital Heavy Patching / Asphalt Overlay Program - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2032/33	700,000.00										700,000.00	
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2024/25	100,000.00						100,000.00					
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2025/26	110,000.00						110,000.00					
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2026/27	120,000.00						120,000.00					
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2027/28	120,000.00						120,000.00					
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2028/29	120,000.00						120,000.00					
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2029/30	120,000.00						120,000.00					
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2030/31	120,000.00						120,000.00					
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2031/32	120,000.00						120,000.00					
Capital Heavy Patching / Asphalt Overlay Program - Byron Bay - As per inspection report	Local Roads and Drainage	Roads	Roads Sealed	SHIREWIDE	Renewal	2032/33	120,000.00						120,000.00					
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2024/25	150,000.00										150,000.00	
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2025/26	160,000.00										160,000.00	
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2026/27	170,000.00										170,000.00	
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2027/28	180,000.00										180,000.00	
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2028/29	190,000.00										190,000.00	
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2029/30	200,000.00										200,000.00	
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2030/31	210,000.00										210,000.00	
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2031/32	220.000.00										220,000,00	
Bridge Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads	Bridges	SHIREWIDE	Renewal	2032/33	230.000.00										230.000.00	
Causeway Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2024/25	60.000.00										60.000.00	
Causeway Cantial Maintenance Works Program - As per inspection report	Local Boads and Drainage	Roads		SHIREWIDE	Renewal	2025/26	70 000 00										70,000,00	
Causeway Capital Maintenance Works Program. As per inspection report	Local Roads and Drainage	Roade		SHIREWIDE	Renowal	2025/20	80,000,00										80,000,00	
Causeway Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roade		CHIPEWIDE	Benewal	2020/2/	00,000,00										00,000.00	
Causeway Capital Maintenance Works Program - As per Inspection report	Local Roads and Drainage	Rodus		SHIKEWIDE	Reliewal	2027/28	90,000.00										90,000.00	
Causeway Capital Maintenance Works Program - As per Inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2028/29	100,000.00										100,000.00	
Causeway Captial Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2029/30	110,000.00										110,000.00	
Causeway Captial Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2030/31	120,000.00										120,000.00	
Causeway Captial Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2031/32	130,000.00										130,000.00	
Causeway Captial Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2032/33	140,000.00										140,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2024/25	60,000.00										60,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2025/26	70,000.00										70,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2026/27	80,000.00										80,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2027/28	90,000.00										90,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2028/29	100,000.00										100,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2029/30	110,000.00										110,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2030/31	120,000.00										120,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2031/32	130,000.00										130,000.00	
Major Culverts Capital Maintenance Works Program - As per inspection report	Local Roads and Drainage	Roads		SHIREWIDE	Renewal	2032/33	140,000.00										140,000.00	
Orana Bridge Capital Concrete Repair	Local Roads and Drainage	Roads		OCEAN SHORES	Renewal	2025/26	406,000.00										406,000.00	

STAFF REPORTS - INFRASTRUCTURE SERVICES

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Helen Sreet Footbridge Deck Renewal	Local Roads and Drainage Roads		OCEAN SHORES	Upgrade	2024/25	500,000.00						500,000.00	-
Tallow Creek Footbridge Renewal - Design	Local Roads and Drainage Roads		BYRON BAY	Renewal	2024/25	60,000.00							
Tallow Creek Footbridge Renewal - Construction	Local Roads and Drainage Roads		BYRON BAY	Renewal	2025/26	470,000.00					178,400.00	291,600.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2024/25	78,000.00				20,000.00	48,000.00	10,000.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2025/26	80,000.00				20,000.00	50,000.00	10,000.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2026/27	82,000.00				20,000.00	52,000.00	10,000.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2027/28	85,000.00				20,000.00	55,000.00	10,000.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2028/29	87,000.00				20,000.00	57,000.00	10,000.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2029/30	90,000.00				20,000.00	60,000.00	10,000.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2030/31	92,000.00				20,000.00	62,000.00	10,000.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2031/32	95,000.00				20,000.00	65,000.00	10,000.00	
Access ramps and footpaths Capital Works Program	Local Roads and Drainage Roads	Footpaths/cycleway	s SHIREWIDE	Upgrade	2032/33	100,000.00				20,000.00	70,000.00	10,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads		SHIREWIDE	Renewal	2024/25	88,000.00						88,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage		SHIREWIDE	Renewal	2025/26	90,000.00						90,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage		SHIREWIDE	Renewal	2026/27	92,000.00						92,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage		SHIREWIDE	Renewal	2027/28	94,000.00						94,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage		SHIREWIDE	Renewal	2028/29	96,000.00						96,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage		SHIREWIDE	Renewal	2029/30	98,000.00						98,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage		SHIREWIDE	Renewal	2030/31	100,000.00						100,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage		SHIREWIDE	Renewal	2031/32	102,000.00						102,000.00	
Kerb and Gutter Capital Renewal Program - As per inspection report	Local Roads and Drainage		SHIREWIDE	Renewal	2032/33	104,000.00						104,000.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2024/25	116,200.00						116,200.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2025/26	119,700.00						119,700.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2026/27	123,300.00						123,300.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2027/28	127,000.00						127,000.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2028/29	131,000.00						131,000.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2029/30	131,000.00						131,000.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2030/31	131,000.00						131,000.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2031/32	131,000.00						131,000.00	
Active Transport Network Capital Renewal Program - As per inspection report	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	SHIREWIDE	Renewal	2032/33	132,000.00						132,000.00	
Raftons Road Footpath - Construction	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BANGALOW	New	2024/25	твс							
Lighthouse Road Shared Path - Construction	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BANGALOW	New	2024/25	твс							
Centenial Circuit Shared Path - Construction	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BYRON BAY	New	2024/25	650,000.00	650,000.00						
Cowper Street Shared Path and Road Upgrade - Design	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BYRON BAY	New	2025/26	40,000.00				40,000.00			
Middleton Street Footpath (link to beach) - Design	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BYRON BAY	New	2024/25	30,000.00				30,000.00			
Middleton Street Footpath Link to Beach - Design	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BYRON BAY	New	2025/26	30,000.00				30,000.00			
Middleton Street Footpath Link to Beach - Construction	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BYRON BAY	New	2026/27	180,000.00				140,000.00	40,000.00		
Beach Avenue (SGB???) Shared Path - Design	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BANGALOW	New	2028/29	30,000.00					30,000.00		
Beach Avenue (SGB????) Shared Path - Construction	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BANGALOW	New	2029/30	350,000.00					350,000.00		
Market Street Footpath Bangalow - Design	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BANGALOW	New	2024/25	40,000.00					40,000.00		
Market Street Footpath - Construction	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BANGALOW	New	2025/26	120,000.00					120,000.00		
Middleton Street Footpaths - Construction	Local Roads and Drainage Roads	Foot/Cycle/Shared Paths	BYRON BAY	New	2025/26	356,000.00	199,925.00			156,075.00			
Urban Laneway Drainage Master Planning Program	Local Roads and Drainage Stormy	ater	SHIREWIDE	Upgrade	2024/25	60,000.00							60,000.00
Urban Laneway Drainage Master Planning Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2025/26	60,000.00							60,000.00
Urban Laneway Drainage Master Planning Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2026/27	60,000.00							60,000.00
Urban Laneway Drainage Master Planning Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2027/28	60,000.00							60,000.00
Urban Laneway Drainage Master Planning Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2028/29	60.000.00							60.000.00
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STAFF REPORTS - INFRASTRUCTURE SERVICES

Urban Laneway Drainage Master Planning Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2029/30	60,000.00					
Urban Laneway Drainage Master Planning Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2030/31	60,000.00					
Urban Laneway Drainage Master Planning Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2031/32	60,000.00					
Urban Laneway Drainage Master Planning Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2032/33	60,000.00					
Overland Flow Path Study Construction Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2025/26	300,000.00	300,000.00				
Overland Flow Path Study Construction Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2026/27	300,000.00	300,000.00				
Overland Flow Path Study Construction Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2027/28	300,000.00	300,000.00				
Overland Flow Path Study Construction Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2028/29	300,000.00	300,000.00				
Overland Flow Path Study Construction Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2029/30	300,000.00	300,000.00				
Overland Flow Path Study Construction Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2030/31	300,000.00	300,000.00				
Overland Flow Path Study Construction Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2031/32	300,000.00	300,000.00				
Overland Flow Path Study Construction Program	Local Roads and Drainage		SHIREWIDE	Upgrade	2032/33	300,000.00	300,000.00				
Stormwater Capital Renewal Works Program	Local Roads and Drainage	Stormwater	SHIREWIDE	Renewal	2024/25	240,000.00					
Stormwater Capital Renewal Works Program	Local Roads and Drainage		SHIREWIDE	Renewal	2025/26	330,000.00					
Stormwater Capital Renewal Works Program	Local Roads and Drainage		SHIREWIDE	Renewal	2026/27	330,000.00					
Stormwater Capital Renewal Works Program	Local Roads and Drainage		SHIREWIDE	Renewal	2027/28	330,000.00					
Stormwater Capital Renewal Works Program	Local Roads and Drainage		SHIREWIDE	Renewal	2028/29	430,000.00					
Stormwater Capital Renewal Works Program	Local Roads and Drainage		SHIREWIDE	Renewal	2029/30	440,000.00					
Stormwater Capital Renewal Works Program	Local Roads and Drainage		SHIREWIDE	Renewal	2030/31	450,000.00					
Stormwater Capital Renewal Works Program	Local Roads and Drainage		SHIREWIDE	Renewal	2031/32	460,000.00					
Stormwater Capital Renewal Works Program	Local Roads and Drainage		SHIREWIDE	Renewal	2032/33	480,000.00					
Byron Bay Stormwater Upgrade Program	Local Roads and Drainage		BYRON BAY	Upgrade	2030/31	15,000,000.00		15,000,000.00			
Augmentation - Design	Local Roads and Drainage		BYRON BAY	Upgrade	2027/28	25,000.00				25,000.00	
Augmentation - Construction of upnili flows onto properties / 61 Tennyson Overland Flow and Augmentation - Construction	Local Roads and Drainage		BYRON BAY	Upgrade	2028/29	150,000.00	76,600.00			73,400.00	
Studal Lane Drainage Upgrade - Construction	Local Roads and Drainage	Stormwater	MULLUMBIMBY	Upgrade	2025/26	369,720.00	369,720.00				
Lane 6 Brunswick Heads - amplyfy system to prevent property flooding - Design	Local Roads and Drainage		HEADS	Upgrade	2028/29	20,000.00				20,000.00	
Lane 6 Brunswick Heads - amplyfy system to prevent property flooding	Local Roads and Drainage		HEADS	Upgrade	2029/30	110,000.00				110,000.00	
48 Fingal Street - System amplification overland flow not available - Design	Local Roads and Drainage		HEADS	Upgrade	2027/28	20,000.00				20,000.00	
48 Fingal Street - System amplification overland flow not available	Local Roads and Drainage		HEADS	Upgrade	2028/29	110,000.00				110,000.00	
Gaggin Street New Brighton - resolve property nooding poor subdivision driveway designs - Design Case in Charact New Brighton - resolve property flooding poor subdivision driveway designs -	Local Roads and Drainage		OCEAN SHORES	Upgrade	2025/26	25,000.00				25,000.00	
Gaggin Street New Brighton - resolve property flooding poor subdivision driveway designs - construction	Local Roads and Drainage		OCEAN SHORES	Upgrade	2028/29	90,000.00				90,000.00	
Minyon and Teven - System amplifiaftion - Design	Local Roads and Drainage		HEADS	Upgrade	2028/29	30,000.00				30,000.00	
Minyon and Teven - System amplifiaftion	Local Roads and Drainage		HEADS	Upgrade	2029/30	250,000.00	81,600.00			168,400.00	
67 Kingsley Street - resolve flooding of yard and garage - Design	Local Roads and Drainage		BYRON BAY	Upgrade	2029/30	20,000.00				20,000.00	
67 Kingsley Street - resolve flooding of yard and garage	Local Roads and Drainage		BYRON BAY	Upgrade	2030/31	80,000.00				80,000.00	
44 The Terrace - Pipe soakage pit to existing system or new system - Design	Local Roads and Drainage		HEADS	Upgrade	2029/30	25,000.00				25,000.00	
44 The Terrace - Pipe soakage pit to existing system or new system	Local Roads and Drainage		HEADS	Upgrade	2030/31	150,000.00				150,000.00	
24 Balemo Drive - Overland flow to golf course	Local Roads and Drainage		OCEAN SHORES	Upgrade	2030/31	20,000.00				20,000.00	
SGB Street Drainage - Rear easements Augmentation East side - Planning	Local Roads and Drainage		OCEAN SHORES	Renewal	2025/26	30,000.00				30,000.00	
SGB Street Drainage - Rear easements Augmentation East side - Construction	Local Roads and Drainage		OCEAN SHORES	Renewal	2026/27	300,000.00				300,000.00	
SGB Street Drainage Stage - Rear easements Augmentation West side - Planning	Local Roads and Drainage		OCEAN SHORES	Renewal	2025/26	30,000.00				30,000.00	
SGB Street Drainage Stage - Rear easements Augmentation West side - Construction	Local Roads and Drainage		OCEAN SHORES	Renewal	2027/28	300,000.00			 	300,000.00	
SGB Street Drainage Upgrade - Gloria Street West - Construction Urban Main Renewal / Relign Program - Langi Place replace pines between D000012132 and	Local Roads and Drainage	Stormwater	OCEAN SHORES	Upgrade	2024/25	240,000.00			 	240,000.00	
D000012132 Urban Main Renewal / Relign Program - Matong Drive renlace nines between nits	Local Roads and Drainage	Stormwater	OCEAN SHORES	Renewal	2025/26	120,000.00					
D000011322 and D00001321	Local Roads and Drainage		OCEAN SHORES	Renewal	2025/26	120,000.00					
Urban Main Renewal / Relign Program - Construct Parcel 54790 Ocean Shores	Local Roads and Drainage		SHIREWIDE	Renewal	2026/27	200,000.00					

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STAFF REPORTS - INFRASTRUCTURE SERVICES

