

Engineering Manual  
Common

MN A 00100

# Civil and Track Technical Maintenance

Version 2.1

Date in Force: 11 January 2021

Manual

Approved by: Ken Chong  
Professional Head  
Civil Engineering  
Engineering System Integrity

Authorised by: Jonathon McKinnon  
Engineering Technical  
Publication Manager  
Engineering System Integrity

John McLeod  
Professional Head  
Track Engineering  
Engineering System Integrity

## Disclaimer

This document was prepared for use by Sydney Trains and its intended recipient. The information in this document is protected by copyright and no part of this document may be reproduced, altered, stored or transmitted by any person without the prior consent of Sydney Trains.

All Sydney Trains engineering documents are periodically reviewed, and new editions are published. Between editions, amendments may also be issued. It is the document user's sole responsibility to ensure that document they are viewing is the current version, including any amendments that may have been issued. Errors or omissions in this document should be reported to [sydneytrainsstandards@transport.nsw.gov.au](mailto:sydneytrainsstandards@transport.nsw.gov.au).

Sydney Trains makes no warranties, express or implied, that compliance with the contents of this document shall be sufficient to ensure safe systems or work or operation.

## Document control

Version	Date	Author	Summary of change
1.0	5 May 2016	A Khan	First issue as Sydney Trains document, extracts from formerly ESC 100 Updated changes in bridges, track clearance, Lubricators TMPs
1.1	9 May 2016	A Khan	Revert changes to overbridges, footbridges and culvert TMP - pending implementation
1.2	30 Sept 2016	A Khan	Remove references TN065 & TN068 for underbridges
1.3	13 June 2017	A Khan	Added Thornley Lever detailed service, updated section A-9 - Earthworks & A-11 Routine Cleaning, Updated Appendix D section D-1
1.4	21 Aug 2017	A Khan	Updated References (section 2.1), Appendix C Updated Revtar to RevCom, Added Concession SW0175:2016
1.5	18 Jun 2018	A Khan	Minor updates to Appendix A1, A5, A9, A12 & Appendix C
1.6	28 June 2019	James Ning	Added Racor Lever Examination and Servicing, Edited Standard Job Number
1.7	30 August 2019	James Ning	Added Jointed Bearer System
1.8	14 May 2020	James Ning	Added Cleaning and Inspection of Boat Ramps Added existing Standard Job Number to SSC 231 Special Examination of Structures
1.9	3 June 2020	James Ning	Updated Appendix A-1 Standard Track Patrol (Sidings) Updated Appendix A-5 Turnouts Updated Appendix C-3 Integrated Track Patrol Regime

<b>Version</b>	<b>Date</b>	<b>Author</b>	<b>Summary of change</b>
2.0	21 August 2020	James Ning	<p>Added existing Standard Job Number to SSC 402 and SSC 403, A-9 Earthworks</p> <p>Updated Standard Job Number to SSC 405, A-9 Earthworks</p> <p>Separation of Culverts and Pedestrian Subways and Culverts for clarity, A-11 Structures</p>
2.1	11 January 2021	James Ning	<p>Updated Appendix A-1 Detailed Walking Examination – frequencies for Detailed Walking Examination SSC 010 are shown in Days instead of Months</p> <p>Updated Appendix A-1 Integrated Track Patrol – updated frequency of Walking Patrol (SSC 001)</p> <p>Updated Definitions and Abbreviations – updated the definition of Task Planning Latitude</p>