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Urban Main Renewal / Relign Program - Construction	Local Roads and Drainage		SHIREWIDE	Ren	ewal 2028/29	200,000.00					200,000.00	
Urban Main Renewal / Relign Program - Construction	Local Roads and Drainage		SHIREWIDE	Ren	ewal 2029/30	200,000.00					200,000.00	
Urban Main Renewal / Relign Program - Construction	Local Roads and Drainage		SHIREWIDE	Ren	ewal 2030/31	200,000.00					200,000.00	
Urban Main Renewal / Relign Program - Construction	Local Roads and Drainage		SHIREWIDE	Ren	ewal 2031/32	200,000.00					200,000.00	
Urban Main Renewal / Relign Program - Construction	Local Roads and Drainage		SHIREWIDE	Ren	ewal 2032/33	200,000.00					200,000.00	
Urban Laneway Drainage Master Planning- Construction	Local Roads and Drainage		SHIREWIDE	Upg	rade 2026/27	300,000.00	200,000.00			100,000.00		
Urban Laneway Drainage Master Planning- Construction	Local Roads and Drainage		SHIREWIDE	Upg	rade 2027/28	300,000.00	200,000.00			100,000.00		
Urban Laneway Drainage Master Planning- Construction	Local Roads and Drainage		SHIREWIDE	Upg	rade 2028/29	300,000.00	200,000.00			 100,000.00		
Urban Laneway Drainage Master Planning- Construction	Local Roads and Drainage		SHIREWIDE	Upg	rade 2029/30	300,000.00	200,000.00			100,000.00		
Urban Laneway Drainage Master Planning- Construction	Local Roads and Drainage		SHIREWIDE	Upg	rade 2030/31	300,000.00	200,000.00			100,000.00		
Urban Laneway Drainage Master Planning- Construction	Local Roads and Drainage		SHIREWIDE	Upg	rade 2031/32	300,000.00	200,000.00			100,000.00		
Urban Laneway Drainage Master Planning- Construction	Local Roads and Drainage		SHIREWIDE	Upg	rade 2032/33	300,000.00	200,000.00			100,000.00		
Pipe existing drain along the edge of The Strand (NW)	Local Roads and Drainage		OCEAN SHOP	ES New	2027/28	100,000.00				100,000.00		
Design Avocado / Grevillea Overland Flow Path	Local Roads and Drainage		MULLUMBIN	BY New	2025/26	90,000.00				30,000.00		
Construct Avocado / Grevillea Overland Flow Path - Construction	Local Roads and Drainage		MULLUMBIN	BY New	2026/27	430,070.00	230,070.00			200,000.00		
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2024/25	1,200,000.00			310,000.00	200,000.00	690,000.00	
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2025/26	1,220,000.00			248,300.00	200,000.00	771,700.00	
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2026/27	1,140,000.00			142,375.00	187,625.00	810,000.00	
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2027/28	1,360,000.00			260,000.00	260,000.00	840,000.00	
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2028/29	1,380,000.00			289,000.00	200,000.00	891,000.00	
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2029/30	1,400,000.00			300,000.00	200,000.00	900,000.00	
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2030/31	1,420,000.00			254,000.00	200,000.00	966,000.00	
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2031/32	1,440,000.00			380,000.00	200,000.00	860,000.00	
											000.000.00	
Capital Reseal Program	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2032/33	1,440,000.00			380,000.00	200,000.00	860,000.00	
Capital Reseal Program Mafeking Road Pavement Renewi (CH 1500-3370)	Local Roads and Drainage	Roads	SHIREWIDE	Ren	ewal 2032/33 ewal 2027/28	1,440,000.00 336,000.00	100,000.00		380,000.00	200,000.00	200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290)	Local Roads and Drainage Local Roads and Drainage Local Roads and Drainage	Roads Roads Roads	SHIREWIDE SHIREWIDE SHIREWIDE	Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28	1,440,000.00 336,000.00 330,070.00	100,000.00		380,000.00	200,000.00	200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310)	Local Roads and Drainage Local Roads and Drainage Local Roads and Drainage Local Roads and Drainage	Roads Roads Roads Roads Roads	SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE	Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28	1,440,000.00 336,000.00 330,070.00 760,300.00	100,000.00 130,070.00		380,000.00	200,000.00 200,000.00 313,800.00	200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction	Local Roads and Drainage Local Roads and Drainage Local Roads and Drainage Local Roads and Drainage Local Roads and Drainage	Roads Roads Roads Roads Roads Roads Roads	SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE	Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28	1,440,000.00 336,000.00 330,070.00 760,300.00 663,200.00	100,000.00 130,070.00 131,300.00		380,000.00	200,000.00 200,000.00 313,800.00	200,000.00 200,000.00 446,500.00 531,900.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE	Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2024/25	1,440,000.00 336,000.00 330,070.00 760,300.00 663,200.00 200,000.00	100,000.00 130,070.00 131,300.00		380,000.00	200,000.00 200,000.00 313,800.00	200,000.00 200,000.00 446,500.00 531,900.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE	Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2025/26	1,440,000.00 336,000.00 330,070.00 760,300.00 663,200.00 200,000.00 200,000.00	100,000.00 130,070.00 131,300.00		380,000.00	200,000.00 200,000.00 313,800.00	200,000.00 200,000.00 446,500.00 531,900.00 200,000.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewil (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE SHIREWIDE	Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2024/25 ewal 2025/26 ewal 2025/26 ewal 2025/26	1,440,000.00 336,000.00 330,070.00 760,300.00 663,200.00 200,000.00 200,000.00 200,000.00	100,000.00 130,070.00 131,300.00		380,000.00	200,000.00 200,000.00 313,800.00	200,000.00 200,000.00 446,500.00 531,900.00 200,000.00 200,000.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE	Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26	1,440,000.00 336,000.00 330,070.00 760,300.00 663,200.00 200,000.00 200,000.00 200,000.00	100,000.00 130,070.00 131,300.00		380,000.00	200,000.00 200,000.00 313,800.00	200,000.00 200,000.00 446,500.00 531,900.00 200,000.00 200,000.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection Renewal Program	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/27 ewal 2025/27 ewal 2025/26	1,440,000.00 336,000.00 330,070.00 760,300.00 663,200.00 200,000.00 200,000.00 200,000.00 200,000.00	100,000.00 130,070.00 131,300.00 131,300.00 131,300.00			200,000.00 200,000.00 313,800.00 	200,000.00 200,000.00 446,500.00 531,900.00 200,000.00 200,000.00 200,000.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection Renewal Ren	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28	1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00	100,000.00 130,070.00 131,300.00 131,300.00 131,300.00		380,000.00	200,000.00 200,000.00 313,800.00	360,000.00 200,000.00 446,500.00 531,900.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection Renewal Ren	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2027/28 ewal 2028/29 ewal 2028/29 ewal 2029/30	1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00	100,000.00 130,070.00 131,300.00			200,000.00 200,000.00 313,800.00	360,000.00 200,000.00 31,900.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program -	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2027/28 ewal 2028/29 ewal 2028/29 ewal 2028/30 ewal 2030/31 ewal 2031/32	1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00	100,000.00 130,070.00 131,300.00			200,000.00 200,000.00 313,800.00	200,000.00 200,000.00 531,900.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program -	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/27 ewal 2025/27 ewal 2025/26 ewal 2025/27 ewal 2029/30 ewal 2039/31 ewal 2031/32 ewal 2031/32	1,440,000.00 336,000.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00	100,000.00 130,070.00 131,300.00 131,300.00 131,300.00 10 10 10 10 10 10 10 10 10 10 10 10 1			200,000.00 200,000.00 313,800.00	200,000.00 200,000.00 331,900.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2027/28 ewal 2027/28 ewal 2029/30 ewal 2030/31 ewal 2031/32 ewal 2031/32	1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00	100,000.00 130,070.00 131,300.00 131,300.00 131,300.00 131,300.00 10 10 10 10 10 10 10 10 10 10 10 10 1			200,000.00 200,000.00 313,800.00	360,000,00 200,000,00 31,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 370,000,00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program Gravel Road Capital Renewal Program	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2028/29 ewal 2028/29 ewal 2028/29 ewal 2030/31 ewal 2031/32 ewal 2032/33 ewal 2025/26	1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00 375,000.00	100,000.00 130,070.00 131,300.00 131,300.00 10 10 10 10 10 10 10 10 10 10 10 10 1			200,000.00 200,000.00 313,800.00 313,800.00	360,000.00 200,000.00 531,900.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00 375,000.00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program - As per Inspection report Roads Capital Renewal Program Gravel Road Capital Renewal Program	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2026/27 ewal 2028/29 ewal 2028/29 ewal 2028/30 ewal 2030/31 ewal 2031/32 ewal 2032/33 ewal 2032/35 ewal 2032/36 ewal 2032/37 ewal 2032/38 ewal 2032/38 ewal 2032/38 ewal 2032/38 ewal 2032/38 ewal 2032/38 ewal 2025/26 ewal 2025/26	1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00 375,000.00 380,000.00	100,000.00 130,070.00 131,300.00 131,300.00 10 10 10 10 10 10 10 10 10 10 10 10 1			200,000.00 200,000.00 313,800.00	360,000,00 200,000,00 446,500,00 531,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 370,000,00 375,000,00 380,000,00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewl (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program Gravel Road Capital Renewal Program Gravel Road Capital Renewal Program Gravel Road Capital Renewal Program	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2030/31 ewal 2031/32 ewal 2032/33 ewal 2025/26	1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00 375,000.00 380,000.00 385,000.00	100,000.00 130,070.00 131,300.00 131,300.00 131,300.00 131,300.00 10 10 10 10 10 10 10 10 10 10 10 10 1			200,000.00 200,000.00 313,800.00	80,000,00 200,000,00 446,500,00 531,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 370,000,00 375,000,00 385,000,00 385,000,00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program Gravel Road Capital Renewal Program Gravel Road Capital Renewal Program Gravel Road Capital Renewal Program	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2024/25 ewal 2024/29 ewal 2030/31 ewal 2031/32 ewal 2032/33 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/27 ewal 2025/26 ewal 2025/27 ewal 2025/26 ewal 2025/27 ewal 2025/26	1,440,000.00 336,000.00 3330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 375,000.00 375,000.00 385,000.00 390,000.00	100,000.00 130,070.00 131,300.00 131,300.00 131,300.00 100,000,00 100,000,00 100,000,00 110,000,00 111,000,00 1			200,000.00 200,000.00 313,800.00 313,800.00	360,000,00 200,000,00 31,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 375,000,00 375,000,00 385,000,00 390,000,00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program Gravel Road Cap	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2026/27 ewal 2028/29 ewal 2028/29 ewal 2031/32 ewal 2031/32 ewal 2032/33 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2027/28 ewal 2027/28 <td>1,440,000.00 336,000.00 3330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 375,000.00 375,000.00 385,000.00 395,000.00</td> <td>100,000.00 130,070.00 131,300.00</td> <td></td> <td></td> <td>200,000.00 200,000.00 313,800.00 313,800.00 </td> <td>80,00000 200,000.00 531,900.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00 375,000.00 385,000.00 395,000.00</td> <td>36,000.00</td>	1,440,000.00 336,000.00 3330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 375,000.00 375,000.00 385,000.00 395,000.00	100,000.00 130,070.00 131,300.00			200,000.00 200,000.00 313,800.00 313,800.00	80,00000 200,000.00 531,900.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00 375,000.00 385,000.00 395,000.00	36,000.00
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Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program Gravel Road Cap	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2030/31 ewal 2031/32 ewal 2032/33 ewal 2032/33 ewal 2025/26 ewal 2025/26 <td>1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00 370,000.00 375,000.00 385,000.00 395,000 395,000 395,000.00 395,000.00 395,000.00</td> <td>100,000.00 130,070.00 131,300.00 1</td> <td></td> <td></td> <td>200,000.00 200,000.00 313,800.00 313,800.00 </td> <td>360,000,00 200,000,00 31,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 370,000,00 375,000,00 385,000,00 399,000,00 395,000,00 400,000,00</td> <td>36,000.00</td>	1,440,000.00 336,000.00 330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 370,000.00 370,000.00 375,000.00 385,000.00 395,000 395,000 395,000.00 395,000.00 395,000.00	100,000.00 130,070.00 131,300.00 1			200,000.00 200,000.00 313,800.00 313,800.00	360,000,00 200,000,00 31,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 370,000,00 375,000,00 385,000,00 399,000,00 395,000,00 400,000,00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program Gravel Road Cap	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2027/28 ewal 2025/26 ewal 2028/29 ewal 2030/31 ewal 2031/32 ewal 2031/32 ewal 2032/33 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/26 ewal 2025/27 ewal 2025/26 ewal 2025/27 ewal 2025/26 ewal 2028/29 ewal 2028/29 ewal 2028/29 ewal 2039/31 <td>1,440,000.00 336,000.00 3330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 375,000.00 375,000.00 385,000.00 395,000.00 395,000.00 395,000.00 395,000.00 395,000.00 395,000.00 390,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000 300,000 300,000.00 300,00000 300,000000</td> <td>100,000.00 130,070.00 131,300.00 1</td> <td></td> <td></td> <td>200,000.00 200,000.00 313,800.00 313,800.00 </td> <td>360,000,00 200,000,00 31,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 375,000,00 375,000,00 385,000,00 395,000,00 395,000,00 400,000,00</td> <td>36,000.00</td>	1,440,000.00 336,000.00 3330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 375,000.00 375,000.00 385,000.00 395,000.00 395,000.00 395,000.00 395,000.00 395,000.00 395,000.00 390,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000.00 300,000 300,000 300,000.00 300,00000 300,000000	100,000.00 130,070.00 131,300.00 1			200,000.00 200,000.00 313,800.00 313,800.00	360,000,00 200,000,00 31,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 375,000,00 375,000,00 385,000,00 395,000,00 395,000,00 400,000,00	36,000.00
Capital Reseal Program Mafeking Road Pavement Renewal (CH 1500-3370) Possum Creek Road Pavement Renewal (CH 2330 - 3290) Coolamon Scenic Drive Pavement Renewal (CH 0 - 1310) Federal Drive Renewal (CH 5300 - 5940) Construction Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Side Barriers Capital Renewal Program - As per Inspection report Roads Capital Renewal Program Gravel Road Capital Renewal Program	Local Roads and Drainage Local Roads and Drainage	Roads	SHIREWIDE SHIREW	Ren Ren Ren Ren Ren Ren Ren Ren Ren Ren	ewal 2032/33 ewal 2027/28 ewal 2025/26 ewal 2025/26 ewal 2026/27 ewal 2026/27 ewal 2028/29 ewal 2032/32 ewal 2032/33 ewal 2032/33 ewal 2032/32 ewal 2025/26 ewal 2032/33 ewal 2032/32 ewal 2032/32 ewal 2026/27 ewal 2026/27 ewal 2026/27 ewal 2027/28 ewal 2026/27 ewal 2026/27 ewal 2026/27 ewal 2027/28 ewal 2026/27 ewal 2030/31 <td>1,440,000.00 336,000.00 3330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 375,000.00 375,000.00 385,000.00 385,000.00 395,000.00 400,000.00 400,000.00 400,000.00 120</td> <td>100,000.00 130,070.00 131,300.00 1</td> <td></td> <td></td> <td>200,000.00 200,000.00 313,80</td> <td>80,000,00 200,000,00 531,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 370,000,00 375,000,00 385,000,00 395,000,00 395,000,00 400,000,00 400,000,00</td> <td>36,000.00</td>	1,440,000.00 336,000.00 3330,070.00 760,300.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 200,000.00 375,000.00 375,000.00 385,000.00 385,000.00 395,000.00 400,000.00 400,000.00 400,000.00 120	100,000.00 130,070.00 131,300.00 1			200,000.00 200,000.00 313,80	80,000,00 200,000,00 531,900,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 200,000,00 370,000,00 375,000,00 385,000,00 395,000,00 395,000,00 400,000,00 400,000,00	36,000.00

STAFF REPORTS - INFRASTRUCTURE SERVICES

Pandanus Lane Capital Reconstruction	Local Roads and Drainage	Roads	BYRON BAY	Renewal	2032/33	231,000.00						231,000.00	
Kendal Street Railway Crossing Safety Improvements	Local Roads and Drainage	Roads	BYRON BAY	Renewal	2025/26	100,000.00						100,000.00	
Bus Stop Accessibility Upgrade Program	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2027/28	500,000.00					400,000.00	 100,000.00	
Bus Stop Accessibility Upgrade Program	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2025/26	500,000.00					400,000.00	100,000.00	
Bus Stop Accessibility Upgrade Program	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2026/27	500,000.00					402,400.00	97,600.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2024/25	55,000.00						55,000.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2025/26	60,000.00						60,000.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2026/27	65,000.00						65,000.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2027/28	70,000.00						70,000.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2028/29	75,000.00						75,000.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2029/30	80,000.00						80,000.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2030/31	85,000.00						85,000.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2031/32	90,000.00						90,000.00	
Retaining Structures Captial Renewal Program - As per inspection report	Local Roads and Drainage	Roads	SHIREWIDE	Renewal	2032/33	95,000.00						95,000.00	
Lighthouse Road, Byron (At No Name Lane)	Local Roads and Drainage	Roads	BYRON BAY	Renewal	2029/30	400,000.00						400,000.00	
Lighthouse Road Capital Reconstruction (Massinger to Tallow Beach Road)	Local Roads and Drainage	Roads	BYRON BAY	Renewal	2032/33	400,000.00			300,000.00			100,000.00	
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2024/25	100,000.00					100,000.00		
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2025/26	100,000.00					100,000.00		
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2026/27	150,000.00					150,000.00		
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2027/28	170,000.00					170,000.00		
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2028/29	190,000.00					190,000.00		
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2029/30	210,000.00					210,000.00		
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2030/31	230,000.00					230,000.00		
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2031/32	250,000.00					250,000.00		
Local Area Traffic Management Facilities	Local Roads and Drainage	Roads	BYRON BAY	New	2032/33	270,000.00					270,000.00		
Station Street Upgrade	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2024/25	1,613,325.00	356,200.00		81,300.00		576,300.00	599,525.00	
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2024/25	110,000.00							110,000.00
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2025/26	115,000.00							115,000.00
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2026/27	120,000.00							120,000.00
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2027/28	125,000.00							125,000.00
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2028/29	130,000.00							130,000.00
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2029/30	135,000.00							135,000.00
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2030/31	140,000.00							140,000.00
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2031/32	145,000.00							145,000.00
Capital Projects Grants Planning and Development	Local Roads and Drainage	Roads	SHIREWIDE	Upgrade	2032/33	150,000.00							150,000.00
Grevillea Street Capital Renewal (Ch 0 - 420)	Local Roads and Drainage	Roads	BYRON BAY	Renewal	2028/29	430,000.00						430,000.00	
Banksia Drive Capital Renewal (Ch 20 - 725)	Local Roads and Drainage	Roads	BYRON BAY	Renewal	2030/31	710,000.00					164,000.00	546,000.00	
South Arm Beach Road Car Park Upgrade	Local Roads and Drainage	Roads	BRUNSWICK HEADS	Upgrade	2024/25	860,000.00	860,000.00						
New City Road Open Drain Upgrade Design	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2024/25	80,000.00					80,000.00		
New City Road Open Drain Upgrade Construction	Local Roads and Drainage	Roads	MULLUMBIMBY		2025/26	500,000.00			238,400.00		261,600.00		
Bangalow Road Shared Path and Underpass Upgrade - Construction	Local Roads and Drainage	Roads	BANGALOW		2024/25	1,100,000.00	1,100,000.00						
Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2024/25	606,325.00				606,325.00			
Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2025/26	604,375.00				604,375.00			
Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2026/27	602,375.00				602,375.00			
Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2027/28	600,350.00				600,350.00			
Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2028/29	598.300.00				598,300.00			
Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2029/30	596.200.00				596,200.00			
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STAFF REPORTS - INFRASTRUCTURE SERVICES

Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2030/31	594,075.00					594,075.00	
Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2031/32	592,275.00					592,275.00	
Byron Bay Town Centre Masterplan Projects to be determined	Local Roads and Drainage	Roads	BYRON BAY	New	2032/33	592,275.00					592,275.00	
Marchalls Creek Foreshore & Roadside Frosion Improvements - New Brighton - Design	Local Roads and Drainage	Roads	OCEAN SHORES	Upgrade	2028/29	100.000.00 10	00.000.00					
Marchalls Creek Foreshore & Roadside Frosion Improvements - New Brighton - Construction	Local Roads and Drainage	Roads	OCEAN SHORES	Lingrade	2029/30	358 470 00 14	48 470 00	40 000 00			170.000.00	
Musuullumbah Read Pataining Wall Renowal AID 47206 (as par cond ran)	Local Roads and Drainage	Reads	PYRON PAY	Ronowal	2024/25	200,000,00		40,000.00			170,000,00	
Pacific Virita Partier System Llograde AID 47231 (as not cond rep)	Local Roads and Drainage	Roads	BYRON BAY	Lingrado	2024/25	100,000,00						
	Local Roads and Drainage	Roads	BTRON BAT	Opgrade	2025/20	100,000.00						
Gloria Street Retaining Wall Renewal AID 58110 (as per cond rep)	Local Roads and Drainage	Roads	BYRON BAY	Renewal	2026/27	40,000.00						
32 Coomurra Crescent Overland Flow Path Design and Easement	Local Roads and Drainage	Stormwater	OCEAN SHORES	New	2025/26	250,000.00						
32 Coomurra Crescent Overland Flow Path Construction	Local Roads and Drainage	Stormwater	OCEAN SHORES	New	2026/27	150,000.00						
Corrabell and Binna Burra Road Intersetion Safety Improvements - Design	Local Roads and Drainage	Roads	FEDERAL	Upgrade	2026/27	100,000.00						
Corrabell and Binna Burra Road Intersetion Safety Improvements - Construction	Local Roads and Drainage	Roads	FEDERAL	Upgrade	2027/28	400,000.00						
Massey Green Stormwater Renewal	Local Roads and Drainage	Stormwater	BRUNSWICK HEADS	Renewal	2025/26	750,000.00						
Azalea / Jubilee Intersection Upgrade - Design	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2027/28	120,000.00						
Azalea / Jubilee Intersection Upgrade - Construction	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2028/29	3,000,000.00						
Belongil Parking Scheme - Stage 2 works - Design	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2027/28	100.000.00						
Belongil Parking Scheme - Stage 2 works - Construction	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2028/29	гвс						
Mullumhimhy / Gulgan Road Intersection Ingrade - Design	Local Roads and Drainage	Roads	MULLIMBIMBY	Ungrade	2026/27	100.000.00						
Mullumbimby / Gulgan Road Intersection Lingrade - Construction	Local Roads and Drainage	Roads	MULLIMBIMBY	Ungrade	2027/28	4 000 000 00						
Mananianiany / Galgar Road Intersection Opgrade - Construction	Local Deads and Dealinage	Deada		Userado	2027/20	4,000,000.00						
Broken Head Road / Clifford Street Intersection Upgrade - Design	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2025/26	100,000.00						
Broken Head Road / Clifford Street Intersection Upgrade - Construction	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2027/28	1,200,000.00						
Brunswick Heads Foreshore Shared Path - Concept Layout	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2025/26	50,000.00						
Brunswick Heads Foreshore Shared Path - Design	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2026/27	100,000.00						
Brunswick Heads Foreshore Shared Path - Construction	Local Roads and Drainage	Roads	MULLUMBIMBY	Upgrade	2027/28	гвс						

Copy of Design & Construction Capital Works Pro...

No. No. <th></th> <th>Pulse Project</th> <th>Task Name</th> <th>Duratior</th> <th>Start</th> <th>Finish</th> <th></th> <th>Q1</th> <th></th> <th></th> <th>Q2</th> <th></th> <th></th> <th>Q3</th> <th></th> <th></th> <th>Q4</th> <th></th>		Pulse Project	Task Name	Duratior	Start	Finish		Q1			Q2			Q3			Q4	
Image:		No.					Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
2 Normal Paramet Relation 10000 0000000 000000 000000 000000 000000 000000 0000000 000000 000000 000000 000000 000000 000000 0000000 0000000 0000000 0000000 0000000 000000000000 0000000000000000 0	1		FY 23-24 - Capital Construction Projects	276d	03/04/23	15/05/24												
1 Conduction 1000 100020	2	n/a	Manns Rd Pavement Rehab	15d	13/06/23	03/07/23												
4 PM22,1980 0	3		Construction	15d	13/06/23	03/07/23	Crew	1										
S Oneopen Mode	4	PM22_1368	Wordsworth Street Upgrade	86d	04/05/23	01/09/23												
1 0 10022 10022 100233 100233 10023	5		Design	40d	04/05/23	29/06/23												
7 0	6		Project Approval Package	0	19/06/23	19/06/23												
8 Accordingtion 300 20020 Construction 1 <	7		Construction planning	20d	26/06/23	21/07/23		Capital W	orks									
9 model mo	8		Construction	30d	24/07/23	01/09/23			Capital	Works	Crew 1 &	\$ 2						
10 P422_4000 (************************************	9		Project close out	0	01/09/23	01/09/23	\diamond		Bella									
Image: Marrier	10	PM22_1490	Left Bank Rd Pavement & Drainage Works	137d	16/05/23	24/11/23												
12 0 Ordenstanden 680 10720 2 0	11		Construction Planning	30d	16/05/23	27/06/23												
9 P202_1204 Project Accordal Package 0000 000022 <td< td=""><td>12</td><td></td><td>Construction</td><td>99d</td><td>10/07/23</td><td>24/11/23</td><td></td><td></td><td></td><td></td><td>(</td><td>Capital \</td><td>/Vorks C</td><td>rew 1 & 2</td><td>2</td><td></td><td></td><td></td></td<>	12		Construction	99d	10/07/23	24/11/23					(Capital \	/Vorks C	rew 1 & 2	2			
44 Design 010002 020020 000020 000020 01020 010020 01020 01020 010020 01020 010020 01020 010020 01020 010020 01020 01020 010020 01020 0	13	PM20_1204	Carlyle Street Upgrade	190d	04/05/23	12/02/24												
1 Project Approval Package 0 07002 0 <td< td=""><td>14</td><td></td><td>Design</td><td>81d</td><td>04/05/23</td><td>25/08/23</td><td></td><td></td><td>IS Plann</td><td>ing</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	14		Design	81d	04/05/23	25/08/23			IS Plann	ing								
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1 Construction 704 110923 181223 181223 1 Construction 1 <td>16</td> <td></td> <td>Construction planning</td> <td>20d</td> <td>14/08/23</td> <td>08/09/23</td> <td></td> <td></td> <td>🔟 Capit</td> <td>al Work</td> <td>s</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	16		Construction planning	20d	14/08/23	08/09/23			🔟 Capit	al Work	s							
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STAFF REPORTS - INFRASTRUCTURE SERVICES

Report No. 4.3	Deficient Inspection Budget- Australian Defence Force Modular Steel Bridge
Directorate:	Infrastructure Services
Report Author:	David Haupt, Road & Bridge Engineer
File No:	12024/200

Summary:

In 2018, the contractor SEE Civil completed the installation of five modular steel bridges for Council. The modular steel bridge system is a surplus Australian Defence Force system known as a Line of Communication (LOC) Bridge and known as the Cardno/RPC

10 Panel Bridging System. The maintenance requirements for these bridges are monthly inspections, six-monthly, yearly and five yearly, however currently there is no budget allocated for these inspections to take place.

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RECOMMENDATION:

That Council note and take into consideration:

- Funding considerations for the 2024/25 Budget for Australian Defence Force
 bridge inspections to ensure the safety of road users and the longevity of the structures. Funding will cover:
 - a) scheduled monthly, six-monthly, yearly and five yearly inspections
 - b) live structural health monitoring investigation
 - c) allowable cycle loading to determine expected design life.