## Summary of changes from previous version

<b>Summary of change from version 2.0 to version 2.1</b>	<b>Section</b>
Updated Appendix A-1 Detailed Walking Examination – frequencies for Detailed Walking Examination SSC 010 are shown in Days instead of Months	A-1, P18
Updated Appendix A-1 Integrated Track Patrol – updated frequency of Walking Patrol (SSC 001)	A-1, P18
Updated Definitions and Abbreviations – updated the definition of Task Planning Latitude	3, P10
<b>Summary of change from version 1.9 to version 2.0</b>	<b>Section</b>
Added existing Standard Job Number P15033 Shotcrete/Fibrecrete to SSC 402 Added existing Standard Job Number P15034 Rocknets/Catch Fences to SSC 403 Updated Standard Job Number P15004 to SSC 405	A-9, P26
Separation of Culverts and Pedestrian Subways and Culverts for clarity	A-11, P28 & 29
<b>Summary of change from version 1.8 to version 1.9</b>	<b>Section</b>
Removed examination of turnouts in good conditions on concrete bearers in sidings from Standard Track Patrol A-1, Track System	A-1, P17
Added Redfern Eveleigh Engine Dive to the Primary Trackwork – Sidings, Standard Track Patrol A-1, Track System	A-1, P17
Added tangential turnouts to Special Turnout examination, A-5 Special Turnout examination, Turnouts	A-5, P23
Amended first dot point in notes of Table 3 – Special Integrated Patrol – Main Line Plus Walking Patrol every 90 days for plain track	C-3, P39
Amended second dot point in notes of Table 3 – Special Integrated Patrol – Main Line The Walking Patrol may be aligned with the Detailed Walking Examination and carried out at the same time, however the smaller latitude applies for tasks that are common between the two service schedules	C-3, P39
<b>Summary of change from version 1.7 to version 1.8</b>	<b>Section</b>
Added Cleaning and Inspection of Boat Ramps	A-12, P31
Added existing Standard Job Number P26041, P25004 and P31003 to SSC 231 Special Examination of Structures	A-11, P29
<b>Summary of change from version 1.6 to version 1.7</b>	<b>Section</b>
Added Jointed Bearer System to Examination of Special Track Layouts	A-5, P23
<b>Summary of change from version 1.5 to version 1.6</b>	<b>Section</b>
Added existing Standard Job Number to remove duplicability (Track Patrol)	A-1, P17
Changed Standard Job Number to remove duplicability (Test Weld)	A-2, P21
Added Examination of Manual Point Lever (Racor Lever)	A-5, P23
Added Servicing of Manual Point Lever (Racor Lever)	A-5, P23
Changed Standard Job Number to remove duplicability (Expansion switch examination)	A-5, P24
Added existing Standard Job Number to remove duplicability (Detailed Structures Examination)	A-11, P27
Created SSC to include 217 to remove duplicability for 207(Servicing of Bearings)	A-11, P31

<b>Summary of change from version 1.4 to version 1.5</b>	<b>Section</b>
Definitions and Abbreviations update in table	3, P10
Change from SAP to Transport Equip	8.6, P14
Updated Standard Job number	A-1, P17
Updated frequency of Inspection of Crossing condition	A-5, P24
Updated Standard Job number	A-9, P25
Frequency and Latitude Update	A-12, P31
Inclusion of Tunnels in Integrated Track Patrol in Appendix C	Table 3, P39
Inclusion of EI 14/03 - MTP Camera Failure Protocols	Appendix C P37
<b>Summary of change from version 1.3 to version 1.4</b>	<b>Section</b>
Updated Reference documents	Section 2.1
Updated Revtar to RevCom	Section 3
Updated all concrete or masonry culverts and separated steel culverts	A-11 page28
Updated transom type – ASA product type approval PTA CI001 2016	A-11 page29
Amended dot point in table 2 page 36; <ul style="list-style-type: none"> <li>MTP to occur every 14 days, with imagery review within 24hrs of patrol (MTP can occur on 15th day, with imagery reviewed within 24hrs of patrol)</li> </ul> Updated wording <ul style="list-style-type: none"> <li>(Regime may also be used in Hi-Rail Patrol lengths in Outer Suburban &amp; Regional areas)</li> </ul>	Appendix C
Amended dot point in table 3 page 37; <ul style="list-style-type: none"> <li>MTP to occur at least every 14 days, with imagery review within 24hrs of patrol (MTP can occur on 15th day, with imagery reviewed within 24hrs of patrol)</li> </ul> Updated wording <ul style="list-style-type: none"> <li>(Regime may also be used in Hi-Rail Patrol lengths in Outer Suburban &amp; Regional areas)</li> </ul>	Appendix C
Removed section D2 table 9 – pending approval	Appendix D
<b>Summary of change from version 1.2 to version 1.3</b>	<b>Section</b>
Note: EI C 17/01 (Inspection of Direct fixed track slab in tunnels & on bridges) All Actions are incorporated in Service Schedule SSC227 in MN C 10110	MN C 10110
EI T 16/14 (prefix in v 1.2) removed as FFU is added with Timber Sleeper	A-1, A-3, A-5
EI A 16/01 (prefix in v 1.2) removed & Note for Axle counters added	4.1 – P12
Section 7.1: “Authority to Waive” added	7.1 – P13
Section 8.8: “TMP Implementation” added	8.8 – P15
EI T 16/05 (prefix in v 1.2) removed & SSC017 added for of manual interlocking levers in Siding and Yards	A1 – P17
Updated Rail Lubricator examination (All Electrical Remotely monitored lubricators)	A2 – P22
EI T 16/05 Added SSC066 for complete service of manual interlocking levers	A5 – P23
Added definition of heavy rain (>50mm in 24 hours)	A6 – P25
Added comments in General examination of Cutting & Embankments (not risk assessed)	A9 – P25
Added latitude and comments in Detailed Examination to Cutting & Embankments (not risk assessed)	A9 – P25
Updated geotechnical risk site examination and review section	A9 – P26
Moved pedestrian subway from underbridges to culverts	A11 – P27
Added Surface drain/ Track Slab & Subsurface drain Routine Cleaning - Jet / Hydrovac	A11 – P30
Added following statement in section D-1, "ensure the output from engineering assessment is uploaded in the appropriate database"	Appendix D Page-44

Summary of change from version 1.1 to version 1.2	Section
Updated Appendix D at page 39, added underbridges functions on page 25. “All steel or concrete underbridges including flyover, dives, multilevel stations, pedestrian subway” Added table 8 & 9: condition assessment of underbridges	Appendix D
Updated examination regime for all cuttings and embankments which are not risk assessed	Appendix A
Moved Buffer stops from Detailed Structures Examination to A-8, Track Equipment	Appendix A
Added new column for standard job numbers	Appendix A

## Table of Contents

<b>1</b>	<b>Purpose</b> .....	<b>9</b>
1.1	Scope and Application .....	9
<b>2</b>	<b>References</b> .....	<b>10</b>
2.1	Sydney Trains / Transport of NSW Documents.....	10
<b>3</b>	<b>Definitions and Abbreviations</b> .....	<b>11</b>
<b>4</b>	<b>Maintenance Concept</b> .....	<b>13</b>
4.1	General.....	13
4.2	Preventive Maintenance.....	13
4.3	Corrective Maintenance .....	13
<b>5</b>	<b>Competency</b> .....	<b>13</b>
<b>6</b>	<b>Safety Importance</b> .....	<b>13</b>
<b>7</b>	<b>Management and Reporting</b> .....	<b>14</b>
7.1	Authority to Waive .....	14
<b>8</b>	<b>Technical Maintenance Plan User Information</b> .....	<b>15</b>
8.1	Asset .....	15
8.2	Service Description .....	15
8.3	Safety Importance .....	15
8.4	Applicability .....	15
8.5	Service Schedule Reference .....	15
8.6	Period.....	15
8.7	Latitude.....	16
8.8	TMP Implementation .....	16
<b>9</b>	<b>Tailored Technical Maintenance Plans</b> .....	<b>16</b>
<b>10</b>	<b>Changes to TMP's and Updates</b> .....	<b>17</b>
<b>Appendix A</b>	<b>Technical Maintenance Plan</b> .....	<b>18</b>
A-1	– Track System .....	18
A-2	– Rail System.....	21
A-3	– Sleepers / Bearers .....	23
A-4	– Ballast .....	24
A-5	– Turnouts .....	24
A-6	– Drainage .....	25
A-7	– Train Monitoring Equipment.....	26
A-8	– Track Equipment.....	26
A-9	– Earthworks .....	26
A-10	– Level Crossings .....	28
A-11	– Structures.....	29
A-12	– Right of Way .....	31
<b>Appendix B</b>	<b>Detailed Plain Track Rail Testing Schedule</b> .....	<b>33</b>
<b>Appendix C</b>	<b>Implementation of Varied Track Patrol Arrangements</b> .....	<b>36</b>
C-1	– Adjacent Track Patrol and Night Patrol .....	36
C-2	– Engine Patrol .....	36

C-3 – Integrated Track Patrol Regime.....37  
C-4 – Applicability.....42  
C-5 – Mandatory Requirements for Operation of the Integrated Walking Regime: .....42  
C-6 – Mandatory Requirements for Mainline Track Sections:.....42  
C-7 – Mandatory Requirements for Ancillary Line Track Sections:.....43  
C-8 – Conditions Requiring Supplementary Patrol .....43  
C-9 – Plain track .....43  
C-10 – Turnouts and Special Trackwork.....44  
C-11 – Ancillary Lines.....44  
**Appendix D Examination Frequencies for Underbridges.....45**  
D-1 – Engineering Assessment (EA).....46  
**Appendix E Tailored Technical Maintenance Plans.....49**



# 1 Purpose

This document sets out the Sydney Trains maintenance policy for civil infrastructure in terms of mandatory preventive maintenance and minimum service frequency by asset type.

It is applicable to all track and civil infrastructure maintained by Sydney Trains.