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Attachments:

ADF Steel Bailey Bridges - Modular - LOC Bridge - Maintenance Manual, E2019/10876, page 43 🖟 🖀
STAFF REPORTS - INFRASTRUCTURE SERVICES

Report

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In 2017 council acquired five Australian Defence Force bridges, also known as a line of communication bridge. These bridges were used to replace five dilapidated bridges in 2018. The bridges replaced were:

- Booyong Bridge ID 64651
 - Parker Bridge ID 64652
 - O'Mearas Bridge ID 64649
 - James Bridge ID 64650
 - Scarrabelottis Bridge ID 64653
- 10 The Line of Communication (LOC) Bridge, also known as the Cardno/RPC Panel Bridging System is a modular steel bridge system that is used by the Australian Defence Force.

At the end of 2018 SEE Civil Completed the installation of five modular steel bridge, starting the maintenance "clock".

Being designed to be used in a temporary setting the bridge manual requires monthly, sixmonthly, yearly and five yearly inspections.

Attachment 1 to this report is Council document E2019/10876 ADF Steel Bailey Bridges - Modular - LOC Bridge - Maintenance Manual.

The inspections are *objective of maintaining the integrity of each bridge in service* (Section 9.1.01 Maintenance manual provided at attachment 1).

20 There is no current budget to implement these inspections, however, structural sag surveying has been implemented in the past, being charged under WO 2479 for Survey and Design of Englishes Bridge which was closed bringing this issue to the surface on the 17/11/2023.

It should be noted that the required inspections are more in depth/intensive than a typical bridge's yearly inspection due to:

- Bridges being a temporary structure the structure has not been designed with sacrificial steel to allow for a set design life therefore, the design life of each bridge is assumed as 70 years. ...The realised life will depend primarily on the long-term performance of the hot dipped galvanised coating of the steelwork. Therefore, it is paramount that ...early detection and treatment of corrosion... to ensure the integrity of the components.
- The welded steel components are subjected to high stresses during normal use. In addition...because of manufacturing techniques... residue stress may remain in the components. (Section 9.1.02 Maintenance manual provided at attachment 1)

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- Inspection Techniques that need to be employed are:
- 5 o Visual

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- Dye penetration test -to detect cracks that is not visible to the naked eye which is quite labour intensive.
- Magnetic Particle test -to detect cracks that is not visible to the naked eye.
- "Special to task gauges i.e. Magnetic principle coating thickness gages etc. (Section 9.1.04 provided at attachment 1).

Attention needs to be given to all welds particularly on the bottom chords of the panels, pinhole plates... At the different periodic inspections an array of elements needs to be inspected as well as some retightening/reseating of some elements as listed below. (Section 9.1.05 provided at attachment 1)

Monthly inspection

The inspection is to be visual with some minor labour components.

- o <u>Visual</u>
 - Check structure for <u>impact damage</u>
 - Check the seating of the deck units and ramps
 - Assess the general condition of protective coating
 - Inspect for <u>missing components</u>:
 - Panels pins and safety clips
 - Brace pins and safety clips
 - Chord reinforcement
 - Ramp bolt and nuts
 - Inspect for <u>Accumulation of dirt or debris</u> on:
 - Deck
 - Panels
 - Around bearings
 - Base plate
 - End post

o Manual labour

- Ensure chord reinforcement and ramp bolts are tight.
- <u>Remove dirt and debris</u> during inspection.
- Reseat components.

Note a monthly bridge inspection form will need to be completed for this inspection.

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Six Monthly Inspection

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The six monthly inspection includes a full inspection of all components from above and below the superstructure.

- Bridges are to be examined for signs of:
 - o Wear
 - General integrity
 - Condition of protective coating
 - Distortion
 - o Misalignment
- 10 o Damage

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- Items that need to be checked are:
 - Panels for distortion or damage
 - o Check transoms, sway and end bay bracing
 - Bearings are to be checked for:
 - Squareness
 - Level
 - Seating
 - Deck units are to be checked for:
- 20 damage, ■ uneven seating
 - wear

• <u>Special attention</u> is to be given to <u>fatigue cracks</u> in <u>main panels and chord</u> <u>reinforcing pin plates</u> where access is available.

- Use to be made of dye penetrant for identification.
- Sag of the bridge needs to be measured by survey and compared to limits.
- Galvanised coating of all components is to be thoroughly checked for:
- 30 o Damage
 - o Weakness
 - Corrosion

o Manual labour

- Ensure chord reinforcement and ramp <u>bolts are tight</u>.
- <u>Remove dirt and debris</u> during inspection
- Reseat components.
- Reinstate galvanising coating

40 <u>Note:</u>

To do this we need 21 tonne Moog MBI 140-1,4/S crane unit to do these inspections.

A Six monthly bridge inspection form will also need to be completed for this inspection.

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Image: 21 tonne Moog MBI 140-1,4/S

• <u>Yearly – this is more related to elements being returned to storage after being disassembled.</u>

• Five year Inspection:

The five-year inspection is for components being disassembled and measured however an alternative process is being investigated because disassembly of this bridges is unrealistic and cost prohibitive.

- Items for inspection are:
 - Dimensional check of all members using gauging examination
 - Fatigue crack (section 10.1.12)
 - Loss of section, by removing rust and measuring section, note loss of 10% cross-sectional area will deem it unusable.
 - Elongating of holes
 - Warping, kinking bending etc. (Table 10.1)
 - Strength Test

Note: In July 2023 Council should have completed a 5 year inspection (referring Booyong Bridge), however no detailed inspection has been done to date other than the traditional bridge inspection and six-monthly sag survey.

25 **Conclusions:**

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Due to the lack of funding and the in depth and intensive inspection requirements staff propose that funding is included in the 2024/25 financial year budget to allow all five bridges to be inspected using the six-monthly inspection regime.

Actual costs will be reviewed with a post inspection review to analyse labour, hire and material cost which in turn would be used as a baseline to determine future yearly budget requirements from 2025/26 onwards.

In parallel funding will be required to investigate the cost of implementing strain gauges along bridge members to provide real-time data or "live structural health monitoring" to reduce the frequency of the inspections, however a cost comparison needs to be made to analyse the viability of implementing live structural monitoring vs the current required inspections.

Additional Issues to consider:

10 1. The structures superstructures main support is the panels as highlighted in the red box in the photo below.

These structures are at risk of collapse under a vehicle impact if the vehicle breaches the thrie-beam safety barrier. Based on AS5100 bridges are to be designed to not fail under these situations hence the design did not comply to the bridge standard.



2. Bridges are designed to take x amount of cycle loading in their design life. i.e., In regard to the Bailey Bridge the original modular steel bridge the design cycle loading is 100,000 cycles therefore the design life would be extended or shortened based on the daily traffic load. <u>https://engineeringmanagementinstitute.org/tcep-060-bailey-bridge-civil-engineering/</u>

In regard to the steel modular bridges, staff have not seen any reference to allowable cycle loading or the expected design life based on the current vehicle loading, this being in reference to the manuals and bridge design plans by Bridge

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IAC Agenda

STAFF REPORTS - INFRASTRUCTURE SERVICES

Design Pty Ltd. Planning for the future cycle loading are critical information especially in regard to:

- Future development
- Planning for replacement

Bridges for the Bangalow Agricultural Area

MAINTENANCE MANUAL

Bridges for the Bangalow Agricultural Area

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2 Piling1
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4 Deck
4.1 General2
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4.3 Six-monthly Inspection3
4.4 Five-yearly Inspection
5 Barriers4
6 Underbridge Inspection4
7 Summary of Maintenance Requirements4
Appendix A LOC Technical ManualA

1 Introduction

This manual covers the maintenance requirements for 5 modular steel truss bridges listed in Table 1.1. The modular steel bridge system is a surplus Australian Defence Force system known as a Line of Communication (LOC) Bridge and also known as the Cardno/RPC Panel Bridging System. The LOC components have not been in service previously.

	e e	
Bridge Name	Nominal Length	Truss Type
O'Meara's Bridge	45m	TSR
Scarrabelotti's Bridge	45m	TSR
Booyong Bridge	45m	TSR
Parkers Bridge	40m	TSR
James Bridge	30m	DSR

Table 1.1 - LOC Bridges

TSR denotes triple single reinforced and DSR denotes double single reinforced.

The design life of each bridge is assumed as 70 years. A life of 100 years is therefore not assumed on current knowledge. The realised life will depend primarily on the long term performance of the hot dipped galvanised coating of the steelwork. Studies of coating loss indicate that a life well in excess of 50 years is achievable, but many factors are involved and long term experience is not available. The LOC components will need to be inspected regularly to ensure that they are fit for service.

The bridge foundations have generally been designed for the maximum durability that could be reasonably obtained, but during the design life of the bridge some maintenance will probably be necessary.

2 Piling

The piles have been designed for a 100 year design life and are unlikely to require any attention. Two piling options were given - bored concrete piles and driven concrete piles. For the bored pile scenario a permanent pile casing extends to below the level of any gravels to support the pile hole excavation.

Geotechnical investigations were conducted at each site which included testing of the soil. The results of the testing indicated that the soil environment is at worst mildly-aggressive and is considered a B1 environment. The concrete strength and cover requirements are sufficient for these conditions.

Page A

3 Abutments

The concrete abutments are designed to the standards that predict 100 year life and no maintenance is envisioned. Inspection for cracks should be made during scheduled inspection.

4 Deck

4.1 General

The maintenance requirements for the LOC components are detailed in sections 9, 10, 11 and 12 of the LOC Technical Manual (Appendix A). More detailed information may be found in this document, in particular regarding the procedures for panel testing and component repairs.

The LOC steel components and additional steel members have been hot dip galvanised. The panel pins are manufactured from stainless steel and have not been hot dip galvanised. All bolts, nuts and washers have been hot dip galvanised.

The galvanised coating of all components is to be checked for damage, weakness and corrosion. Should local corrosion occur, its cause should be identified and removed. Given the long life expected, and the changes in technology that are likely, no recommendation is made on reinstating the protection at that time.

4.2 Monthly Inspection

A visual inspection of the structure is required once a month and is to consist of the following:

- Check the entire structure for impact damage.
- Assess the general condition of protective coatings.
- Check for missing components, in particular panel pins, brace pins and safety clips, and chord reinforcement nuts and bolts.
- Ensure chord reinforcement bolts are tight.
- Check the seating of deck units and transoms.
- Inspect for the accumulation of dirt or debris on the deck or panels, and around bearings, base plates and end posts, and remove during the inspection.
- Check for scour or subsidence in the stream banks as well as potholing or scouring of the approaches.

4.3 Six-monthly Inspection

This inspection will require a full inspection of all components above and below deck level at a frequency of once every six months. In addition to the items in the monthly inspection this will require the following:

- Check panels for damage and distortion.
- Inspect main panels and chord reinforcing pin plates for fatigue cracks.
- Measure the sag at midspan.
- Check deck units damage, wear and uneven seating, including the skid-resistant deck surfacing.
- Inspect the transoms, sway and end bay bracing.
- Check bearings for squareness, level and seating.
- Thoroughly check the galvanised coating of all components for damage, weakness and corrosion.

A careful search of the entire panel is to be made but concentrating near welds in joints and in pin plates around the pin holes. Visual inspection should be aided by the use of dye penetrant or magnetic particle methods.

The sag is to be measured at midspan on each side at the top of the transom, hard against the inner truss. The sag is measured as the distance below the line joining the top flanges of the end transoms.

The maximum sag given is given in Table 9.4 of the Technical Manual and is repeated below in Table 4.1.

Nominal span	Maximum Sag
30m	110mm
40m	220mm
45m	270mm

Table 4.1 - Maximum sag limits

4.4 Five-yearly Inspection

The panels are the main load carrying elements of this bridge system and hence are the focus of this inspection. This requires a visual inspection and a dimensional check on all members. These steps are in addition to the monthly and six-monthly inspections.

The acceptable limits are outlined in Table 4.2 below, which has been adapted from Table 10.1 of the LOC Technical Manual.

ITEM	LIMIT
Loss of section on any panel member	10%
Overall transverse bending of chords	120mm
Transverse bending or kinking of individual channels between batten plates	25mm
Overall vertical bending of chords	50mm
Bending or kinking of diagonals and verticals	50mm
Lateral bending of flange or twist of section of transom which cannot be straightened by normal pressure	200mm
Bending or kinking of any member	Length/40, or 50mm max.

Table 4.2 - Panel distortion limits

5 Barriers

Barriers on this bridge are low performance level consisting of a three beam railing supported on breakaway steel posts. Barriers are to be checked for impact damage and replaced as required.

6 Underbridge Inspection

An underbridge inspection unit will be required in order to inspect all deck members. The original design is suitable for a 21 tonne Moog MBI 140-1,4/S unit. Additional units such as the 15 tonne Barin S.p.A may be used with the temporary removal of the bridge barriers. More suitable units may be available at the time of the inspection.

7 Summary of Maintenance Requirements

The following maintenance requirements have been identified:

Area	Requirement	Frequency
General	Full visual check of structure	Monthly
Deck	Thorough check of galvanised coating, fatigue cracking and welds. Check of transoms and sway bracing.	Six-Monthly
Panels	Dimensional check. Measurement of loss of section.	Five-Yearly

4.3 - ATTACHMENT 1

Appendix A LOC Technical Manual

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PURPOSE AND GENERAL DESCRIPTION 1. 1.01 The Cardno/RPC Bridging System is a Panel Bridging System. It comprises standardised steel components which are assembled in a specified arrangement and sequence and connected by high strength pins and bolts to form through truss bridge spans in the range 20 to 70 metres in 5 metre increments. Various loading specifications can be accommodated. The basic load carrying component is the truss panel. These panels are 1.02 arranged in particular combinations and reinforced as necessary to form side trusses of various capacities to suit the span and loads applied. The standard bridges are double lane, the deck being 7.3m wide between 1.03 kerbs. The deck is formed from steel deck units. The deck members - transforms and deck units - are designed for one lane of MLC70 loading of two lanes of National Association of Australian State Road Authorities (NAASRA) T44 (MLC 35) truck loading. Fig. 1.2 shows the bridge cross-section. 1.04 The system is designed to be assembled rapidly. It can be placed in position with the aid of cranes or progressively launched into position by rolling out over the crossing. When launching a cantilever launching nose, assembled from standard components, is used for this purpose. Rapid disassembly and removal is possible by rolling back across the gap. The bridge system is supplied complete with jackable end posts and bearings, 1.05 ramps, launching rollers, equipment and tools for construction. This Handbook describes the Cardno/RPC Bridging System components and 1.06 their purpose, lists permissible spans and load capacity combinations and sets down and illustrates all aspects of the assembly, launching and completion of bridge spans. 1.07 Maintenance generally, including inspection frequency is covered from page 82. It is to be noted that parts are fabricated from special high strength steels.

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Fig 1.1 Bridge Cross Section

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2. COMPONENTS OF THE BRIDGING SYSTEM

2.1 MATERIAL SPECIFICATION

2.1.01 Components are manufactured of high strength steel to be robust and durable. The major components – panels, transoms and bracing, etc. – are manufactured from plates and rolled sections of Grade 350 to Australian Standard AS1204 and tube sections of Grade C350 or C450 to AS1163.

2.1.02 Parts subject to extremely high stresses such as pin plates, panel pins and brace pins are made from quenched and tempered steels, high strength stainless steels and other hardened steels. All steel components except pins and safety clips are hot dip galvanized.

2.2 BRIDGE AND LAUNCHING NOSE COMPONENTS

2.2.01 Standard Panel – PS (Photo 2.1)

The standard panel (PS), illustrated in Photo 2.1. is the basic load carrying component of the bridging system. The panels are connected in a line end to end by panel pins at each corner to form trusses. There are male pin plates at one end of the panel and female at the other, to suit the interconnection.



Photo 2.1 Standard Panel

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The transoms supporting the deck sit directly on the bottom chords either at the middle of the panel or between the end verticals of adjoining panels. The mid-panel transom is held in place at its top flange by the transom clamp middle (TCM) which connects to the panel diagonals. The TCM is also an integral part of the panel structure and must always be in place whether the mid panel transom is present or not.

2.2.02 Panel Pins – PPH, PPN (Photo 2.2)

The panel pins used to interconnect the panels are of two types.

The **headed panel pin (PPH)** is tapered at one end to facilitate insertion. Small holes through the tapered end accepts the large safety clip (SCL) which keeps the pin in place.

The **non headed panel pin (PPN)** is longer and has tapers and safety clip holes at both ends. It is used to connect the middle line of panels and reinforcement in triple construction where ti must pass through the pin holes in the outer lines of panels before fitting into place.

2.2.03 Transoms – TS, TE (Photo 2.3)

The transoms cross-connect the trusses on each side of the bridge and support the deck. There are two types of transom – **the standard transom (TS)**, used generally in the span and launching nose, and the **end transom (TE)** which is used at the first two transom locations at each end of the span. Both are of 1-section form, the end transom having additional cleats to connect end bay bracing, and web holes for attachment of ramp components.

2.2.04 Transom Clamps – TCM, TCJ, TCE (Photo 2.4)

There are three types of transom clamps: **the transom clamp middle (TCM)**; **the transom clamp joint (TCJ)** and the **transom clamp end post (TCE)**. All transom clamps restrain the top flange of the transom from longitudinal movement.

The TCJ holds the transom at the panel to panel connection and is pinned to the end verticals of the adjoining panels using the short brace pins (BPS). The TCE holds the transom at the connection of the end post to an adjoining panel and is fixed in a similar manner to TCJ. TCJs and TCEs are not required for the middle line of panels each side of the bridge for triple construction.

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Photo 2.2 Panel Pins and Safety Clips



End Transoms (note holes in middle)



Photo 2.3 Transom

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Photo 2.4 Transom Clamps



Photo 2.5 Brace pins with small safety clip

2.2.05 Brace Pins – BPS, BPL (Photo 2.5)

Brace pins are used to connect the transom clamps and vertical bracing. They have a hexagonal bolt head at one end and are tapered at the other. Holes at the tapered end accept the small safety clips SCS.

The **brace pin short (BPS)** has a 150mm long shaft and is used to fix the transomclamps TCJ and TCE.

The **brace pin long (BPL)** has a 210mm long shaft and two alternative holes for the safety clip. The safety clip SCS is inserted in the inner hold when connecting the TCM and the outer hold when connecting either the top of the raker brace (B 1) or the cross brace (B2).

To facilitate insertion of the safety clips (SCS) the brace pins can be rotated using the appropriate podger spanner on the hexagonal head.

2.2.06 Safety Clips – SCL, SCS (Photos 2.2 and 2.5)

Safety clips are inserted through the panel pins and brace pins to prevent those pins from working loose in service. Many of the bracing members have their connecting pins permanently welded in place. Safety clips through holes in these pins prevent those brace members from working loose.

Two sizes of clips are provided, the **safety clip large (SCL)**, for use with panel pins (PPH and PPN) and the **safety clip small (SCS)** for use with brace pins and welded pins.

2.2.07 Vertical Bracing – B1, B2 (Photo 2.6)

Two vertical bracing members are provided to keep the panels vertical and perpendicular to the transoms and at the correct spacing. They are the **raker brace (B1)** and the cross-brace **(B2)**.

Brace B1 connects between the end of the transom top flange and the raker cleats under the top chord of the innermost panel at the panel/panel connection. It is pinned at the top with brace pin BPL and at the bottom by a fixed pin.

The cross-brace interconnects the top of the second and third line of panels (if present) back to the inner most panel and are therefore not required in single construction.

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Photo 2.6 Vertical Bracing



Photo 2.7 Horizontal Bracing & End Bay Brace

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The inside end of B2 fits into a slot at the top end of B1 and is connected to the panels by the same brace pin (BPL) that holds B1.

Braces B1 and B2 are not required where panels connect to the end posts.

2.2.08 Horizontal Bracing – B3, SBJ (Photo 2.7)

The four **sway braces (B3),** fitted to each 5 m bay of the span keep the construction aligned and square in plan. They are to be installed in every bay to form a horizontal truss structure which resists transverse loads applied to the bridge.

Each sway brace connects via fixed pins to cleats welded to the webs of the transoms.

Normally the four sway braces in each bay join to a common cleat at the middle of the mid-panel transom. In the launching nose, where there are no mid-panel transoms, a **sway brace junction (SBJ)** is provided instead to interconnect the four sway braces in the middle of the bay.

2.2.09 End Bay Brace – B4 (Photo 2.7)

The **end bay braces (B4)** fit between and connect via welded pins to the two end transoms (TE) at each end of the span. The welded cleats to which these braces connect are only provided on TEs. The four end bay braces at each end of the bridge perform a number of functions.

- They resist longitudinal loads supplied to the deck by the braking vehicles.
- They resist the horizontal component of self-weight of the deck structure when the bridge is on a slope (1:10 max).
- Working with the deck units, they brace the transoms thereby increasing their strength.
- They brace the 5 m ramp extension module when attached to each end of the bridge.