## 1.1 Scope and Application

The Technical Maintenance Plan (TMP) specifies the level of maintenance required for assets within the Track and Civil disciplines. This document is provided for the use of personnel responsible for programming preventive maintenance activities.

The TMP lists items when:

- They are repairable.
- They have a defined maintenance policy (i.e. the item has a scheduled maintenance activity at a defined interval).
- They require some special maintenance management input and thus will need certain information to be recorded.

The TMP specifies:

- which items are to be maintained,
- what maintenance is carried out,
- when maintenance is required, and
- requirements for managing and reporting compliance with standards for nominated scheduled maintenance tasks.

The maintenance tasks and minimum frequencies defined in this document are mandatory for all track and structures assets maintained by Sydney Trains.

Any proposed reduction in task scope or frequency (lengthening time between tasks) shall be approved, as appropriate, by the Manager, Technical Maintenance Plans, in a location-specific tailored TMP. Tailored TMPs, where approved, are listed for reference in Appendix E.

Maintainers shall also review any atypical situations, consider if more stringent requirements are appropriate and ensure appropriate defect management is carried out.

## 2 References

Note that references to RailCorp engineering documents remain valid after the inception of Sydney Trains, until the document references are replaced with a Sydney Trains or Asset Standards Authority equivalent.

### 2.1 Sydney Trains / Transport of NSW Documents

- ESC 200 Track System
- ESC 215 Transit Space
- ESC 302 Structures Defect Limits
- TMC 301 Structures Examination Manual
- MN T 20203 Track Inspection Manual
- MN T 20101 Track Service Schedules
- MN C 10110 Structures Service Schedules
- MN C 10140 Geotechnical Service Schedules
- T MU AM 01003 ST (Development of Technical Maintenance Plan)
- T MU AM 01004 ST (Maintenance Service Schedule classification & Compliance)
- MN A 00119 Maintenance Plan – Tunnels

### 3 Definitions and Abbreviations

The following definitions are used within this standard.

<b>Transport Equip</b>	It integrates Enterprise Asset Management (EAM) functions across the Transport cluster through Transport Equip technology.
<b>Mainline track</b>	Main lines include crossing loops, refuge loops and "sidings" where operating speed in excess of 25km/hr is possible.
<b>Safety Critical Asset or Component</b>	An asset/component whose functional failure or secondary damage resulting from the functional failure, either by itself or as a hidden function in concert with one other failure, will result in an increase in the likelihood of an incident which could involve significant injury to public or staff.
<b>Failure</b>	The inability of a system or asset to perform its intended function or inability to satisfy some predetermined conditional attribute.
<b>Safety Critical Task</b>	A task that protects against a failure mode (or root cause of a system failure) in a Safety Critical Asset/Component where the failure mode may be applicable to an individual asset/component (e.g. measurement of the gap in a single facing point lock that may drift beyond limits).
<b>Safety Significant Task</b>	A task that: <ul style="list-style-type: none"> <li>protects against an eventual possible failure mode (or root cause of a system failure) in a Safety Critical Asset/Component whose reliability performance is derived from that of a population of asset/components or</li> <li>is a quality check on staff performance on safety critical activities.</li> </ul>
<b>Deviations for Preventive Maintenance</b>	Maintenance task should be completed within scheduled published latitudes. A deviation from the published maintenance frequencies beyond published latitudes for all tasks requires approval from the appropriate engineering authority as detailed in PR A 00402 (under review).
<b>RevCom</b>	If work is not completed within a specific time frame, it will require a REVCOM (Revised compliance). The common REVCOM process will be used to approve the revision of all planned and corrective work.  No deviation will be issued unless a satisfactory risk mitigation management process is in place.
<b>Task Packaging</b>	The aggregation of individual valid maintenance tasks into logically grouped packages to form service schedules.
<b>Task Period</b>	The minimum frequency at which relevant maintenance tasks should be carried out unless otherwise specified in Site Inspection Report (SIR). The term "various" indicate the specified frequency in SIR.

<b>Task Planning Latitude</b>	The allowed variance of a TMP task from its target date. Latitudes are for planning purposes, as tasks cannot always be completed on the actual day due.
<b>Detailed Structures Examinations</b>	These examinations are detailed investigations of all aspects of the condition of a structure. These examinations involve close-up visual examination of all members of the structure as detailed in the structures examination TMC 301.(TN 072: 2014)
<b>General Structures Examinations</b>	Close-up examination from within one meter is required for readily accessible members of structures, member of bridges and OHWS. Culverts, using mobile CCTV camera where necessary as detailed in the structures examination TMC 301.(TN 072: 2014)

## 4 Maintenance Concept

### 4.1 General

The maintenance concept provides for preventive maintenance schedules to minimise or avoid disruption to services, commensurate with Sydney Trains' safety and reliability objectives. There are two types of maintenance to support the system:

- Preventive maintenance
- Corrective maintenance

Note: Sydney Trains are installing axle counters on the rail network. Axle counters are a critical signalling train detection asset and must not be disturbed without prior approval from licenced signal personnel.

### 4.2 Preventive Maintenance

Preventive maintenance is undertaken to keep an item in a specified operating condition through regular maintenance tasks and through systematic examination to detect and prevent potential failures. The former of these includes routine servicing and regular scheduled maintenance based on time or traffic. The latter comprises surveillance examinations, condition monitoring and functional checks. The Technical Maintenance Plan details periods at which preventive maintenance is performed.

### 4.3 Corrective Maintenance

Corrective maintenance is undertaken to restore items to a specified condition by repairing or replacing items. Corrective maintenance is carried out as a result of failures or unsatisfactory conditions detected during preventive maintenance examinations and checks. Corrective maintenance tasks are not detailed in the TMP.

## 5 Competency

All maintenance inspection, assessment, monitoring and review functions shall only be carried out by accredited staff.

## 6 Safety Importance

Not all safety related tasks are of equal importance, and therefore need different compliance regimes for cost-effective management. Sydney Trains has divided its assessed safety tasks into two categories, safety critical and safety significant. There are other tasks that are not directly safety related.

The difference in importance between safety critical tasks and safety significant tasks is the failure characteristic of the condition being assessed by the examination task.

The failure characteristics of safety critical tasks are generally rapidly developing and adverse following the breach of defined conditional criteria. There is a significant increase in risk associated with safety critical tasks being extended beyond the specified task period without defined and approved risk mitigation measures in place.

The failure characteristics of safety significant tasks are slower to manifest themselves and less likely to be adverse following the breach of defined conditional criteria.

## 7 Management and Reporting

Senior Manager Civil Engineering (NMD), Senior Manager Track Engineering (NMD) and Maintenance Operations Manager (MOM) must establish and maintain systems to ensure that the following requirements for the completion of Safety related tasks are met:

1. Safety Critical and Safety Significant tasks shall be completed within the defined planning latitude. A TMP Deviation shall be sought for those tasks exceeding the planning latitude as referred in the Deviation for Preventive Maintenance Procedure PR A 00402 (under review).
2. Maintenance Operations Manager (MOM) shall review the compliance of Safety Significant and other tasks at the end of each month.
3. A documented risk mitigation process designed to manage the increase in risk of extending the task period shall be provided to Engineering & System Integrity (E&SI) for those tasks exceeding the planning latitude.
4. All Deviations for Preventive Maintenance shall be documented. The records, including risk assessment, must be retained as per document retention standard.

### **WARNING**

**Failure to secure the appropriate Deviation will require IMMEDIATE (same day) action to bring the risk back to acceptable levels. This action may include seeking an Engineering TMP deviation for an extension, removal of the asset from service or placement of service restrictions on the particular asset.**

### 7.1 Authority to Waive

NMD can only exercise Engineering Authority to waive the conditions in Engineering Standards and Manuals that are specifically within the authority of Civil Maintenance Engineer. The authority of Civil Maintenance Engineer under MNA 00100 has been vested to the Senior Manager Civil Engineering & Senior Manager Track Engineering. In these instances only Senior Manager Civil Engineering or Senior Manager Track Engineering has the Engineering Authority to approve local waiver. The local waiver is to be prepared and endorsed by the local Civil Engineer prior to being submitted for approval to the NMD Senior Manager Civil Engineering or Senior Manager Track Engineering.

E&SI have the authority to deviate from conditions within Engineering Manuals. Only ASA can waive conditions in Engineering Standards. In both of these cases an application for a Concession is to be submitted to the E&SI Professional Head Civil or the E&SI Professional Head Track for consideration. The application for a Concession is to be prepared by the Local Civil Engineer and Endorsed by the NMD Senior Manager Civil Engineering or NMD Senior Manager Track Engineering before being submitted to E&SI. Senior Manager Civil Engineering or Senior Manager Track Engineering is NOT to submit Concession requests directly to ASA.