2.2.10 Deck Units – DU, DUK (Photo 2.8

The running surface of the bridge consists of fabricated steel deck units. Each deck unit spans the 2.5 m between the supporting transoms and there are four deck units in the width. There are two types of deck unit. The two inner units are **standard deck units**

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Kerb deck unit



Photo 2.8 Deck Units



Photo 2.9 Chord Reinforcement CRS, CRL

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(DU) while the outer two are **deck units with kerb** (DUK). The kerb section can be unbolted from the base unit if required.

All deck units are positively located on and fixed to the transoms via the latch bars welded along the top flange of each transom. While the self weight of each deck unit is sufficient to prevent it jumping out of position under traffic, four hold down latches have been provided per unit as additional fixing devices. The latch devices also serve as lifting points during installation of the deck units.

2.2.11 Chord Reinforcement and Bolt – CRS, CRL, CRTF, CRTM, CRE & BC2 (Photos 2.9, 2.10 and 2.11)

Chord reinforcement consists of lengths of battered channel sections similar in form to the chord sections of the standard panel. They are pin connected end to end in the same manner and using the same pins as the panels. Chord reinforcement, where required, is fitted on top of and under the panels and bolted to them.

The two main chord reinforcing parts are the **long chord reinforcement (CRL)**, running the length of two panels (10 m approx.), and the **short chord reinforcement (CRS)** being the length of one panel (5 m approx.). Where possible long chord reinforcement (CRL) is used as this reduces the total number of components and the number of crane movements during construction. The short chord reinforcement is used only where necessary e.g. 25, 35, 45 m spans etc and in the launching nose. Chord reinforcement always stops one panel short of the bridge end.

For the longer spans with longer launching noses, chord reinforcement is required for a few bays at the back of the launching nose. Extra short length reinforcement will be required over and under the end post where the reinforcement must be continuous through to the launching nose. The **Chord reinforcement taper (CRTM)** attaches to the rear female end.

Chord reinforcement tapers are provided for use at the termination of bottom chord reinforcement in order to provide a continuous, smooth surface for rolling. **The female chord reinforcement taper (CRTF)** attaches to the front male end of normal chord reinforcement and the **Male chord reinforcement taper (CRTM)** attaches to the rear female end.

Chord reinforcement is attached to the panels by **chord reinforcement bolts BC2** through the batten plates connecting the channels. These high strength bolts have tapered shanks to facilitate insertion. Each comes with one dome washer and one nut. The dome washers prevent the nut from working loose. The convex surface of the washer must face the nut.

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Photo 2.10 Chord Reinforcement Tapers



Photo 2.11 Chord Reinforcement End Post and Chord Bolt



Photo 2.12 Universal End Post

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2.2.12 End Posts – UEP (Photo 2.12)

Attached at each of the four corners of the span is a **universal end post (UEP)** to transfer the loads from the bridge proper to the bearing base plate. The end posts attach to the end panels by standard panel pin connections. A single UEP can connect one, two or three lines of panels. For double construction, panels are attached at the outer two connection points on each end post.

The UEP can connect to either the male or the female ends of panels as complete sets of male and female pin plates are provided on alternate sides of the post. This feature enables the end post to be fitted between the panels of the main span and the launching nose so that once the launch is complete, all end posts will be in place ready for the lowering operation.

Incorporated into each end post is a jacking system which enables the four corners of the span to be jacked up or down by up to 1.4 m. This jacking feature is used to lower the span into position at the completion of the launch.

Fitted at the bottom of the universal end post are three stainless steel bearing pins which fit into the matching slots of the main bridge bearing (BB1). A similar but higher pin, in the middle of the end post, supports the outer ramp stringers of the 5 m ramp extension module.

2.2.13 Bridge Bearing and Bearing Base Plate – BB1, BB2 (Photo 2.13)

The **bridge bearing (BB1)** transfers loads from the end post to either the base plate or concrete foundations. One bridge bearing is required to each corner of the bridge. Holes are provided in the lower flanges of the side channels to accept hold down bolts (not supplied) when the bridge bearing is founded on concrete or similar rigid foundations.

If the bridge is to be founded directly on the ground, the **bearing base plate (BB2)** is required to spread the load over a larger area thereby reducing the bearing pressures and the amount of foundation settlement. The base plate has been designed for a maximum uniform bearing pressure of 800 kPa.

The bridge bearing seats directly on top of the base plate and is located on it, at its approximate centre, by six lugs. The spacing of the lugs allows the bearing to be adjusted up to 75mm from the base

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Photo 2.13 Bridge Bearing and Base Plate



Photo 2.4b Transom Seating Plate



Photo 2.14a Launching Link in Place

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plate centreline in the longitudinal direction may be required when the bridge is being lowered into position to ensure that the bearing pins of the end post line up with mating slots of the bridge bearing.

Bolted to the top of the base plate, to one side of its centreline, is a small steel stool onto which bears the jacking strut during the jacking operations. This stool transfers the load from the strut to the stiffening ribs of the base plate. The stool must be located towards the inside of the bridge (i.e. towards the bridge centreline) so that it is directly under the jacking strut, affording it proper support.

2.2.14 Launching Link – LL (Photo 2.14a)

The **launching link (LL)**, when pinned between adjacent panels near the front of the launching nose, causes the panels forward of the launching link to be inclined upwards. This raising-up of the tip counteracts the downward deflection of the nose as it cantilevers out and ensures that it is above the level of the rollers when it reaches the far bank. The inclination due to the launching link is 7.5°(1 in 7.5 approx.)

Cleats welded near the lower male end enable the connection of sway bracing in the bay forward of launching link.

2.2.15 Transom Seating Plate – TSP (Photo 2.14b)

The **transom seating plate** (**TSP**) is required where a transom is to sit on the unconnected male end of a panel. It ensures proper seating and correct location of the transom and therefore proper connection of the sway bracing.

2.3 RAMP COMPONENTS

The ramp components provided enable the construction of either a 2.5 m ramp of a 7.5 m ramp by the addition of a 5 m extension module. The deck of the ramp is constructed from the same deck units DU and DUK as used on the bridge proper. The maximum ramp slopes are 1 in 10 down or 1 in 20 up from the deck.

2.3.01 Ramp Stringer – RS (Photo 2.15)

Ramp stringers (RS) are the main longitudinal support members of the 5 m extension module. Each consists of an I- section beam fitted with two sets of holed cleats to connect the ramp transoms and a hook-type connection plate at each end.

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Photo 2.15 Ramp Stringer and Ramp Transom



Photo 2.16 Ramp Pedestal, Ramp Supporting Bracket and Reacting Beam

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The hook plates at each end enable connection to pin-type supports; either ramp pedestals, the end posts or the ramp stringer bracket.

The hook plates at the forward or bridge end incorporate locking latches which prevent the stringers jumping off their supports under dynamic load.

2.3.02 Ramp Transom – RT (Photo 2.15)

The **ramp transoms (RT)** span transversely between the three lines of ramp stringers to support the deck units of the extension module. As on TS and TE the top flange of each ramp transom is fitted with latch bar devices to locate and connect the deck units.

The **ramp pedestals (RP)** support the outer ends of the ramp stringers and transfer loads to the ground or foundations. A stainless steel bearing pin, fitted at the top, accepts the hook of the ramp stringer. The base is designed to withstand a uniform bearing pressure of 800 kPa. The maximum permissible load on the pedestal is therefore 375 kN.

2.3.04 Ramp Supporting Bracket and Reacting Beam – RSB, RB (Photo 2.16)

The **ramp supporting bracket (RSB)** is bolted at the middle of the end transom of the bridge and is provided to support the inside end of the middle ramp stringer via a stainless steel pin.

The **reacting beam (RB)** is required for the 7.5 m ramp only and is bolted between the two end transoms on the bridge centreline. The connection at the outer end uses the same five bolts that connect the ramp supporting bracket. The outer end of the reacting beam is fixed to the inner end transom by a single ramp bolt through the middle hole in the central sway bracing cleat of that transom. The **reacting beam is essential for the proper support of the 5 m ramp extension.**

2.3.05 Ramp Ledger – RL (Photo 2.17)

The **ramp ledger** (**RL**), when bedded on the ground, supports the outer end of the last line of deck units spanning from either the end transom or the ramp transoms to the ground. Holes in the base plate may be used for hold down bolts (not supplied).

Latch bars, similar to those on transoms, are provided for positioning and holding down of the ramp deck units.

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Photo 2.17 Ramp Ledger

2.3.06 Ramp bolt Set – BR1

Ramp bolts (BR1) are 24 mm diameter high strength bolts each with one nut and one washer. They connect the main components of the 5m ramp extension module. BRI is also used to interconnect roller support cribs. These bolts are to be tightened to the maximum force possible with hand tools provided.

2.4 CONSTRUCTION EQUIPMENT AND TOOLS

The following Sub-section describes the equipment and tools provided for construction and indicates their intended use.

2.4.01 Main Roller Assembly & Roller Spacer – MR, MRS (Photo 2.19)

The **main roller assemblies** (**MR**) are used for launching the bridge. Two pairs are located on the home bank while one pair on the far bank receives the structure as it reaches the other side.

Each roller assembly comprises three pairs of roller drums, side by side, mounted in a pivoting cradle which is supported off the base plate element by two screw jacks. The three pairs of roller drums support up to three lines of panels, and each has a load capacity of 350 kN (175 kN per drum) The screw jacks permit height adjustment of up to 100 mm. They are extended or retracted by turning the nuts with the special tool provided.

In general, both screw jacks should have the same extension so that the cradle is parallel to the base. It is, however, permissible to tilt the cradle somewhat extending one jack more than the other. This tilt adjustment may be used for fine tuning to ensure all roller drums are on a common plane. The difference in screw jack height should never exceed 30 mm (=1:20 slope). **Height adjustment is only permitted when the rollers are unloaded.**

Mounted on each side of the roller cradle are two lateral guide rollers to help keep the structure on line. The lateral guide rollers bear against the flange edges of the panel chords or reinforcement. While capable of resisting some lateral load the guide rollers are intended to "guide" the structure only and not to force it back if it is veering off line.

The main rollers incorporate a holding brake which is applied by inserting the brake bar (MR5) through one of the holes in the roller cradle side plates and one of the 6 holes in either the outer or inner roller drum. The brake bar must not be inserted until the span has come to a complete stop and must always be fully inserted up to the stop plate.

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Main roller spacers (MRS) cross-connect pairs of main rollers to ensure that the transverse spacing is maintained at all times. The main roller spacer is connected to the sides of the rollers base plate elements by welded pins.

Spacers are provided for the main home and far bank roller pairs only.

2.4.02 The Construction Roller – RC (Photo 2.20)

The two **construction rollers (RC)** are used to support the launching nose during its construction and booming out.

Each construction roller consists of a single drum mounted in a cradle which can be adjusted vertically relative to its supporting base by up to 100 mm. Mounted on one side of the cradle is a lateral guide roller, similar to that described above. The construction rollers support the inside lines of panels of the launching nose with the lateral guide roller running against the inside flange edge of those panels.

Height adjustment of the construction roller is achieved by turning the four hanger bolts supporting the cradle using the podger spanner. The cradle must always be parallel to the base and this is to be checked by measuring the height of the cradle above the base at all four corners which are to correspond within 3 mm. When the roller is loaded all bolts should be checked to ensure that they are loaded and not loose.

Construction rollers also incorporate a holding brake system similar to that of the main roller. The brake bar for the construction roller is RC4.

2.4.03 The Push Brace & Push Strut – BP, SP

The **push brace (BP)** is to be connected between the last two transoms at the rear of each stage of the structure along the centreline of the span at the time of booming out. It can also be fitted to the back of the launching nose, in which case it connects between the end transom and the sway brace junction (SBJ) in the centre of the end bay.

The **push strut (SP)** provides the connection between the pushing dozer and the bridge.

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Spacer



Photo 2.19 Main Roller and Spacer



Photo 2.20 Construction Roller

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2.4.04 Panel Propping Struts - PPS (Photo 2.21)

Panel propping struts (PPS) are used to hold the first panels of the launching nose upright until they are cross-connected and supported by the transoms. They comprise two telescoping tubular steel legs connected at the top to form an A. The base shoes are to be spiked in firm ground.

2.4.05 Roller Support Cribs & Slide Track - CP3, CP4, CP5, RST (Photo 2.22)

Roller support cribs are 300 mm (CP3), 400 mm (CP\$ or 500mm (CP5) in height. They can be stacked and bolted in various combinations to form supporting structures for the main roller assemblies at the abutments. Structures of height from 300 mm to 1500 mm in 100 mm increment can be constructed from these cribs.

To remove main rollers from support cribs when the span over restricts crane access, a 3.6 m long, steel sliding track RST is provided. It is attached by hook and pin type connections to the uppermost crib.

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Photo 2.21 Panel Propping Strut



Photo 2.22 Roller support Cribs and Slide Track

3. BRIDGE DESIGN

3.0.01 This section covers the selection of the correct type of construction necessary to carry the traffic loads to be applied for the particular span length involved. The selection of the launching nose necessary for the construction, and the approach ramps at each end of the bridge, are also covered.

3.1 SELECTION OF THE CONSTRUCTION TYPE

3.1.01 The main spanning elements – the side trusses – are assembled from panels and chord reinforcement in particular combinations to suit the design. One, two or three lines of panels can be installed each side of the bridge and each line may be reinforced to increase the bending strength. Four combinations or "construction types" for the main span are covered in this Handbook:

٠	Double Single	DS
•	Double Single – Reinforced	DSR
•	Triple Single	TS
	Triple Single Dainforced	TCD

• Triple Single – Reinforced TSR

The cross-section for each construction type is shown in figure 3.1. Single Single (SS) and Single Single Reinforced (SSR) construction, which are used in the launching nose, are also shown.

3.1.02 Although DSR and TS construction have similar load capacity, DSR would normally be preferred as it requires fewer components and is therefore more efficient.

3.1.03 The deck construction comprising transoms and deck units, is the same for all four types of construction.

3.1.04 Two factors govern the design of the span:

- The span length, and
- The traffic load to be carried by the bridge.



Fig. 3.1 Construction Types

3.1.05 The selection of the span length will depend on the nature and size of the crossing and the bank conditions on each side. Factors such as the clearance above water, the nature of the foundation material and the approach road levels must be taken into account. Spans can be varied in 5 m increments to suit the standard panel length.

3.1.06 With the bridge span length established, the appropriate construction type can be selected from Table 3.1 for standard traffic loading specifications.

3.1.07 Alternatively, for loading specifications not covered in Table 3.1, the construction type can be determined by consulting an engineer. The maximum live load bending moment and shear force applied to each side of the bridge will need to be determined.

3.1.08 This Handbook deals primarily with spans designed for the maximum permissible traffic loading specification, viz., 1 lane of MLC70. The recommended construction types for spans subject to this loading in the range 20 m to 50 m (known as principal spans) are highlighted in Table 3.1. 50 m is the maximum span possible under MLC70 Loading.

LOADING SPEC	20	25	30	SPAN 35	LENG 40	TH 45	50	55	60
Q TT44	DC	DC	DCD	DCD	DCD	TOD	TCD		
2 X 144	DS	D2	DSK	DSK	DSK	15K	15K	-	-
1 x MLC70	DS	DS	DSR	DSR	DSR	TSR	TSR	2	(e)
1 x MLC60	DS	DS	DSR	DSR	DSR	TSR	TSR	. 	-
2 x MLC35	DS	DS	DSR	DSR	DSR	TSR	TSR	TSR	-
2 x MLC16	DS	DS	DS	DS	DSR	DSR	DSR	TSR	TSR

TABLE 3.1 Construction Types

3.1.09 Figure 3.2 shows the typical arrangement of components to form a completed Cardno/RPC bridge span. Plan, elevation and cross-sectional views of the bridge are given. Note that the actual span from centreline of bearing to centreline of bearing is the nominal span + 0.43 m. Figure 3.3 gives views of a typical internal bridge bay, showing the position of all components, while Figure 3.4 shows a typical end bay including the end posts, bearings and base plates. The total number of each component required for each principal span is tabulated in Appendix A.

3.2 SELECTION OF A LAUNCHING NOSE

3.2.01 A launching nose is required to be fixed to the leading end of the span to permit rolling out by cantilever over the crossing.

3.2.02 Launching nose is assembled from standard panels, chord reinforcement, transoms and bracing components and in addition has a launching link designed to compensate for sag in the cantilever. The nose attaches to the end posts at the leading end of the span.

3.2.03 The length and construction of the launching nose depends on length and construction type of the span being launched. Noses for the principal bridge spans covered in this manual are of lengths ranging from 20 m to 35 m. Refer to Table 3.2.

SPAN (M)	MAIN SPAN CONSTRUCTIO N	LAUNCHING No of Bays	NOSE Length (m)
20, 25, 30	DS	4	20
35, 40	DSR	5	25
45	TSR	6	30
50	TSR	7	35

Note: 8 bay Launching Nose is required for non-principal spans exceeding 50 m.

TABLE 3.2 Launching Noses for Principal Spans

3.2.04 Launching noses are generally of single construction with only the 30 m and 35 m nose requiring one bay of double construction at the trailing end. Launching noses 25 m and longer require reinforcement to their rear-most bays. Where this reinforcement is required, it must continue back past the end post and into the end bay of the span proper. Refer to Figure 3.5.



Fig 3.5 Launching Nose Construction.

Figures 3.6a and 3.6b indicate the construction of the launching noses for the principal spans.

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Fig 3.2 Arrangement of a Typical Bridge Span.

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fig 3-3 Arrangement of a Typical Internal Bay.

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3.2.05 It is critical to the overall stability during launching that a specific length of decking is installed prior to booming. This length of decking is also indicated in Figures 3.6a and 3.6b and must neither be reduced nor increased.

3.2.06 Figure 3.7 shows the arrangement of components to form a typical launching nose. The total numbers of each component required for each of the standard launching noses are tabulated in Appendix A.

3.3 SELECTION OF THE SPAN LEVEL AND SLOPE

This section for general information only. Please consult appropriate qualified engineer.

3.3.01 The slope and level of the span, when in position for use, should be selected prior to commencement of construction. Several factors must be considered when making the selection including:

- the clearance of the structure above normal and flood water level
- the deck level relative to the approach roads each side,
- the range through which the span can be jacked during construction (1.4 m maximum) and the level of rollers during launching and,
- the depth of excavations required each side to obtain suitable foundation material for the bridge base plates.

The maximum permissible longitudinal slope of the span when in final position is 1 in 10.

3.3.02 Further information, pertinent to the selection of the appropriate level and slope for the bridge, can be found in Section 4 which deals with preparations for construction.

3.4 FOUNDATION DESIGN

3.4.01 The bridges have been designed to be founded on the ground without the need for concrete foundations. Bearings and base plates are provided at each corner of the span to spread the load over an area of 1.65 square metres.

3.4.02 The ground on which the bases are to bear should be assessed to determine the maximum pressure which can be applied while keeping settlement to an acceptable level. This is the Safe Bearing Value (SBV). The maximum load applied via the base plates for the various span lengths and loading specifications are listed in Table 3.3.

LOADING SPEC 20 25 30		SPAN (M) 35 40 45 50 55 60							
51 201	20			00	10	10	20		
2 x T44	65	70	78	80	85	99	107	Ξ	(1)
1 x MLC70	49	53	59	64	67	82	89	-) e .
1 x MLC60	45	49	56	59	63	77	84	-	-
2 x MLC35	42	48	54	57	62	71	75	79	-
2 x MLC16	25	28	31	34	42	47	58	64	68
Values assume short ramp construction as in Table 3.1									

TABLE 3.3 Base Plate Load at Each Corner (tonnes)

3.4.03 The applied pressure, which may be assumed to be uniform under the base plate, can be calculated from the base plate area.

Applied Pressure (kPa) = $\underline{Maximum Reaction (t) \times 9.8}$ 1.65 (m2)

Where the SBV of the supporting ground would be exceeded, it will be necessary to provide grillage or other means, under the base plate to spread the load such that the SBV is not exceeded.

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3.5 ABUTMENT DESIGN AND RAMP SELECTION

3.5.01 The underside of the bearing base plate is 1.45m below the deck level. To make the transition from roadway to bridge it will be necessary to provide either:

- an abutment back wall and short ramp (2.5 m) or,
- a long ramp (7.5m) and stable slope from the base plate level.

These alternatives are illustrated in Figure 3.8. the choice will depend on site conditions and the consulting engineer.

3.5.02 If the abutment back wall is to be located directly under the end of the short ramp, it must be designed to resist the directly applied traffic loads and earth pressure and traffic surcharge loads. Refer to Figure 3.8a. Concrete construction is envisaged.

3.5.03 Standard steel ramps are provided with the bridges. They are assembled from standard deck units, ramp stringers and transoms, pedestals, etc. The 2.5m ramp can be constructed using only deck units and the ramp ledger while the 7.5m ramp is constructed by adding the components of the 5 m extension module. The ramps are designed for MLC70 vehicle loads and are therefore suitable for all lesser traffic loads. The angle of the ramp must lie within the range **1 in 10 down to 1 in 20 up** from the end of the bridge.

3.5.04 The pedestals on which the outer end of the 7.5 m ramp is supported have a base area of 0.47 m². The maximum pedestal loads given in Table 3.4. should be used in conjunction with consultation with an engineer to calculate an applied pressure.

3.5.05 Figures 8.1 and 8.2 show assembly diagrams for the short and long ramps respectively.

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Figure 3.8

LOADING SPEC	Outer Pedestals	Centre Pedestals
2 x T44	14	36
1 x MLC70	24	39
1 x MLC60	22	35
2 x MLC35	18	40
2 x MLC16	9	25



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4. **PREPARATION FOR CONSTRUCTION**

4.1 CONSTRUCTION AREA

4.1.01 Figure 4.1 indicates the area required for construction. Ideally, the area beyond the far bank rollers should be of length to accommodate the launching nose and of width to allow access for cranes dismantling the nose. An area should be allowed for storage of components. The space behind the rear home bank rollers should allow for the longest construction stage of the main span plus an amount for the pushing vehicle. The width of construction area must allow for crane access and storage of components each side.

4.2 ABUTMENT AND SITE PREPARATION

4.2.01 The home and far bank construction areas should be cleared, graded and compacted if necessary such that roller foundations can be placed, components stored and construction traffic can operate upon it without uneven or undue subsidence.

4.2.02 The actual area of the assembly should have a cross-fall not exceeding 1 in 20, and a longitudinal grade not exceeding 1 in 10.

4.2.03 At the abutment locations, the banks should be excavated to form benches at levels and of extent and location to suit the base plates and home bank rollers. Refer to Figures 4.2.

4.2.04 These benches should be level and of uniform surface compacted to uniform bearing capacity. The batters to the crossing gap must be stable as must any slope excavated back to the approaches.

4.3 BEARING ROLLER LAYOUT

4.3.01 The positions in plan of bearing base plates and rollers are given in Figure 4.2. The base plates are to be spaced at fixed crosscentres and at longitudinal centres which depend on the span. They are to be set out square to the bridge centreline. The main home bank and far bank rollers are positioned nominally 1.3 m inside the base plates (see Figure 4.2) and both pairs are to be cross-connected by main roller spaces (MRS). The remaining rollers are set out from the main home bank rollers.

4.3.02 The construction rollers are located under the inside lines of panels (8.1 m crosscentres) with the lateral guide rollers towards the bridge centreline.

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fig 4-1 Construction Area

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4.3 - ATTACHMENT 1



5 LIFTING PROCEDURES

5.0.01 This Section illustrates the correct methods for lifting the main components using the two or four leg lifting slings provided. Also described is the correct method for jacking the span, when required, using 50 tonne, hand-operated jacks and spreader beam.

5.1 LIFTING OF COMPONENTS

5.1.01 Because of the weight, the main components must be lifted by crane. Most of the main components are fitted with one or more lifting points. These lifting points should be used wherever possible.

5.2 JACKING THE SPAN

5.2.01 In certain circumstances the span, part of the span or launching nose may need to be jacked up by a small amount, e.g. for rebedding a roller which has settled excessively or for moving a roller if the span has moved off line. Two 50 tonne hand operated hydraulic jacks can be used. A load spreading beam JSB is provided for use with each jack, and is to be placed between the jack and the underside of the panels. Figure 5.1 shows the correct arrangement for jacking the span. Note that the spreader beam must always be used; the jack must be placed directly under the panels diagonal intersections or end post, never between these points. They can be used for general duties around the construction site and can be used upright or horizontally (front face down) but never upside down.



Fig 5.1 Arrangement for Jacking Under Spans

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6. STANDARD PROCEDURES FOR INSTALLATION OF COMPONENTS

6.0.01 The following Section describes procedures to be adopted for installation of the most commonly used components of the bridge and launching nose. These procedures will be required repeatedly during construction and have been designed to suit the particular features of each component.

6.1 ATTACHING A STANDARD PANEL – PS

6.1.01 The standard panel is attached to a previously erected panel by standard panel pin type connections. The top and bottom male pin plates of the panel are inserted between the female pin plates of the panel in place and the panel pins fitted after the holes have been aligned. The panel is normally attached after the transom at the joint and its transom clamp-joint have been installed.

6.1.02 An effective method of installing panels (also the launching link) is illustrated in Figure 6.1. The top connection of the tilted panel is completed first and the panel then pivoted downwards to engage the bottom pin plates. The bottom panel pin can then be installed through aligning holes whilst the weight continues to be taken by the crane.

6.1.03 Assembly of bays should commence with connection of the inner panel, followed by the middle panel (for triple construction) and then the outer panel. The middle panel cannot be added last as insertion of the non-headed pins can only be achieved through the pin holes of the panels already in position.

6.1.04 During the pivoting stage, the panel end vertical should fit between the vertical plates of the TCJ already installed at the joint. After the panel is installed the connection of this transom clamp can be completed by fitting the second brace pin BPS.

6.2 INSTALLING PANEL PINS AND BRACE PINS

Panel Pins – PPH & PPN

6.2.01 Panel Pins PPH & PPN connect panels end to end and are inserted through the holes in the pin plates at the four corners of the



panels. The panel pins are installed after careful alignment of the pin holes in mating pin plates.

6.2.02 If the pin will not slide into place easily, due to some small misalignment of holes or load on the pin, it may be hammered **lightly** on its end, using the hammer provided, to push it home. **Excessive force should never be used to drive pins** through grossly misaligned holes. Every effort should be made to align pin holes precisely.

6.2.03 The non-headed panel pin must pass through the female pin plate holes of the outer lines of panels before fitting into place. If light hammering of PPN is required to complete insertion it can be achieved by using the large pin-drive (LPD) through the outer holes. Refer to Figure 6.2b.

6.2.04 After insertion the pins are held in place by the large safety clips (SCL). Two safety clips are required for each non-headed panel pin. The holes in the pins for the safety clips should be aligned with the direction of the panel chord or reinforcement to allow easy fitting of the clips.

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fig 6.2 Panel Pin Installation

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Brace Pin – BPS & BPL

6.02.05 The 30mm diameter brace pins, BPS and BPL, are used to connect the raker and cross braces and the transom clamps. They are installed in a similar manner to panel pins.

6.2.06 Light hammering on the pin head, using the smaller ball pein hammer, is permissible to achieve alignment and push the pin home. However, excessive force should never be used. A small pin punch is provided for use on brace pins where access to the head is restricted.

6.2.07 After insertion, the brace pins are held in place by the small safety clips (SCS) inserted through the small holes at the tapered ends. The long brace pin (BPL) has two alternative safety clip positions, the inner one being used when connecting the TCM and the outer when connecting the raker and/or cross braces.

6.3 INSTALLING A TRANSOM AT MID-PANEL – TS, TE & TCM

6.3.01 The bottom flange of the mid-panel transom is located longitudinally by fitting between lugs welded to the small diagonals of the panels. Transversely it is located by the lugs welded on its underside which fit around and between the flanges of the panel bottom chords. The top flange is restrained and positioned longitudinally by the TCMs.

6.3.02 The installation procedure is as follows:

- Unpin and remove TCMs, if in place, from all panels in the bay.
- Lift the transom into position from beyond the end of the last bay as shown in Figure 6.3a.
- Position the transom directly over its final position but hold it a small distance (20-100mm) above the panel chord. At this point two sway braces should be pinned to the transom to partially locate it. (See Sub-section 6.6).
- Lower the transom, adjusting its position and that of the panels to achieve proper seating. The panel spacing gauges (GPS) can be used to hold 2 or 3 panels at precisely correct centres.
- Install the TCMs to all panels in the bay, fixing them in place using long brace pin (BPL) each end. The middle transom clamp (TCM) is symmetrical so that it may be installed either way up.



fig 6·3a Installing a Transom at Mid-Panel

6.4 INSTALLING A TRANSOM AT A PANEL JOINT – TS, TE, TCJ & TCE

6.4.01 The transom at a joint is installed and seated at the bottom chords at the female ends of the panels adjacent the end verticals after all panels in the bay are in place. The transom and clamp, TCJ, must be installed prior to the attachment of the next panel.

6.4.02 The procedure is as follows: (Refer to Figure 6.4).

- Lift the transom and position it over the bottom female pin plate each side of bridge adjacent the end vertical of the panel.
- Lower the transom with flange edges just touching and sliding against the end vertical.

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- Hold the transom a small distance (20-100mm) above its seating while the two sway braces are connected to it (See Sub-section 6.6).
- Lower the transom, adjusting its position and that of the panels to achieve proper seating. The panel spacing gauges (GPS) can be used to hold 2 or 3 panels at precisely correct centres.
- Install the TCJ at the inner and outer panel lines each side and fix by inserting a brace pin BPS. The transom should be held by the lifting sling until all the transom clamps are properly installed.

The second pin fixing the TCJ cannot be inserted until the next panels are in place.

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fig. 6:4. Installing a Transom at a Joint.

6.4.03 When installing a transom at the female side of the end post a similar procedure is adopted. The end post transom clamps (TCE) however, must be used. They are fixed to the end post using brace pins BPS. **TCEs must be installed prior to the attachment of the adjoining panel or end post.**

6.4.04 Safety clips must be fitted to the brace pins connecting the transom clamps as soon as they have been installed.

6.5 INSTALLING THE RAKER BRACE AND CROSS-BRACE – B1 & B2

6.5.01 The raker brace (B1) is fitted at the panel to panel joint between the top end of the transom and the raker cleats on the underside of the panel top chord. The cross-brace (B2) connects the second and third lines of panels (where present) back to the first line

by fixing one raker cleat on each line of panels. Raker braces and cross-braces are installed after all panels both sides of the joint and the transom are in place.

6.5.02 The cross-brace, if required, is fitted first. It is connected to the raker cleats on the outer line of panels (3) using a long brace pin. In triple construction B2 also connects to the middle line of panels (2). The long brace pin through the raker cleats of the inner line of panels (1) connects the raker as well as the cross-brace so this connection cannot be made until the raker is in position.

6.5.03 The raker brace can be fitted as shown in Figures 6.5a, 6.5b and 6.5c. The slot in its upper end fits around the end of B2 and the common connecting pin BPL installed.





6.5.04 The panel spacing gauge (GPS) may be used to hold the tops of the panels at the correct centres during installation of B1 and B2. Safety clips must be fitted to the brace pins and fixed pins as soon as they have been installed.

6.6 INSTALLING SWAY BRACING – B3 & SBJ

6.6.01 The sway bracing (B3) is fitted between and connects to adjacent transoms. Normally two braces are installed as each new transom is added to ensure that construction is square in plan. Each brace connects between the central holed cleat on the mid panel transom and the outer cleat of the transom at the joint.

6.6.02 It is recommended that the pair of sway braces be fitted during the installation of the new transom. The two sway braces should be held in approximately correct position already pinned to the previously installed transom. With the new transom held just above its final position the remaining pin connections of the sway braces can be easily made. Installation of the transom with sway brace attached can then be completed. Refer to Figs 6.3 and 6.4.



fig 6.6 Installing Sway Bracing.

6.6.03 The pins of the sway braces should never be forced home by excessive hammering. Correct alignment of pins and holes should be achieved by the method mentioned above.

6.6.04 In the launching nose there are no mid-panel transoms. The sway brace junction (SBJ) is used instead to interconnect the four sway braces in the middle of the bay. All four sway braces and the sway brace junction are installed at the same time. While supporting the sway brace junction and new transom just above position, install all four-sway braces, adjusting the lateral position of the transom if required to achieve correct fit.

6.6.05 Insert the safety clips in the fixed pins of all sway braces as soon as they have been fitted through the cleat holes.

6.7 INSTALLING CHORD REINFORCEMENT

Installing Bottom Chord Reinforcement – CRS & CRL

6.7.01 The bottom chord reinforcement is lifted into place with the male pin plates lifting between the female pin plates at the rear of previously attached bottom chord reinforcement. The pinholes should be aligned and the panel pin installed. As for the panels, the middle line of reinforcement in triple construction cannot be added last as access for the headless pin through the outer pin plates is required.

6.7.02 The trailing end of the chord reinforcement, whether short (CRS) or long (CRL), should rest on the ground until the next bay of panels is added. After the panels of the next bay are added, the reinforcement can be pivoted up into position lifting at the trailing end, and bolted to the underside of the panels. All four chord reinforcement bolts (BC2) to each panel must be installed and tightened as construction proceeds.

Bolting of Chord Reinforcement

6.7.03 The tapered shank chord reinforcement bolt, (BC2) is to be installed with the head above and the nut below. The domed washer must be installed with the dome towards the nut below. The domed washer must be installed with the dome towards the nut. The domed spring washer will flatten, pre-loading the nut to provide resistance against loosening. Tightening of BC2 nut can be done either by pneumatic wrench or by the hand rachet provided, with the following warning:

CAUTION

The Dome Washers are to be inspected for distortion or signs of damage prior to use and after disassembly. If any signs of damage or flattening are present the washer is to be replaced.



Installing Top Chord Reinforcement - CRS & CRL

6.7.04 Top chord reinforcement is lifted into position, pinned to the trailing end of the previously fitted reinforcement and bolted to the panel with chord reinforcement bolts. The pi connection is made in a similar manner to that for panels and bottom chord reinforcement and again the middle line of reinforcement cannot be added last. All chord reinforcement bolts must be installed and tightened as each length of reinforcement is added.

6.7.05 Long reinforcement (CRL) at the top should never overhand the last bay of panels or it will be impossible to fit the next bay; installation should be delayed until the next bay of panels has been added.

Installing Chord Reinforcement Tapers and Chord Reinforcement End Post – CRTF, CRTM & CRE

6.7.06 The chord reinforcement end post (CRE) fits above and below the end post along all lines of reinforcement that continue from the launching nose through to the bridge proper.

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4.3 - ATTACHMENT 1



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6.7.07 All the extra chord reinforcement components CRTF, CRTM and CRE can be lifted into place by hand. Refer to Figure 6.8a. CRTF and CRTM are bolted to the panels by standard chord reinforcement bolts (BC2), while CRE is attached by the integral hook device illustrated in Figure 6.8b. The pin-type connections of these three parts are the same as CRS and CRL. CRTF and CRTM may be bolted to the panel prior to it being lifted into place.

6.8 INSTALLING DECK UNITS 0 DU & DUK

6.8.01 As well as forming the running surface of the bridge, deck units DU and DUK on the rear of the bridge act as counterweight during launching. These deck units are therefore installed during the staged construction of the span, the remaining deck units at the front of the span being installed after the bridge has been seated on its bearings. See Figures 3.6a and 3.6b for the extent of counter-weight decking.

6.8.02 The deck units are installed as illustrated in Figure 6.9 with a sling lifting hook attached to each of the four latch/lift hooks (opened).

6.8.03 The deck units are to be positioned so that their end plates fit between the locating latch bar and lug on the transoms and the slots in the end plate fit around the latch bars.

6.8.04 Once seated correctly onto the transoms the lifting sling can be removed from the four latches allowing them to pivot down into the closed position. The latches allowing them to pivot down into the closed position. The latches should fit easily around the latch bars on the transom with a small clearance between them. The only situation where a tight fit may be encountered is when deck units are fitted to a steeply sloping ramp.

6.9 INSTALLING END POSTS – UEP

6.9.01 The end posts are attached at the back of the launching nose or end of the span. They are installed in a similar way to the panels by pivoting into position as shown in Figure 6.10. They are to be pinned to all adjoining lines of panels with headless pins being used for the middle line.

6.9.02 When the end post is being attached to the back of a launching nose the connection of the outer transom clamp TCE must be completed while the crane is still taking load. This is to ensure that the off-centre weight of the end post is supported by the adjacent transom.

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fig. 6-10 Installing the End Post.

6.10 INSTALLING END BAY BRACING – B4

6.10.01 Four end bay braces fit between each pair of end transoms in the end half bays of the bridge. They are installed in a similar manner to sway braces, connecting by fixed pins to cleats on the end transoms. They should be fitted after the sway bracing. The correct arrangement of end bay braces is shown in Figure 3.4, with two braces always connecting to the middle of the outer most end transom.

It should be noted that this Manual does not cover launching with a launching nose. Section 7 is for general information only and should be used in conjunction with your engineer. It is recommended using cranes wherever possible either for the entire lift or all support on the receiving bank.

7. LAUNCHING PROCEDURES

7.0.01 After certain stages of construction of the launching nose and main span, the structure is to be boomed out (pushed forward) over the supporting rollers. This section describes the standard procedures to be carried out during the launching operation.

7.0.02 The launching operations should always be carried out with great care and under close supervision as in this phase there is most potential for problems to occur. The primary concerns during launching are:

- to keep the structure on the correct line, running between the guide rollers at all times and,
- to avoid overbalancing the structure by ceasing booming at the correct position.

7.1 PREPARATION AND FITTING OF THE PUSH BRACE

7.1.01 The following preparatory work must be carried out prior to booming. It is assumed that the construction stage is complete, correctly seated on the rollers and on the correct line.

1. Fit the Push Brace BP.

The Push Brace (BP) must be fitted to the rear half bay of the construction and securely pinned in place as shown in Figure 7.1. This member transfers the central pushing force to the sway bracing system. It must be removed after each booming stage, prior to further assembly.

2. Position and Connect the Pushing Dozer

The dozer providing the pushing force is positioned behind the structure precisely on the centreline. The push strut (SP) is connected between the centre of the rear transom and the towing pintle on the dozer as shown in Figure 7.1.

3. Check the structure.

Check visually to ensure that:

- all obstructions to booming are cleared away.
- the correct number of bridge bays and correct amount of decking are installed and,
- rollers are properly aligned, levelled, and bedded within tolerances.
- 4. Remove roller holding brakes.

Remove holding brakes from all rollers, including construction roller if used, immediately prior to commencement of booming and after connecting the pushing dozer.



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7.2 CONTROL AND LATERAL GUIDANCE

7.2.01 The booming must be controlled to ensure that the span remains on line and is stable at all time. The controller of the launching operation should be in direct communication with the dozer operator and observers stationed at each of the roller locations. The observers should monitor the performance of the rollers, and, in particular, the lateral position of the structure relative to the lateral guide rollers. They should be able to signal the controller to immediately halt booming if and when necessary. Booming should proceed at a slow rate, stopping occasionally to permit checking of the rollers and guiding system for satisfactory performance.

7.2.02 Provided the direction of push by the dozer is correct and the rollers have been set up correctly as described in Section 4, the span should remain on line during booming and run between the lateral guide rollers. Refer to Figure 7.2. While capable of resisting some lateral load and **easing** the structure back on line, the guide rollers are intended to **guide** the structure only and not to **force** it back on line against distinct tendency to run askew. The guides also ensure that all panels are properly centred over the roller drums.

7.2.03 The observers at each roller should signal for the booming to cease if the structure is applying excessive force to the lateral guides. Remedial action will be required if this is the case since further forward movement will only worsen the situation.

7.2.04 Apart from a skew push by the dozer, the usual cause of the span running off line is incorrect roller set up. If the rollers in a pair are not at the same level or one or both are not horizontal and parallel to the underside of the panels then there will be a tendency for the structure to run off line. If this tendency is detected, booming must cease and the span jacked up adjacent to the offending roller(s) and the roller(s) adjusted as necessary (refer to Sub-Section 5.2).

7.2.05 In certain circumstances the lateral force applied to the guide rollers may cause the entire roller assembly to move sideways. As the main rollers are cross-connected, both rollers will move together. This situation is acceptable provided:

• rollers remain bedded, aligned and levelled correctly and,

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Fig 7.2 Lateral Guide System

the new alignment is acceptable to construction and other rollers can be • repositioned to suit.

7.3 ADJUSTMENT OF ALIGNMENT

7.3.01 If the structure being launched is allowed to move off line excessively, remedial action may be required.

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7.4 BREAKING & PUSHING FORCE

7.4.01 The pushing force required to boom the span is dependant on the friction forces within the rollers and the slope of the plane of the rollers. For rollers in good condition the force to overcome friction is generally less than 5% of the structure weight. Once moving, the frictional resistance reduces considerably below this figure. When the plane of the rollers slopes upwards the pushing force against gravity adds to the friction force. If the slope of the roller plane is the maximum permitted (1 in 10), the required pushing force, in addition to friction, is 15 tonnes (mass of structure x % slope/100) for a complete 50 m span.

7.4.02 When the plane of the rollers slopes downwards friction forces resist the down hill rolling however, the restraining force against gravity will be almost equal to the pushing force described above.

7.4.03 From the above, it is clear that the flatter the slope of the roller plane the lower the pushing or restraining forces will be and the greater will be the control during rolling. Even on sloping sites, the rollers can be set up on a horizontal plane so as to minimise pushing or restraining forces and the ends then jacked down by differing amounts to suit the final slope of the span.

7.4.04 Braking of the structure during booming is controlled by the push dozer. If the structure is being pulled across the gap by a cable and winch a back haul winch is required to restrain against uncontrolled forward movement and to provide a braking force.