## 8 Technical Maintenance Plan User Information

The TMP table has the following elements:

- Asset group description
- Safety Importance
- Brief description of the preventive maintenance/service to be performed
- Applicability of the Service to specified asset configurations or operating environments
- Service Schedule reference
- Minimum task frequencies or periods (including task planning latitudes)

### 8.1 Asset

This element details relevant groups of assets within the civil discipline that share similar maintenance requirements e.g. track system, rail, sleeper/bearer, geotechnical, structures and right of way.

### 8.2 Service Description

This column provides a brief description of preventive maintenance tasks or sets of tasks defined in the Service Schedule.

### 8.3 Safety Importance

Some scheduled examination tasks have been categorised as Safety Critical (C) or Safety Significant (S). Tasks that are unscheduled (ON EVENT tasks) are shown as NA.

### 8.4 Applicability

This column provides information about how preventive maintenance tasks are to be applied across various asset configurations and/or within specific operating environments. For example, the frequency of Track Patrols varies according the asset type and traffic pattern.

### 8.5 Service Schedule Reference

This column provides the alpha-numeric reference code of the Service Schedule applicable for the maintenance tasks.

### 8.6 Period

The “Period” column defines the minimum frequency at which relevant maintenance should be carried out for each asset and configuration.

Note: There are several differences in frequency definitions between Transport Equip and MNA due to standardisation in strategy used in Transport Equip, which have been aligned for planning, rostering and track access cycles. This has resulted in a discrepancy in the total allowable latitude/compliance between the dates when the maintenance has been carried out. As such, for compliance standards, the information noted in the Civil TMP (MNA -00100) takes precedence over that defined in the Transport Equip system.

Period references include:

ON EVENT	Maintenance or examination is to be carried out when the relevant event occurs
ON CONDITION	Maintenance or examination is to be carried out when the item reaches a defined condition
ATI	Maintenance or examination is to be carried out <b>At the Time of Installation</b>

Any reduction in the minimum recommended frequencies (lengthening time between tasks) must be authorised, as appropriate, through the Asset Standards Manager.

Where criteria overlap the most stringent is to apply. For example if a section of track carries passengers services and freight traffic less than 1 Mgt per annum, two different track patrol frequencies might be seen to apply (two patrols per week and every 14 days). In this case the most stringent (two patrols per week) will apply.

## 8.7 Latitude

This column specifies any latitude that may be allowed for scheduling purposes. The average time between maintenance events should still be in accordance with the specified minimum.

Latitudes are generally expressed in days. That is, a task with a period of four months and scheduling latitude of 12 days should be completed within a period of 120 + or - 12 days i.e. nominally 120 days, not more than 132 days and not less than 108 days between services.

Note: Early and late latitudes allowed/setup in EAM are dependent on scheduling parameters applied to the maintenance plans.

### Note on Rounding

When latitudes result in fractions of a day, they have generally been rounded up to whole days. This has been preferred over conventional rounding or explicitly rounding down. This was decided on the basis that a fraction of a day places the task in a particular day so the algorithm should use that day for calculations.

## 8.8 TMP Implementation

Any TMP Updates/Changes from the previous version should be implemented according to implementation plan agreed with the business or as advised by Engineering & System Integrity (ESI).

## 9 Tailored Technical Maintenance Plans

Approved Tailored Technical Maintenance Plans are detailed in E.

The information includes:

- Location
- Asset Class to which the Tailored TMP applies
- Task to which the Tailored TMP applies (and a summary of its application)



## 10 Changes to TMP's and Updates

Technical maintenance plans are developed by Asset Management Division of Sydney Trains in accordance to T MU AM 01003 ST. Sydney Trains uses a maintenance requirements analysis (MRA) approach to ensure that the technical maintenance plan is fit for purpose and is able to be referenced across the networks.