7.4.05 Once booming has ceased, the roller holding brakes (described in Section 2.4) should be installed. It may not be possible to install the roller brake bar at all roller locations, however, as many as possible should be inserted with at least two through the load bearing roller drums. The span may have to be moved forward or backwards to allow brake bars to be installed.

7.5 CRITICAL POINT DURING LAUNCHING

7.5.01 The most critical point during launching is reached when the centre of gravity (balance point) of the whole structure corresponds with the main home bank rollers and the structure begins

to pivot forward to land on the far bank rollers. At this stage it is important to ensure that:

- the far bank rollers have been positioned correctly to receive the launching nose tip and,
- the rate of forward movement is low and controlled so that, at the balance point, the launching nose tip descends slowly to land gently on the rollers avoiding excessive impact.

7.5.02 Ideally booming should cease at the balance point with the descent of the launching nose being controlled by men at the far bank roller positions. Once the nose is bearing on the roller booming should proceed.

7.6 HAULING OUT

7.6.01 An alternative to pushing out the structure using a dozer would be to pull the structure from the far bank using a cable and winch. If the equipment is available for this method it may be preferable as the pull applied tends to keep the structure on line and the winch enables finer control of movement. If a winch is used, the cable is connected to the middle of the leading transom. The push brace BP must be installed in the leading half bay for this method.

COMPLETION OF THE SPAN 8. 8.1 **GENERAL** 8.1.01 With the span seated on its bearings only the construction of the approach ramps and completion of decking need to be carried out before the bridge is ready for use. 8.1.02 The portion of the deck not installed during the earlier construction stages may be added at any time after launching is complete. However, suitable access to install on its bearings and access ramps constructed. 8.1.03 Selection of an appropriate form of ramp (short or long) to suit the approaches/abutments is covered in Sub-section 3.5. The ramp ledger and ramp pedestals (7.5 m ramp only) are to be bedded as described in Sub-section 4.5 for bearing base plates. Pedestal loads are given in Sub-section 3.5. Earthworks, foundation preparation and/or construction to suit the selected ramp arrangement should be completed at this stage. The description of construction methods for short ramps (Section 8.2) and long ramps (Section 8.3) assume that all such preliminary work has been carried out. 8.1.04 Assuming that all ramp and deck components are on the home bank, the usual steps to complete the construction of the bridge is as follows: Construction of the ramp at the home bank end, 1. 2. Completion of the span decking with vehicle access possible from the home bank and, 3. Construction of the ramp on the far bank, bringing components from the home bank and working with the crane on the end of the completed deck. 8.2 **CONSTRUCTION OF THE SHORT RAMP (2.5 M)** 8.2.01 The short (2.5 m) ramps are constructed using four deck units (2 x DU and 2 x DUK) and the ramp ledger RL only. Refer to Figure 8.1 for the arrangement. 8.2.02 The ramp ledger is to be properly bedded at the specified distance from the end transom and parallel to it. The level of the ramp ledger should be such that the) change in grade from the deck) ()) .)) ·) 75 | Page .)



lies between 1 in 20 up and 1 in 10 down. The underside of the ramp ledger must be between 0.250m below and 0.115 m above the top flange of the end transom to comply with this limitation.

8.2.03 The base plate of the ramp ledger should preferably be horizontal, both longitudinally and transversely. However, a crossfall of up to 1 in 20 relative to the end transom could be accepted provided the limitations on longitudinal slope noted above are maintained.

8.2.04 The ramp ledger should be positioned transversely so that the latch bars align with those on the bridge transoms. Correct alignment should be checked using a string line or by careful sighting.

8.2.05 Deck units to the short ramp are installed in the normal way, fitting over and latching to the bars on the end transom and ramp ledger. The gap in the road surface over the end transom should be minimised by positioning the deck units hard against the stop lugs on the end transom.

8.2.06 Road fill material may be pushed up against the ramp ledger and onto the ramp deck to provide a smooth transition for traffic. If necessary the ramp ledger may be pushed hard against the deck unit end plates so as to minimise any spill through. If holding down bolts are installed to the ramp ledger they should be securely tightened.

8.3 CONSTRUCTION OF THE LONG RAMP (7.5 M)

8.3.01 The long ramp is constructed by installing the 5 m ramp extension module between the span and the 2.5 m short ramp. The components of this extension module are described in Section 2.3. The marking plan for the construction of 7.5 m ramp is shown in Figure 8.2.

8.3.02 The steps in construction of the 5 m ramp extension module are as follows:

1. **First, install the three ramp pedestals (RP).** All three pedestals should be properly founded at a common level to produce a ramp which is horizontal transversely and within the permissible range of longitudinal slopes (1 in 20 up to 1 in 10 down). The underside of RP must be between 0.23m and 0.98m below the top flange of TE to comply with this limitation. Each pedestal base should be horizontal.



Fig 8.2 Arrangement of parts for Long Ramp

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The plan position of pedestals relative to the bridge is to be as specified in the marking plan however absolute accuracy at this stage is not essential as the construction techniques allows for some fine adjustment of position. Nevertheless the more accurate the set out the easier will be the construction.

Install the Ramp Stringer Bracket (RSB) and Reacting Beam (RB). The reacting beam is lifted into place, after temporarily removing the two centre end bay braces B4. It is bolted into place along with the ramp stringer bracket as shown in Figure 8.2. The six bolts used are to be fully tightened using the ratchet wrench.

3. **Install the three Ramp Stringers (RS).** These are lifted into place with the hooks at the span end fitting around the stainless steel pins of either the end posts (outer stringers) or the ramp stringer bracket (central stringer). The outer ends should be supported on a temporary timber packing at a common level under the bottom flanges so that the hook plates are clear above the bearing pins in the pedestals. Refer to Figure 8.3.

After installation, the centre to centre spacing of stringer should be as close to 4400 mm as possible so as to minimise adjustment when connecting the ramp transoms. It is therefore best to install the centre transom first and space the outer stringers from it. The locking devices to the hooks at the bridge end are to be closed. Refer to Figure 8.4.



Fig 8.3 Temporary support of ramp stringer

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Fig 8.4 Ramp Stringer lock operation

- 4. **Install the ramp transoms (RT).** Each of the four ramp transoms is bolted into position, as shown in Figure 8.2. All transoms must be fitted from the "bridge" side of the connection cleats. Adjusted stringer positions using the crane or wire rope puller if necessary to achieve correct fit. The bolts may be left loose until the construction is squared.
- 5. **Square the Construction in Plan.** The ramp frame construction must be precisely squared so that the deck units will fit properly. Squaring is achieved by fitting two sway braces B3 (removed from the launching nose) between the ramp transoms as shown in Figure 8.2. If they sway braces do not fit, the frame structure is squared by this means all bolts connecting the stringers to the transom must be fully tightened by hand. The squaring sway braces are to be removed after final seating of stringers (See 6 below).
- 6. **Seat the Ramp Stringers on the pedestals.** Lift the outer end of the ramp structure just off its temporary supports.

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attaching the sling to the end most ramp transoms. The lift will be approx. 1.7 tonnes. Remove the temporary timber packing and lower the structure so that the hook plates of the stringers fit around the bearing pins of the pedestals during lowering may be required to achieve proper seating. Check that all pedestals remain properly bedded.

- 7. Add the deck units to the ramp extension module. The deck units to the ramp extension module (4 x DU + 4 x DUK) are installed in the same way as on the bridge. The end plates of the deck units should fit between the special restraining lugs on the top flange of the end transom and ramp transoms.
- 8. **Install the 2.5 m ramp.** The short 2.5 m ramp is installed at the end of the 5 m ramp extension as shown in Figure 8.2 and as described in Sub-section 12.2. It is acceptable to have a difference in grade between the 5 m and 2.5 m sections provided both slopes are within the limits specified in Sub-sections 8.2 and 8.3.

8.4 **COMPLETION OF THE DECK**

8.4.01 Completion of a ramp at the home bank enables access to the deck for the crane and vehicles carrying the deck units. The remaining deck units can therefore be progressively installed in the undecked section of the span. Once all deck units are in place all latches should be checked to ensure they are engaged correctly before opening the bridge to traffic.

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CHAPTER 9

INSPECTION

9.1 GENERAL

9.1.01 Inspection of Line of Communication Bridging has the objective of maintaining the integrity of each bridge in service, and the components from which bridges are assembled, by the detection and assessment of excessive movement, or damage or other reduction of capacity of components, or loss of components from a span (pins etc.), or deterioration by way of cracking or corrosion or loss of protective treatment. Inspection is aimed at the identification of faults at the earliest time, so that problems can be dealt with before conditions conducive to failure can develop. Inspections must be regular, thorough, orderly and properly recorded.

9.1.02 The welded steel components are subjected to high stresses during normal use. In addition, although stress relieving techniques were employed during design and manufacture, residue may remain in components because of manufacturing techniques or subsequent repairs.

9.1.03 The maintenance of the galvanised protective surface, and the early detection and treatment of corrosion, should it occur, is necessary to ensure the integrity of the components.

9.1.04 Inspection techniques to be employed are visual, dye penetrant, magnetic particle and the use of special to task gauges.

9.1.05 During inspections, particular attention is to be given to all welds particularly on the bottom chords of panels, pinhole plates and the condition of protective coatings. Dye penetration or magnetic particle techniques are to be used on areas suspected of having cracks.

9.2 INSPECTION INTERVALS

9.2.01 The inspection intervals listed in Table 9.1 are to apply.

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TABLE 9.1 – INSPECTION FREQUENCY

SERIAL	INTERVAL	REMARKS
1.	Monthly	The inspection is to consist of a thorough visual inspection in accordance with 9.3.01 and 9.3.08
2.	6-Monthly	The inspection is to consist of a thorough visual inspection from both above and below the superstructure. Bridges are to be examined for wear, general integrity and the condition of the protective coating in accordance with the requirements of Paragraph 9.3.03
3.	Annual	The inspection is to be carried out in accordance with the requirements of 9.3.06.
4.	5-Yearly	This is a technical inspection which may require the stress testing of panels in accordance with Paragraph 9.3.08 and Chapter 10.

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9.3 INSPECTION DETAILS

9.3.01 **Monthly Inspection.** A monthly inspection is to be carried out on assembled bridges. The inspection is to be visual and is to consist of:

- a. Check entire structure for impact damage.
- b. Assess the general condition of protective coatings.
- c. Inspect for missing components, in particular panel pins, brace pins and their safety clips and chord reinforcement and ramp bolts and nuts.
- d. Ensure chord reinforcement and ramp bolts are tight.
- e. Check the seating of deck units and ramps.
- f. Inspect for the accumulation of dirt or debris on the deck or panels and around bearings, base plate and end post, and remove during the inspection.
- g. Check for scour or subsidence in the stream banks and potholing or scouring of approaches.

9.3.02 Where possible clear any dirt and debris, tighten bolts and replace or reseat components as necessary during the inspection. A Monthly Bridge Inspection Form is to be completed after each inspection. An example of this form is included as Table 9.2.

9.3.03 **Six Monthly Inspection.** The six-monthly inspection of bridges in place and includes a full inspection of all components from above and below the superstructure. Bridges are to be examined for signs of wear, generally integrity and the condition of protective coatings. The inspection shall include those points in paragraph 407 and in addition:

- a. Panels are to be checked for distortion or damage.
- b. Special attention is to be given to fatigue cracks in main panels and chord reinforcing pin plates where access is available. Use to be made of dye penetrant for identification.
- c. The sag of the bridge is to be measured each side at the inner truss line and compared with the limits in Table 9.4.
- d. Deck units are to be checked for damage, uneven seating or wear.
- e. Check transoms, sway and end bay bracing.

- f. Bearings are to be checked for squareness, level and seating.
- g. The level at each corner of the bridge is to be measured at the bearing. Refer to Paragraph 10.1.08.
- h. The galvanised coating of all components is to be thoroughly checked for damage, weakness or corrosion.

9.3.04 Where possible the maintenance team is to clean any dirt and debris, tighten bolts and replace or reseat components as necessary during the inspection. A Six-Monthly Bridge inspection form is to completed after the inspection. An example of this form is included at Table 9.3.

9.3.05 Where possible the measured sag is found to exceed the limits for the span set down in Table 9.4, then a component fault such as damage, excess wear or even failure must exist. The fault must be determined by checking each connection and measuring each panel dimension for any discrepancy. Depending on findings the bridge is to be dismantled and the problem part removed and replaced.

9.3.06 **Annual Inspection.** The annual inspection is to be carried out on bridge components and equipment and tools on return to store and at yearly intervals when in store. The inspection is to consist of a thorough visual inspection of all components to detect damage, distortion and cracking, to access the general condition of the surface protective coatings and to detect corrosion.

CAUTION

Now that the option of pneumatic wrenches has been introduced, the dome washers for the chord reinforcement bolts are to be inspected for distortion or signs of damage annually, prior to use and after disassembly. If any signs of damage or flattening are present the washer is to be replaced.

9.3.07 The annual inspection is also to include an assessment of storage conditions. Storage in contact with cinders, unseasoned timber, mud or clay is to be avoided as it may lead to surface staining and premature corrosion. Clearance for ventilation is necessary and water catchment configurations are to be avoided.

9.3.08 **Five-Yearly Inspection.** A five-yearly inspection is to be carried out on each and every panel. The inspection includes those criteria covered in the Annual Inspection and in addition each panel is to be tested for dimensions and strength. The procedure for testing panels is detailed in Chapter 10.

9.4 REFERENCING

9.4.01 For the purposes of referencing components, at any inspection where the bridge is assembled, the span components shall be numbered as indicated in the example below. Refer also Figure 9.1.

COMPONENT REFERENCING – EXAMPLE

2/L3/CRS(T)

2	-	Bay Number (counting from Home bank)
L3 -		Truss Line Number, counted from the bridge centreline, looking from the Home bank L1, L2, L3 (left) R1, R2, R3 (right)
CRS(T)		- Component Designation, and Top (T) or Bottom (B) if applicable. Chord Reinforcement Short, top, in this case.



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DATE:

REMARKS

over.....

Km

Home Bank (N.S.E.W)

Construction

FURTHER ACTION

TO BE TAKEN

STAFF REPORTS - INFRASTRUCTURE SERVICES

TABLE 9.2

INSPECTOR:

ITEM

appearance, cleanliness, line, etc.

1.

2.

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5.

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7.

a.

8.

9.

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MONTHLY INSPECTION REPORT

BRIDGE

Road

Reference

Span m

General condition,

Missing pins or parts

Damage to members

Galvanising System

Deck Seating

Ramp

Stream Scour, saltation

Signs

Any other

subsidence b. Debris build up

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29	February	2024

DETAILS: to be provided where further action is recommended.

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FABLE 9.3					
5-MONTHLY INSPECTION	REPORT				
NSPECTOR:		DATE	3:		
BRIDGE		over			
Road		Km			
Reference		Home	Bank (N.	S.E.W)	
Span m		Const	ruction		
Item	Measu	rement	Clear (✓)	Fault Details	
1. Panels (Table 10.1)					
. Damage	-				
. Distortion	=				
. Pins in place	-				
2. Cracks in Pin Plates (10.1.08-10.1.12)				If Detected, then:	
. Panels	-			1. List separately	
. Chord reinforcing	(H				
3. Sag (Table 9.4)					
. Left side	mm				
. Right side	mm				
. Limit (Table 9.4)	mm				
4. Deck units					
. Damage					
. Seating	-				
5. Bracing, Sway					
. In place					
. Distortion	mm				
6. Bracing, End					
. In place					

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TABLE 9.3 (cont'd)

6-MONTHLY INSPECTION REPORT

Item	Measurement	Clear (✓)	Fault Details
7. Straightness of		. /	
Top chord			
Left side	mm		
Right Side	mm		
Limit Span/300	mm		
8. Transoms			
. Straightness			
(25mm limit)	mm		
. Clamps	-		
. Seating			
9. Bearing levels			
(Paragraph 10.1.08)			
Left Home	m		
Right Home	m	8 4 8	-
Difference (40 mm max.)	mm		
Left Far	m	3 8	-
Right Far	m	-	
Difference (40 mm max.)	mm		
10 Bearing Base Plate Slope			
(Paragraph 10.1.08)			
I ongitudinal Slone			
Max = 1 in 20			
-55mm diff in			
1100mm length			
Left Home difference	mm		
Right Home difference	mm		
Left For difference	mm		
Right Far difference	mm		
Lateral Slope	111111		
$M_{av} = 1 \text{ in } 100$			
= 15 mm diff in			
= 13mm unit. m 1500mm width			
I JUUIIIII WIUII Laft Llama difference	122.122		
Lett Home difference	mm		
Kight Home difference	mm		
5 Lett Far difference	mm		
Right Far difference	mm		

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STAFF REPORTS - INFRASTRUCTURE SERVICES

TABLE 9.3 (cont'd)

6-MONTHLY INSPECTION REPORT

		Measurement	Clear (✔)	Fault Details
11. C And C	Galvanised Coating			
(Chapt . Dama . Corrc	er 11) ge sion			
(loss o 10.2.03	f section 3)	mm		
IOTES	:			
	A monthly inspection	report is to be filed i	in addition (to this form.
	Where the span is cle (\checkmark) .	ar of faults in any pa	rticular iterr	n, indicate with a tick
	Where more than one list to this report.	fault is noted under	any item, th	en attach a separate
	Any distortion or sag does not constitute a f	or out of level, etc., v ault and the "Clear"	within the sp column sho	pecified tolerances ould be marked (\checkmark).
,	Cracks in pin plates c	an only be inspected	where acce	ssible. Full inspection

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TABLE 9.4

SAG LIMITS

SPAN	MAXIMUM SAG	
	050	
50 m	350 mm	
45 m	270 mm	
40 m	220 mm	
35 m	150 mm	
30 m	110 mm	
25 m	80 mm	
20 m	50 mm	

NOTES:

1. Sag measured at mid-span.

2. Sag is to be measured each side on the top of the transom, hard against the inner truss. (Check that the transom is seating hard on the panel).

3. Sag is measured as the distance below the line joining the top flanges of the end transoms.

CHAPTER 10

PANEL TEST PROCEDURE

10.1 GENERAL

10.1.01. The following section describes specific detailed inspection and testing of panels which is to be carried out as part of the Five Yearly Inspection. Three tests involved:

Test 1	Visual
Test 2	Dimensional (Gauging)
Test 3	Strength (Panel Testing)

1.1.02. The panel is the main load carrying element of the system and hence the concentration on the inspection and testing of this component. These principles are to be applied where relevant to other components.

Corrosion Areas

10.1.03. Corrosion to be instigated due to a breakdown of the galvanising system resulting from damage, mis-use, severed environment, the passage of time or a combination of these causes.

10.1.04. The more susceptible areas for corrosion of a panel are indicated on Figure 10.1. This does not preclude the possibility of corrosion adversely affecting other parts of the panel, or other components, and inspection must be fully comprehensive.

Cleaning

10.1.05. To inspect for corrosion, all dirt, paint or other coating and the products of corrosion should first be removed back to bright metal.

10.1.06. A stainless steel brush should be employed when necessary. Care is to be taken to remove and not burnish the products of corrosion. A pointed tool may be required.

Measurement of Loss of Section

10.1.07. The effective size of channels used in chord construction is shown at Figure 10.2. Accurate measurement will be difficult because of the uneven surface, but the measurement will confirm the evidence of the visual assessment. Mark the chord on the inside face to indicate the centre position where the loss of section is greatest. The measurement may be taken with callipers or more usually with a micrometer preferably fitted with a pointed anvil and shaft. Take at least three readings at points along the centre position.



Cracks in Pin Plates

10.1.08. Some panels and chord reinforcement were found to have a fine crack in the inside face of the male pin plate. These cracks are illustrated in Figure 10.3. It was established by an extensive testing programme conducted at the University of Sydney, School of Civil and Minding Engineering that these particular cracks which are the result of weld restraint during manufacture and not the result of loading, do not detract from the performance of the panel. The panels which exhibit these cracks were accepted by way of a concession.

10.1.09. Should a crack of this particular form be detected during the examination it should be noted but no action is otherwise required, other than to monitor the crack.

Fatigue cracks

10.1.10. Detection of cracks, particularly of fatigue origin, is of prime importance. A careful search is to be made of all parts of a panel but concentrating in or near (within 10 mm) of welds in joints and in pin plates around the pin hole. Special attention should be given to tension (bottom) chords of panels and all chord reinforcement.

10.1.11. Visual inspection should be aided by the use of dye penetrant or magnetic particle methods.

10.1.12. A crack, other than the particular type described in Paragraph 1008 above, which exceeds:

- 8 mm in length in the pin plates around the pin hole or
- 15 mm in length in the bottom chord or diagonal member including associated plates;
- 30 mm in length in the top chord,

will cause a panel to be classified UR.

10.2 TEST 1, VISUAL INSPECTION

10.2.01. All panels are to be subjected to a thorough examination to determine the extent if any of corrosion, cracking, warping or damage.