## Appendix A Technical Maintenance Plan

Technical Maintenance Plan								
Service Description	Safety Importance	Applicability		Standard Job no	Service Schedule	Period	Latitude	Comments
<b>A-1 – Track System</b>								
Standard Track Patrol (Includes Walking, hi-rail, Adjacent Track Patrol and Night Patrol)	C	Heavy Freight Lines (Including Refuges and loops adjacent to tracks which meet these criteria)		P00001 P00047 P00031	SSC 001 SSC 002 SSC 006	Two per week	N/A	Maximum of 3 calendar days between days of examination Example: This means that if patrol is carried out on Monday the next patrol can be carried out anytime on Friday
		Passenger Main Line (Including Refuges and loops adjacent to tracks which meet these criteria)				Two per week	N/A	Maximum of 3 calendar days between days of examination
		Mixed Passenger Freight Main Line (Including Refuges and loops adjacent to tracks which meet these criteria)				Two per week	N/A	Maximum of 3 calendar days between days of examination
		Freight Main Line (Including Refuges and loops adjacent to tracks which meet these criteria)	carrying > 10mgt per annum			Two per week	N/A	Maximum of 3 calendar days between days of examination
	carrying ≤10mgt per annum		7 days			1 day		
<b>Sidings</b>		<i>Siding classifications are detailed in ESC200 – Track System</i>						
Passenger operations/ or maintenance centres and General Yards	S	Signalled & Focal points	Concrete track in good condition	P00033	SSC 001	28 days	3 days	Signalled Track - includes all turnouts and catchpoints that are interlocked and all rail which passes signalling current
			Other track			7 days	1 day	
		Primary Tracks including Manual non-interlocking Levers				14 days	1 day	Focal Points - locations at which a number of alternate routes diverge/converge. If not signalled already such locations normally abut signalled trackwork.
	Secondary Tracks including Manual non-interlocking Levers		28 days	3 days				
	Passenger Sidings	Primary Tracks		P00033	SSC 001	14 days	1 day	Primary Trackwork - includes the Redfern Eveleigh Engine Dive and all the areas of the yard where rollingstock passes over regularly
		Secondary tracks				28 days	3 days	
Freight Sidings and Engineering Maintenance Sidings						28 days	3 days	Secondary Trackwork - non-critical areas of track infrequently used

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Integrated Track Patrol	C	Mainline track meeting ALL of the criteria detailed in Appendix C.	P00001 P00047	SSC 001 SSC 002	Two per week	N/A	Integrated Track Patrol regime includes combinations of Walking Patrol, Hi-rail Patrol, Engine Patrol, Mechanised Track Patrol AND Supplementary Patrol (where required) as determined by the Senior Manager Track Engineering (NMD) to meet the requirements of Appendix C
	C	Ancillary track meeting ALL of the criteria detailed in Appendix C.	P00048 P00050	SSC 003 SSC 004	7 days	1 day	
	C	Maximum Walking Patrol interval (ONLY applicable in association with Integrated Patrol regime)	P00001	SSC 001	91 days	9 days	Integrated Patrol regime includes combinations of Weekly Mechanised Track Patrol, Engine Patrol, Walking Patrol, Turnout Patrol AND
	C	Maximum Turnout Patrol interval (ONLY applicable in association with Integrated Patrol)	P08016	SSC 051	28 days	3 days	Supplementary Patrol (where required) as determined by the Senior Manager Track Engineering (NMD) to meet the requirements of Appendix C
Engine Patrol	C	Mainline track	P00050	SSC 004	Various	N/A	Utilised as part of Integrated Track Patrol or to replace Standard Track Patrol as determined by the Track Engineering Manager (NMD) to meet the requirements of Appendix C.
Supplementary Patrol	C	ONLY applicable in association with Integrated Track Patrol	P00051	SSC 005	Various	N/A	Examination of Plain track, BIJs or special trackwork in poor condition as determined by the Senior Manager Track Engineering (NMD) to meet the requirements of Appendix C
Wet Weather Patrol	NA	All track	P00020	SSC 007	On event	N/A	Event trigger: heavy rain, (dependent on infrastructure susceptibility)
Heat Patrol	NA	Mainline Track with FFU / Timber Sleepers	P00011	SSC 008	On event	N/A	Event trigger: During WOLO conditions and at times of high rail temperature or when there is concern for the stability of welded track
Post Irregularity examination	NA	All track	P00006	SSC 011	On event	N/A	Event trigger: Any event that may potentially cause track system damage e.g. derailment, collision, flood or fire, earthquake, high wind, (dependent on infrastructure susceptibility) or a "call out" based on reports from train drivers or the public
Front of train examination	S	All mainline track	P00002	SSC 009	14 days	5 days	
Detailed walking examination	S	Heavy Freight Lines	P00016	SSC 010	91 days	18 days	
		Passenger Main Lines					
		Mixed Passenger Freight Main Lines					
		Freight Main Lines					
			carrying > 10mgt per annum	SSC 010	182 days	36 days	
			carrying ≤ 10mgt per annum				
		Sidings & Yards - General Yard, Passenger operations/ or maintenance, Freight Siding and Passenger Siding including Mechanical non-interlocking Levers	P02001	SSC 016	182 days	36 days	
	P02003	SSC 017	364 days	72 days	To be performed / planned in alignment with SSC016. SSC017 includes all tasks from SSC016		
Engineering Maintenance Sidings	P02001	SSC 016	364 days	72 days			