10.2.02. Inspect for cracking in accordance with Paragraphs 510, 511 and Paragraph 512 above.

10.2.03. Inspect for corrosion, and if any is detected, check for loss of section as described in 10.1.07 above. The maximum loss of section on any member of the panel is 10% of the area at any cross-section. Any corrosion in excess of this will cause the panel to be classified UR.

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10.2.04. Inspect for distortion or damage making use of straight edges, string lines and steel measuring tapes. Visible distortion in excess of the damage limits set down in Table 10.1 will render the panel UR. Where distortion is detected, but is less than the limits set down, it shall be repaired in accordance with Chapter 6.

10.2.05. Inspect for burred or otherwise distorted pin holes and repair before applying pin hole test.

10.3 TEST 2, DIMENSIONAL CHECK

10.3.01. All panels which pass Test 1 are to be subjected to gauging examinations.

- a) Oversize or elongation of pinholes
- b) Distances between pinholes

10.3.02. All holes must be checked and passed for diameter before centre to centre distance is tolerated. Some hole elongation is permitted in the pin holes which have been in service.

10.3.03. The gauges which are to be used in the dimensional testing are:

- a) Pin Hole Tester PHT
- b) Gauging Beam GB

Examination

10.3.04. The examination of the panels is to be carried out as follows:

Pin Hole Tester (PHT)

10.3.05. This device is used to check for under or oversize, or elongation of pin holes in the standard panel PS, chord reinforcement components CRS, CRL, CRTF, CRTM and CRE and the end post UEP. It is a "go – no go" device, comprising a circular shaft onto which are filled two longitudinal ribs, diametrically opposite and over half (1/2) the length.

10.3.06. The device is to be inserted into the panel pin hole and from both sides. If the first half of the shaft passes completely through the pin hole then that pin hole is not undersize. Failure of this part of the test may be caused by localised burring of the edges of the hole. All edges of all holes are to be checked for such burring and if found, remedial action is to be taken as described in Chapter 11. The device is further inserted until the ends of the ribs meet the hole. If the ribbed section of the pin passes completely onto the hole then that hole is oversize or elongated, and the component is to be rejected. The gauge is to be tried first with the ribs oriented in the longitudinal direction of the panel then transversely to it.

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TABLE 10.1

MAXIMUM DISTORTION OR DAMAGE LIMITS

Item		Limit (Out of Straight)
1.	Overall transverse bending of chords in 5 m	120 mm
2.	Transverse bending or kinking of individual channels between batten plates	25 mm
3.	Overall vertical bending of chords	50 mm
4.	Bending or kinking of diagonals and verticals (any direction)	50 mm
5.	Lateral bending of flange or twist of section of transom which cannot be straightened by normal pressure	200 mm
6.	Bending or kinking of any member	Length/40 or 50 mm max.

Notes:

- 1. Damage exceeding the above limits automatically renders the panel or component UR (UnRepairable) and it is to be replaced.
- 2. Any lesser damage is to be repaired.
- 3. Any panel or component which has been straightened or repaired must be subject to dimensional check and testing prior to re-use.

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Gauging Beam (GB)

10.3.07. The gauging beam is used to check for correct longitudinal, vertical and diagonal hole centres of a standard panel. The gauging beam test is to be performed after ascertaining by the pin hole test that no panel pin holes are either under or oversized or elongated.

10.3.08. At one end of the beam is the reference pin, which protrudes from both sides of the beam. Three other pins are set out at 2150 mm (vertical), 5000 mm (longitudinal) and 5443 mm (diagonal) from the reference pin.

10.3.09. Ideally the panel to be checked is laid flat on trestles at a convenient height. The gauging beam is lowered carefully from above, first fitting the reference pin in one hole, then attempting to fit the appropriate other pin in the second hole. If both pins fit in their holes without the application of any force then that hole spacing is within tolerance. For each panel the full complement of checks is to be made, i.e.:

1.	Longitudinal centres	-	top chord
2.	Longitudinal centres	-	bottom chord
3.	Vertical centres	-	male end
4.	Vertical centres	-	female end
5.	Diagonal centres	÷	male top to female bottom
6.	Diagonal centres	-	female top to male bottom

10.3.10. The order of checking is not important. If the panel fails any of the above six gauging tests it is to be classified UR.

10.3.11. The pins have a slightly rounded leading edge to facilitate location and insertion. No attempt must ever be made to force any pin into a hole as this invalidates the test and may damage the pins or beam. The surface of the pin is to be oiled lightly and all care must be taken to avoid denting or bruising the pin surface.

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CHAPTER 11

COMPONENT REPAIRS

11.1 CLASS OF REPAIR

11.1.01. Two classes of repair apply to panels or other components which have been classified as repairable:

- A. **Minor Repair** which can be carried out in the field or in an approved workshop.
- B. Major Repair to be carried out at approved workshop.

11.2 MINOR REPAIRS

11.2.01. Minor repairs may be carried out on components in place or in the store, where the component or panel member has been bent or twisted or warped or otherwise damaged, but to an extent such that the strength is not impaired by more than 10%. These instances include:

- Panel members bent (but not kinked) out of straight by not more than length/200
- Other main components such as chord reinforcing and transoms bent by up to length/200 or twisted.
- Minor members such as bracing, or ramp members, bent (but not kinked) by up to length/100, or twisted.
- Cleats for bracing connections bent not more than outstand/10.
- Deck units dented or kinked.

11.2.02. Members may be straightened by heating and hammering or jacking with strong backs. The heating shall be controlled such that the metal temperature does not exceed 500°C. Heat shall not be applied to bottom (tension) chord of panels or reinforcement under load, i.e. forming part of a bridge must be closed to all traffic. Where a tension member is involved, a part of equal section is to be fixed with U bolts to splice across the affected zone. Where the air temperature is less than 10°C, the rate of cooling is to be slowed by the periodic application of heat.

11.2.03. Dents or kinks in secondary members such as cleats, bracing, deck units, roller frames etc., should be repaired by hammering or cutting out and welding in new sections. The plate or section to be welded in shall be of equal cross section and material to that cut out and shall be aligned and flush with the part being repaired. Edges shall be cut square and prepared for qualified full

strength butt welds. Backing plates or sleeves may be used. Welding, including preparation shall comply with AS 1554. Welding electrodes shall be selected in accordance with AS 1553.

11.2.04. Any cracking of minor welds associated with damage as described above shall be made good by gouging and grinding out to the depth of the crack and rewelding.

11.2.05. No welding of pin plates, or other components manufactured from Bisalloy 80 or stainless steels shall be permitted. Work on these elements is to be carried out at an approved Workshop.

11.3 MAJOR REPAIRS

11.3.01. Any damage or deterioration beyond the limits described in 1002 shall necessitate the return of the component to an Approved Workshop for assessment and specialised repair if appropriate.

11.4 BEARINGS

11.4.01. Where it is found by survey that the bearing base plates are out of level by more than the following limits.

Level of 2 bearings At one end of span	40 mm
Longitudinal slope of base plate	1 in 20
Lateral slope of base plate	1 in 100

then the base plate shall be raised by wedging into the correct position and the space under packed with dry cement grout. The weight of the span shall be removed from the bearing by jacking under the 2 or 3 lines of panels forming the trusses.

CHAPTER 12

CORROSION PROTECTION SYSTEM

12.1 MAINTENANCE

12.1.01. In all instances corrosion will be inhibited by maintaining the protective surface coatings in good condition. It is essential that components remain clean and dry in storage, and are to be washed down with fresh water after use in order to remove mud and salt encrustations. Pockets of entrapped water are to be dried out and components are to be stored above ground on seasoned wooden dunnage.

12.1.02. Storage of galvanised surfaces in contact with cinders, unseasoned timber, mud or clay is to be avoided since such contact will lead to surface staining and in severe cases, premature corrosion. Clearance for ventilation between stacked components is necessary under damp and humid conditions to avoid the possibility of wet storage stain and the development of bulky white corrosion product.

12.2 THE SYSTEM

12.2.01. The corrosion protection system is comprised of a metallurgically bonded zinc coating applied by the hot dip galvanising process in accordance with AS1509. Minor scratches to the galvanised surface will be "self-healing" and are of no consequence. Panel pins are manufactured from stainless steel and have not been hot dip galvanised.

12.2.02. Should the coating deteriorate for any reason, or be affected by damage or subsequent repair to a component, then the surface should be prepared and painted in accordance with paragraphs 10.1.05 and 10.1.06.

12.3 SURFACE PREPARATION

12.3.01. Areas of degradation or exposure should be cleaned with a stiff bristle brush to bare steel. A cold chisel or hammer may be used to remove weld slag at repairs. Heavy areas of white corrosion build up can be removed by brushing with a five percent solution of sodium or potassium dichromate with the addition of 0.1 percent of volume of concentrated sulphuric acid. This is applied with a stiff brush and left for about 30 seconds before thoroughly rinsing and drying.

CAUTION

Sulphuric acid is a strong acid solution. Avoid contact with skin and eyes. Eye protection and gloves are to be worn. If contact occurs wash with copious quantities of water and seek medical attention.

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12.3.02. If the area is too large to clean back, or if it is impractical to do so, with a stiff bristle brush then the area should be cleaned back to bare steel by abrasive blasting in accordance with AS 1627 Part 4 Class 2.5.

12.3.03. A temperature should be manufactured to a shape that extends 10 mm beyond the repair to ensure overlapping onto the surrounding galvanised surface.

12.4 PAINT TREATMENT

12.4.01. The paint used in patch and total repaints is to be an inorganic zinc silicate. Mixing and handling is to be in accordance with the manufacturer's instructions.

12.4.02. The paint should be applied within two hours of blast cleaning by brushing or airless spray. An even coating of dry film thickness of between 70 and 120 microns is required. Two coats by brushing and three by spray will give a total paint film thickness of approximately 100 microns.

CHAPTER 13

SERVICE OF MECHANICAL EQUIPMENT

13.1 GENERAL

13.1.01. Mechanical equipment supplied with the bridging system comprises the proprietary tools and equipment and main and construction rollers used in the erection and launching of the spans.

13.2 PROPRIETARY ITEMS

13.2.01. The items of manufactured proprietary items or equipment for use during assembly and erection include:

- Jack Pump Air
- Jack Cylinders (JC1)
- 50t Hydraulic Bottle Jack
- Impact Wrench

13.2.02. These items shall be inspected for damage and serviced at the conclusion of each bridge erection, and at such intervals as nominated by the manufacturer.

13.2.03. Servicing shall be in accordance with the particular manufacturer's instructions.

13.3 ROLLERS

13.3.01. The main and construction roller assemblies comprise machined steel cylinders in fabricated frames, used in the launching process. Each main roller assembly incorporates jacks for purposes of adjusting the level. The rollers are illustrated in Figures 8.1 and 8.2 in exploded view.

13.3.02. When returned to store at the conclusion of each bridging erection, and at yearly intervals when in store, the roller assemblies shall be stripped down to the component parts, cleaned with spirit of all dirt or grease and inspected for wear or damage.

13.3.03. Minor damage involving dents and bends (but not kinks) to plate steel elements shall be repaired as described in Chapters 11 and 12. Major damage shall cause the component to be replaced. Any burrs or ridges on the rollers shall be ground smooth. All hinge pins, clevis plates, bearing brushes and lateral guide rollers showing excessive wear shall be replaced. Finally the roller contact surfaces shall be coated with high pressure molybdenum disulphide grease, and the roller assemblies rebuilt using new split pins and placed in store.

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Fig 13.1 Main Roller Assembly

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APPENDIX A – QUANTITIES

TABLE A1 PARTS IN PRINCIPAL SPANS (INCLUDES FOR 2.5M RAMP)

						No. RI	eq'd II	N SPAI	N I	
PART		Part No.	WEIGHT (Kg)	20M	25M	30M	35M	40M	45M	50M
1	Standard Panel	PS	840	16	20	24	28	32	54	60
2	Transom Clamp Middle	TCM	39	16	20	24	28	32	54	60
3	Transom Clamp Joint	TCJ	6	12	16	20	24	28	32	36
4	Transom Clamp End Post	TCE	6	8	8	8	8	8	8	8
5	Chord Reinforcement Long	SCL	416	0	0	16	16	24	36	48
6	Chord Reinforcement Short	CRS	221	0	0	0	8	0	12	0
7	Chord Reinf, Taper Female	CRTF	50	0	0	4	2	0	0	0
8	Chord Reinf, Taper Male	CRTM	52	0	0	4	4	4	6	6
9	Standard Transom	TS	1038	5	7	9	11	13	15	17
10	End Transform	TE	1318	4	4	4	4	4	4	4
11	Raker Brace	B1	28	6	8	10	12	14	16	18
12	Cross Brace	B2	10	6	8	10	12	14	16	18
13	Sway Brace	B3	81	16	20	24	28	32	36	40
14	End Bay Brace	B4	51	8	8	8	8	8	8	8
15	Deck Unit Standard	DU	575	20	24	28	32	36	40	44
16	Deck Unit Kerb	DUK	620	20	24	28	32	36	40	44
17	Universal Endpost	UEP	915	4	4	4	4	4	4	4
18	Bridge Bearing	BB1	155	4	4	4	4	4	4	4
19	Bearing Base Plate	BB2	362	4	4	4	4	4	4	4
20	Panel Pin Headed	PPH	5.4	40	48	72	84	92	108	116
21	Panel Pin Non-Headed	PPN	6.0	0	0	0	0	0	54	58
22	Brace Pin Long	BPL	1.5	44	56	68	80	92	156	174
23	Brace Pin Short	BPS	1.2	40	48	56	64	72	80	88
24	Safety Clip Large	SCL	0.1	40	48	72	84	92	216	232
25	Safety Clip Small	SCS		138	168	198	222	258	340	376
26	Chord Reinforcement Bolt	BC2	0.2	0	0	136	164	196	342	390
27	Ramp Ledger	BL	190	2	2	2	2	2	2	2

TABLE A2PARTS IN LAUNCHING NOSES

No. REQUIRED I	A LAUNCHING NOSE
----------------	------------------

PART		Part No.	WEIGHT (Kg)	4-BAY	5-BAY	6-BAY	7-BAY	8-BAY
1	Standard Panel	PS	840	8	10	14	16	20
2	Transom Clamp Middle	TCM	39	8	10	14	16	20
3	Transom Clamp Joint	TCJ	6	8	10	14	16	20
4	Transom Clamp End Post	TCE	6	2	2	4	4	4
5	Chord Reinforcement Long	SCL	416	0	0	0	0	0
6	Chord Reinforcement Short	CRS	221	0	12	24	28	36
7	Chord Reinforcement Taper Female	CRTF	50	0	2	2	2	2
8	Chord Reinforcement End Post	CRE	40	0	44	8	8	8
9	Standard Transform	TS	1038	5	6	7	8	9
10	Transom Seating Plan	TSP	6	4	4	6	6	6
11	Raker Brace	B1	28	8	10	12	14	16
12	Cross Brace	B2	10	0	0	2	2	4
13	Sway Brace	B3	81	16	20	24	28	32
14	Sway Brace Junction	SBJ	9	4	5	6	7	8
15	Launching Link	LL	125	2	2	2	2	2
16	Panel Pin Headed	PPH	5.4	20	42	62	70	78
17	Panel Pin Non-Headed	PPN	6.0	0	0	4	4	4
18	Brace Pin Long	BPL	1.5	24	30	42	48	60
19	Brace Pin Short	BPS	1.2	18	22	32	36	44
20	Safety Clip Large	SCL	0.1	20	42	74	78	86
21	Safety Clip Small	SCS	9 4 5	82	102	134	154	184
22	Chord Reinforcement Bolts	BC2	0.2	0	50	98	114	148

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TABLE A3.1

MAIN SPAN MODULE (MSM)

ITEM NO.	PART	PART NO.	QTY
1	Standard Panel	PS	4
2	Transom Clamp Middle	TCM	4
3	Transom Clamp Joint	TCJ	4
4	Standard Transom	TS	2
5	Raker Brace	B1	2
6	Cross Brace	B2	2
7	Sway Brace	B3	4
8	Deck Unit Standard	DU	4
9	Deck Unit Kerb	DUK	4
10	Panel Pin Headed	PPH	8
11	Brace Pin Long	BPL	12
12	Brace Pin Short	BPS	8
13	Safety Clip Large	SCL	8
14	Safety Clip Small	SCS	30

TABLE A3.2

END OF BRIDGE MODULE (EBM)

ITEM	PART	PART NO.	QTY	
NU.	Turner Claure Fred Deet	TOE	0	
1	Transom Clamp End Post	TCE	8	
2	End Transform	TE	4	
3	End Bay Brace	B4	8	
4	Universal End Post	UEP	4	
5	Bridge Bearing	BB1	4	
6	Bearing Base Plate	BB2	4	
7	Standard Panel	PS	8	
8	Transom Clamp Middle	TCM	8	
9	Transom Clamp Joint	TCJ	4	
10	Standard Transom	TS	1	
11	Raker Brace	B1	2	
12	Sway Brace	B3	8	
13	Deck Unit Standard	DU	12	
14	Deck Unit Kerb	DUK	12	
15	Panel Pin Headed	PPH	24	
16	Brace Pin Long	BPL	20	
17	Brace Pin Short	BPS	24	
18	Safety Clip Large	SCL	24	
19	Safety Clip Small	SCS	78	
20	Cross Brace	B2	2	
21	Ramp Ledger	RL	2	
22	Chord Reinforcement Bolt	BC2	10	

STAFF REPORTS - INFRASTRUCTURE SERVICES

TABLE A3.3

LAUNCHING NOSE MODULE (LNM)

ITEM NO.	PART	PART NO.	QTY
1	Standard Panel	PS	8
2	Transom Clamp Middle	TCM	8
3	Transom Clamp Joint	TCJ	8
4	Transom Clamp End Post	TCE	4
5	Standard Transom	TS	5
6	Transom Seating Plate	TSP	4
7	Raker Brace	B1	8
8	Sway Brace	B3	16
9	Sway Brace Junction	SBJ	4
10	Launching Link	LL	2
11	Panel Pin Headed	PPH	20
12	Brace Pin Long	BPL	24
13	Brace Pin Short	BPS	18
14	Safety Clip Large	SCL	20
15	Safety Clip Small	SCS	82

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B.1 PROCESS

1. The Design Traffic Load for the span will be specified.





2. Determine the maximum impact factor to be applied to live loads from maximum crossing speed of design vehicles.

Speed	Impact Factor Ci
<5 kph	1.05
5 kmh to 35 kmh	1.15
25 kph and over	1.25

3. Determine proportion of live load to one side of span C





Proportion of load to one side (heaviest) Cec = a/8.8

4. Calculate the Maximum Bending Moment (applied to one side)

Locate the vehicle at the position of maximum moment, as illustrated in Figure B3, and determine the maximum live load bending moment for the design vehicle, M v max. (using simple beam theory)

Note: The load position for maximum moment is where the centerline of the span bisects the distance between the centre of gravity of all axle loads on the span and the adjacent heaviest axle load. This is the Bisection Criterion.

Apply factors for impact (Ci) and eccentricity (Cec) to determine the maximum live load design bending moment (MLL) applied to one side of the span.

MLL = Mvmax x C1 x Cec





5. Calculate the Maximum End Shear (applied to one side)

Place the heaviest end axle load adjacent a support and determine the maximum support reaction

(= maximum Live Load shear for the design vehicle, Vvmax) using simple beam theory.

)



Apply factors for impact (Ci) and eccentricity (Cec) to determine the maximum live load design shear force (VLL) applied to one side of the span.

VLL = Vvmax x C1 x Cec

5. Enter Tables B1 and B2 with MLL and VLL and select the required construction. Normally the lightest construction having sufficient capacity in both shear and bending will be chosen. Shear strength most often governs for short spans and bending moment for long spans.

		BENDING MOM	IENT (kN.m)	
SPAN	DS	DSR	TS	TSR
(m)				
20	3760	7530	5820	11510
25	3460	7180	5470	11080
30	3090	6750	5040	10560
35	2650	6240	4530	9950
40	2140	5660	3940	9250
45	1570	4990	3270	8450
50	940	4250	2530	7560
55	240	3440	1710	6580
60	0	2540	810	550
65	0	1570	0	4330
70	0	520	0	3070

Table B1: Bending Moment Available for Live Load (Per Side)

APPENDIX C

DESIGN FOR CONSTRUCTION

C1 INTRODUCTION

C.1.01 Design for construction is carried out after the span and the construction type have been selected (Appendix B) and involves the selection of a launching nose and decking as counterweight, and the division of main span construction into stages based on the stability of the structure and site conditions.

C.1.02 If the span is one of the principal pans, and the space available behind the home bank roller is adequate (refer to Figures 4.1 and 4.2) then design for construction is **not required.** Launching nose and construction staging is fully specified in this Handbook for such spans. Refer Figures 3.6a and 3.6b

C.1.03 Figure C1, the Design Flow Chart, gives an overview of the process of bridge design including design for construction.

C.1.04 Sub-section C2 below outlines the principles of design for construction, and Sub-section C3 gives a step-by-step Design Sequence including worked examples. Sub-section C4 contains example calculations for centre of gravity.

C.1.05 Throughout this section, particular positions in the length of the span/launching nose structure (or part) are denoted thus:

xPPy

where:

x - is the panel number starting at 1 for the leading panel of the launching nose.

y - is the panel point number within that particular panel. Refer to figure C13 for panel point notation.

e.g. 6PP3 denotes the position at panel point 3 in the 6^{th} panel from the front of the launching nose.

C2 PRINCIPLES OF DESIGN FOR CONSTRUCTION

C.2.01 Design for construction is divided into three phases. **Phase 1** is the selection of a launching nose and amount of decking as counterweight, **Phase 2** is the division of main span construction into a number of stages and **Phase 3** is the checking of bending moment and loads at the rollers.

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4.3 - ATTACHMENT 1

Phase 1 Launching Nose and Counterweight Selection

Selection Criterion

C.2.02 The centre of gravity of the partly decked span and launching nose must not reach the main home bank rollers until the tip of the launching nose has passed the far bank rollers by more than 2 m.



Fig C2

C.2.03 With the distance between main rollers of (Spa L - 2.6 m) this will be so if the centre of gravity of the complete structure with counterweight is more than (Span L - 0.6m) from the front end.

C.2.04 The launching nose is to be selected from the range of standard noses listed in Table C1. Initial estimates of launching nose length and extent of decking as counterweight are adjusted until the above criterion is met.

C.2.05 With the launching nose length selected, the roller layout can be determined from the table in Figure 4.2

Phase 2 Staged Construction Design (Refer also 9.2)

C.2.06 This design involves the selection of the number of bays of the main span to be added in each construction sage and the determination of the permissible booming distance after each stage. The Design Criterion is that the structure must not overturn either backwards of forwards during construction or booming. This will be satisfied, provided the centre of gravity remains between the main and rear home bank rollers until the launching nose tip passes the far bank rollers.





C.2.07 For additional safety the centre of gravity should never be allowed to come within 1 panel point (approx. 1.0 m) of the rollers.

C.2.08 Availability if space on the home bank may further restrict construction stage length.

Phase 3 Roller Effects

C.2.09 At the various construction stages and for the complete span the loads on the roller drums and the bending moments in the panels must be calculated and checked against permissible limits.

C.02.10 Just before the span lands on the far bank rollers (point of balance) the whole weight of the structure is taken by the main home bank rollers. It is at this point that loads on roller drums and local bending of panel chords are most severe. Refer to Figure C4 (i).

C.2.11 Other potential critical points are when the rear most SS, SSR and DSR bays of the launching nose are bearing on the far bank Rollers. Refer to Figure C4 (ii).

C.2.12 To check roller effects the bending moment and roller reaction to each line of parcels are calculated at the points of interest. The graph in Figure C5 is then used to determine whether each combination of bending moment and roller load is within the permissible limits.



C3 STEP BY STEP GUIDE TO DESIGN

BRIDGE DESIGN (*C of G denotes Centre of Gravity)

- Step 1 Determine required bridge span, taking into account slope stability, ground bearing pressure, etc. (Refer to Section 3)
- Step 2 Calculate the required configuration (DS/DSR/TS/TSR) based on MLC or Design traffic Load. Refer to Appendix B or Table 3.1

DESIGN FOR CONSTRUCTION

Phase 1

- Step 3 Select trial launching nose length (use Table 3.2 in Section 3 as a guide) and length of decking to be placed at rear of complete span to act as counterweight.
- Step 4 Determine the C of G of this structure including part decking. (Refer to Appendix C4 for method of calculation of C of G).
- Step 5 Check whether C of G is least Span L 0.6 m from tip of launching nose. If not repeat steps 3 and 4 with new trials. If this criterion is easily satisfied, a shorter launching nose or length of decking may be possible.

PHASE 2

- Step 6 Determine the total space available for construction on the home bank then calculate the distance X on Figure 4.1 based on the lay out of rollers for chosen launching nose (Figure 4.2) and length of push vehicles.
- Step 7 Calculate the maximum number of bays that can be added in any stage as **governed by available construction space.**

Max. No of Bays = (X - 1 m) divided by 5

- Step 8 Select a trial number of bays to be added in the first construction stage using Figures 3.6a and 3.6b as a guide and within the limit calculated in Step 7. Determine the centre of gravity of the partial structure (Calculation method in C4).
- Step 9 Check that the C of G of this partial structure lies forward of the rear home bank rollers by at least 1 panel point. If possible, increase number of bays to be added while still satisfying the criteria (i.e. repeat Steps 8 and 9). Note down the number of bays on the design calculation sheet, specifying which if any are decked.
- Step 10 Determine the booming distance for this stage. Booming must cease when the C of G is panel point (1.2 m) behind the main home bank rollers **OR** the OverHang behind the Rear roller (OHR) reduces to 1 panel point. Note down the OHR at completion of booming of this stage on the design calculation sheet.

Repeat Steps 8, 9 and 10 for subsequent construction stages.

PHASE 3

Roller effects are to be checked at a number of different situations during Launching. In each case the steps are as follows:



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\cap						
\cap	Step 11 Deter	mine the total bending moment and load to rollers at the point of				
\cap	interest	interest				
\cap	using s	simple beam theory and the weight data in Table C2.				
0	Step 12 Calcu	late the load from and bending moment in a single line of panels				
	dividir	ng the above by the number of lines of panels applying load or				
~	taking	a moment				
n in the second s	Denum	g moment.				
2	Step 13 Using	Fig. C5 check that the combination of moment and roller load				
<u><u></u></u>	(leaction) is below	and to the left of the limit lines for reinforced or unreinforced				
\cap	constru	uction as applicable.				
<u>0</u>	EXAMPLE (CALCULATION FOR STEPS 8, 9 AND 10				
5	Refer to C4 fo	r Configuration Nomenclature				
)	CASE :	Span = 55 m (11 bays)				
\bigcirc						
)	:	TSR Construction				
)	:	Launching Nose = 7 bays (35.4 m)				
)	:	Counterweight Decking = $6 \text{ bays} = 30 \text{ m}$				
Ď						
- 3	STAGE 1 CC	DNSTRUCTION				
0	Step 8 *	Try adding 4 bays (none decked)				
5	*	i.e. Configuration 3.TSR 1.TS EPJ 7bay LN				
0	*	Centre of Gravity at 35.2 m (7PP4)				
т.)						
0	Step 9 *	Maximum permissible C of G distance (refer Figure C6)				
0						
U,	=	Total length previous stage – (OHR Previous Stage) – 1.2				
	=	35.4 - 0.5 - 1.2				
0	=	33.7				
2	*	35.2 > 33.7 Too many bays added Reduce to 3 Repeat				
5		Reduce to 5, Report				
0	Step 8 * REPEAT	Try Configuration 2.TSR 1.TS EPJ 7 bay LN				
3	*	Centre of Gravity of 32.3 (7PP2)				
119	Page					
U.						
0						



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	= - 4.27	
	* Cai	a't boom this far.
	IVIU	st stop when $OHR = 1.2 \text{ m}$
0		
0	STAGE 2 C	ONSTRUCTION
	Step 8 *	Try adding 4 bays (2 decked + 2 undecked)
)	*	i e Configuration
		2.TSR(D) 4.TSE 1.TS EPJ 7 bay LN
$\widehat{}$		
\odot	*	Centre of Gravity at 45.3 m (9PP5)
Ô.	Star 0 *	Maximum Derminsible C of C distance
A	Step 9	Maximum Permissible C of G distance
3	=	50.83 - 1.2 - 1.2
-		
	=	48.43
-)	*	45.3 - 48.3 Okay to add 4 bays
)		45.5 < 46.5 Okay to add 4 bays
)	Step 10 *	Calculate OHR if C of G is 1.2 m behind main rollers
)		
)		OHR = 70.83 - 45.3 + 1.2 - 24 - 2.73 (Greater than 1.2)
)		= 2.73 (Greater than 1.2)
)	*	Booming must stop when $OHR = 2.7 \text{ m}$
		(approx. 2PPs)
	STACE 3 C	ONSTRUCTION
	BIAGE 5 C	
)	-	Repeat as above trying to add remaining 4 bays.
\bigcirc	C4 CEN	THE OF CHANTER (C of C) CALCULATION
\bigcirc	C4 CEN	TRE OF GRAVITT (C of G) CALCULATION
\bigcirc	Configuratio	n Nomenclature
\bigcirc	U	
	Example	Meaning
$\overline{\mathbf{O}}$	5 bay LN	: Standard Launching nose 5 bays long
0	3.DSK	: 3 Days of Double Single Kennorced
\mathcal{O}	2.TS(D)	: 2 bays of Triple Single with Decking
\bigcirc	EPJ	: End Post at Junction of MS and LN
\odot	EPT	: End Post at tail end of Structure
Ċ	(E)	: End Bay.
.)		
)		
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5		

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C4.1 Example – Launching Nose and Part Scan – No Decking d = 48.33



Fig (28
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Configuration 3.TSR 1.TS(E) EPJ 7 bayLN

UNIT	WEIGHT W	DISTANCE (d)	WXd
7bayLN	= 32.6	= 21.5	701
EPJ	= 3.43	35.4 + 0.43/2 = 35.6	122
1.TS(E)	1 x 8.72 = 8.72	35.4 + 0.43+2.5 = 38.33	334
3.TSR	3 x 10.69 = 32.07	35.4 + .43 +5 +7.5 = 48.33	1550

 $\sum W = 76.82$

 $\sum W x d = 2707$

Centre of Gravity is at 2707 / 76.82 = 35.2 m (7PP4)

(Note that the end bay is taken as unreinforced. Temporary reinforcement to this bay has been included as part of the launching nose weight).



C4.1 Example 2 Launching Nose + Part Span – Partial Decking



Configuration 2.DSR(D) + 1 DS(E) + EPJ + 4 bay LN

UNIT	WEIGHT W	DISTANCE (d)	WXd
4bayLN	= 14.0	= 9.8	137
EPJ	= 3.43	20.4 + 0.43/2 = 20.6	71
1.DS(E)	$1 \ge 6.89 = 6.89$	20.4 + 0.43 + 2.5 = 23.36	161
2.DSR(D)	2 x (7.98 + 4.85)	20.4 + 0.43 + 5 + 5 = 30.83	791
	= 25.66		

 $\Sigma W = 49.98$

 $\sum W \ge d = 1160$

Centre of Gravity is at 1160 / 49.98 = 23.2 m (5PP3)

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C4.3 Whole Span with Part Deck – Simple Method

Configuration 50 m MS TSR +7 bay LN

UNIT	WEIGHT W	DISTANCE (d)	WXd
7bayLN	= 32.6	21.5	701
50 m TSR ¹	= 109	35.4 + 43 + 50/2 = 60.83	6630
4 bay	4 x 4.85 = 19.4	35.4 + 43 + 40 = 75.83	1471
Decking			
Decking			

8802

Centre of Gravity is at 8802 /161 = 54.67 (11PP3)

 $\sum W = 161$

¹ Refer upper section of Table C2 for weight of whole undecked spans of various construction.

 $\sum W x d =$

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TABLE C1: STANDARD LAUNCHING NOSES

LENCTH		CONFICUEATION	TOTAL	CENTRE OF	
LENGIN		CONFIGURATION	WEIGHT	GRAVITY	
bays	m		(t)	(m)	
4	20	4SS	14.0	9.8	
5	25	4SS, 1SSR	20.3	14.4	
6	30	4SS, 1SSR, 1DSR	28.4	18.8	
7	35	4SS, 2SSR, 1DSR	32.6	21.5	
8	40	4SS, 2SSR, 2DSR	39.6	24.8	



Typical Launching Nose

Fig C11

Note: Reinforcing where fitted only for launching is included in weight of nose.

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TABLE C2: WEIGHT OF BRIDGING (tones)									
	P1			Main	Span		La	unching	Nose
	Element		DS	DSR	TS	TSR	SS	SSR	DSR
	Span (m)	20	32.5	36.0	39.9	45.1			
		25	38.8	44.0	47.9	55.8			
		30	45.0	52.0	56.0	66.5			
E E E		35	51.2	60.0	64.0	77.2			
ght eck		40	57.4	68.0	72.0	87.9			
Vei		45	63.6	76.0	80.1	98.6		•	
חר		50	69.9	84.0	88.2	109.3			
ots		55	76.1	91.9	96.2	120.0			
		60	82.3	99.9	104.3	130.7			
		65	88.5	107.9	112.3	141.3			
		70	94.7	115.9	120.4	152.0			
Weight per Bay (t)	Undecked Bay INTERNAL		6.22	7.98	8.05	10.69	2.20	4.01	6.00
	Undecked Bay End		6.89	(8.75) ²	8.72	(11.85) 2	3.28	4.21	6.99
	DECKING		4.85						
Total Weight (t)	End Post TRAILING END		2.88					•	
	End Post JUNCTION TO LN			3.4	3		-		
	Launching Link			•				0.28	

Foot Notes 1. Total weight (undecked span) include for one end post-trailing end and one endpost-junction. For DSR and TSR the two bays are taken as unreinforced.

2. Bracketed numbers are not normally required in calculations as end bays are always unreinforced.

APPENDIX D

SAFE BEARING VALUES OF SOILS

	Type of Ground	Safe Bearing Value (KPa)
1	Made ground (Mechanically compacted)	300
2	Soft clay or loam	150
3	Confined wet sand	200
4	Medium clay or sandy clay	300
5	Hard dry clay or dense sand	450
6	Soft shale	550
7	Weathered rock or medium shale	800

Notes 1. Safe Bearing Values are in Kilopascals (KPa)

2. 1 KPa = 1 kilonewton per square metre
1 KPa = 0.1 tonnes per square metre
1 KPa = 145 pounds per square inch (psi)



Fig C13

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STAFF REPORTS - INFRASTRUCTURE SERVICES

Report No. 4.4	Operations and Maintenance Works Update
Directorate:	Infrastructure Services
Report Author:	Kirk Weallans, Operations Coordinator - IS
File No:	12024/203

5 **Summary:**

To provide the Committee a status report on the works being carried by Council Operations and Maintenance Teams.

10

RECOMMENDATION:

That the Infrastructure Advisory Committee note the report.

Attachments:

- 15
 - 1 Resheeting_Grading Program 2023_24, E2024/13293 , page 187 🗓 🛣
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Report

PAVEMENT RESEALS

Council has commenced the approved resealing program for the year.

Sections of the following roads will be resealed subject to budget:

- 5 Repentance Creek Road, Repentance Creek
 - Whians Road, Eureka
 - Kings Road, Eureka (partly completed)
 - Federal Drive, Federal
 - Booyong Road, Booyong
- 10 Stewart Street, Booyong
 - Gulgan Road, Mullumbimby
 - Minyon Street, Brunswick Heads
 - Broken Head Road, Broken Head
 - Seaview Street, Byron Bay
- Ruskin Street, Byron Bay
 - Mullumbimbi Street, Brunswick Heads
 - Short Street, Brunswick Heads
 - Teven Street, Brunswick Heads

HEAVY PATCHING

20 Council Officers are currently seeking quotations from Contractors to complete Council heavy patching program.

Defects on the worst sections on the roads listed below have been prioritised for heavy patching subject to budget:

- Coolamon Scenic Drive, Montecollum
- Argyle Street, Mullumbimby
 - Broken Head Road, Broken Head

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- Keith Street (overlay), Bangalow
- Browning Street, Byron Bay
- Bangalow Road, Talofa
- Shirley Street, Byron Bay
- 5 Myocum Road, Myocum

GRADING/RESHEETING

Council gravel road grading and resheeting work continues. Please refer to attached program. Based on the available grading budget for this finance year and estimated expenditure Council expects to complete roads up to Scarrabelottis Road. Any significant rain experienced within the shire may impact the roads prioritised for works.

Council crews have commenced grading works approved within the first package disaster funded gravel roads.



Figure 1 - Grading works completed on Kennedys Lane under disaster funding

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DRAINAGE MAINTENANCE

The drainage maintenance crew is currently undertaking planned drainage maintenance in Mullumbimby. On completion of work in Mullumbimby Crews will mobilise to Brunswick Heads to complete planned drainage maintenance.



5

Figure 2 - Drainage Maintenance being undertaken in Hollingsworth Lane

Rural Drainage maintenance is also underway. Crews are currently fortifying a drainage channel on Huonbrook Road to prevent recurrent erosion and impact to the adjacent road.

RURAL ROADSIDE VEGETATION

- 10 Exotic grasses, introduced for pasture don't recognise fences and often move from paddocks into the road reserve. Setaria grass is one of the main grasses that tend to impact sight distance for motorists. The grass can grow up to 300mm in a week during the high growth season. These conditions make it very difficult for the two Council vegetation crews to maintain vegetation to Council's desired level of service.
- 15 As funds permit Council engages a sidearm contractor to help manage weed and grass growth during the high growth period. This financial year Council has engaged a contractor for a period of 4.5 weeks. Areas which have been maintained or about to be maintained by the sidearm contractor include Huonbrook Road, Wilsons Creek Road, Montecollum and Upper Main Arm Road.

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WORK DELIVERY CHALLENGES

5 **Pavement Reseal and Drainage Maintenance Challenges**

All Maintenance and Capital Works Projects/Activities produce spoil. This spoil is often required to be removed and disposed from site.

Historically due to budget constraints and options for where this material can be taken too, this material has typically been lost within the road reserve. However due to a major increase in works over the past few years the opportunities to keep and lose material

10 increase in works over the past few years the opportunities to keep and lose material within the road reserve and stockpile sites has diminished.

Currently within the Shire the only avenue to dispose of spoil material is at the BSC Resource Recovery Site, which has a charge of \$350 per tonne, plus haulage. To put the cost of disposal in context, let's consider edge clearing on Gulgan Road i.e., prep work to

be completed before the road is resealed. The length of Gulgan Road is approximately 4,000m – 4000m x 2 (2 sides of the road). Assuming that 0.5 meters in width and 0.1 m thickness of spoil material to be removed (will vary along Gulgan Road) then the total amount of material to be removed to facilitated the work is approximately 400m3 or 600 tonnes. The cost to dispose of the material at the resource recovery = 600 tonnes x
\$350/tonne = \$210,000. This figure is approximately 15% of the reseal budget.

Another option available to Council outside of the shire is to dispose of this material at a licenced site which charges \$70/tonne. This rate would cost Council \$42,000 for this work presuming the fill is validated as clean fill through testing, haulage will represent an additional cost. The quoted cost to test and analyse the material on Gulgan Road is

- \$14,000. The costs to manage spoil lawfully will impact the extent of works which Council is able to complete under the reseal program. It is hoped that the significant expenditure required to manage spoil as described above is only incurred for a relatively short period 1-2 years whilst Council finalises the necessary approval to stockpile material quarry with the view that the material can be used as part of the Myocum Quarry rehabilitation plan. A
- 30 long term Spoil Management Strategy is currently being prepared.

A similar issue exists in regard to expenditure for any material removed through Council's drainage maintenance works.

Resource Challenges

Operations and Maintenance has been impacted by a number of staff changes over the past few months. There has been staff movement in terms of the Operations Engineer, General Maintenance Supervisors and Stormwater Supervisor. Whilst this has provided opportunities for staff to act in higher duties whilst the roles are being recruited, it has also impacted delivery due to limited resources. For example, General Maintenance and

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Stormwater Maintenance crews have both been reduced to one crew for periods of time. Where possible labour hire has been accessed to help fill staff gaps.

Strategic Considerations

Community Strategic Plan and Operational Plan

CSP Objective	CSP Strategy	DP Action	Code	OP Activity
5: Connected Infrastructure	5.1: Provide a safe, reliable, and accessible transport network	5.1.2: Road renewal and upgrades - Deliver road renewal and upgrade capital works program	5.1.2.1	Continue to deliver road network annual reseal program
5: Connected Infrastructure	5.1: Provide a safe, reliable, and accessible transport network	5.1.1: Road network maintenance - Undertake road and transport network maintenance to meet the standards identified in the Asset Management Plan	5.1.1.3	Continue to deliver annual gravel resheeting program
5: Connected Infrastructure	5.1: Provide a safe, reliable, and accessible transport network	5.1.1: Road network maintenance - Undertake road and transport network maintenance to meet the	5.1.1.1	Continue to deliver annual urban drainage maintenance program

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		standards identified in the Asset Management Plan		
5: Connected Infrastructure	5.1: Provide a safe, reliable, and accessible transport network	5.1.1: Road network maintenance - Undertake road and transport network maintenance to meet the standards identified in the Asset Management Plan	5.1.1.2	Continue to deliver annual rural drainage maintenance program
5: Connected Infrastructure	5.5: Provide continuous and sustainable water and sewerage management	5.5.3: Storm- water - Provide stormwater infrastructur e to manage flood mitigation and improve social and environment al outcomes	5.5.3.5	Conduct annual stormwater capital maintenance renewal works program

Legal/Statutory/Policy Considerations

Nil

Financial Considerations

5 Works are limited by Council's available budget.

Resheeting/Grading Program 2023/24



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