Technical Maintenance Plan												
Service Description	Safety Importance	Applicability		Standard Job no	Service Schedule	Period	Latitude	Comments				
Track recording examination	S	All Main lines		P00004	SSC 021	4 months	14 days	Twice frequency (i.e ½ as often) of adjacent main lines				
		Crossing loops on all main lines				8 months	28 days					
		Olympic Park Sprint Platform Road - Lidcombe				1 year	36 days					
Track clearances examination	S	All mainline track Safety critical issues should be classified as a defect in high exposure areas and managed in Teams3		P00010	SSC 022	1 year	60 days	Not required for tracks with solid concrete roadbed. Examination should be conducted as per infringement list Infringement list to be reviewed each year				
		Sidings				2 years	72 days					
	NA	All track				On event	N/A	Event trigger: Suspected change in track geometry which could affect track clearances				
Clearance and coping measurement at platforms	S	<b>Sleeper type</b>	<b>Track curvature</b>	P21004	SSC 025							
		Slab track	All radii			4 years	144 days					
		Concrete	Tangent track >1200m radius			4 years	144 days					
			1200 – 300m radius			2 years	72 days					
			< 300m radius			1 year	60 days					
			Unstable platform			6 months	18 days	Minimum				
		FFU / Timber	Tangent track >1200m radius			4 years	144 days					
			1200 – 300m radius			1 year	60 days					
			< 300m radius			1 year	60 days					
			Unstable platform			6 months	18 days	Minimum				
		Platforms with "Gap Reduction" strategies				6 months	18 days	Unless an alternative inspection frequency has been authorised				
		General Examination of clearance of platforms	S			All platforms		P21005	SSC 026	6 months	18 days	Visual examination
		Track Centres Examination	S/C			On multiple mainline track Some areas are more critical than others. Any area that is < kinematic + 200 or not tangent, slab or fixed track (eg bridge deck) can be deemed as safety critical.		P00009	SSC 023	1 year	36 days	Optional where the design track centres for the appropriate rolling stock on the particular line exceed the minimum track design centres as detailed in ESC215 by 300mm or more
NA	Sidings		On event	N/A	Event trigger: Suspected change in track geometry which could affect track centre clearances							
OHW/track alignment Examination	NA	All track with OH Wiring		P00005	SSC 024	On event	N/A	Event trigger: Suspected change in track geometry which could affect track/OHW relationship on electrified track				

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Welded Track Stability Examination	S	Main Lines and Main line Crossing Loops	P00008	SSC 012	1 year	36 days	To be completed by end of September each year. Where seasonal factors prevent completion of examination/analysis a preliminary assessment shall be made of any outstanding track. The locations of any previous misalignments from the last 3 years shall be examined in detail prior to the end of September
Welded Track Stability Analysis	S*	Main Lines and Main line Crossing Loops District waiver required if not completed by 1 <sup>st</sup> October. Engineering waiver required if not completed by 1 <sup>st</sup> November.	P00032	SSC 013	1 year	36 days	To be completed by end of September each year. *Where seasonal factors prevent completion of examination/analysis a preliminary assessment shall be made of any outstanding track. The locations of any previous misalignments from the last 3 years shall be examined in detail prior to the end of September.
Pre-Summer Inspection	S	Main Lines and Main line Crossing Loops	P29002	SSC 015	1 year	36 days	As the Summer approaches each year
<b>A-2 – Rail System</b>							
Ultrasonic rail examination	S	Passenger lines (except as below)	Hi Rail P03001  Manual P03002	SSC 031	4 months	14 days	Detailed listing of lines and testing frequencies is shown in Appendix B
		Sutherland to Cronulla, Metropolitan Goods lines, Pt Kembla line, Unanderra – Nowra, Lithgow to Bowenfels, Nominated Crossing Loops, Refuge Loops and Platform Roads			6 months	1 month	Detailed listing of lines and testing frequencies is shown in Appendix B
		Carlingford, Richmond lines, Darling Harbour, Botany Lines and Homebush Loop, Crossing Loops in Metropolitan Area			1 year	2 months	Detailed listing of lines and testing frequencies is shown in Appendix B
		Other regularly used crossing loops			2 years	72 days	
		All lines			SSC 032	On Event	N/A
	NA	All 53kg/m rails to be reused including for use as closures	SSC 032	On Event	N/A	Event Trigger - proposed installation in main line. Includes examination for Vertical Split Head defects	
Visual Examination of VSH Rail Defects	NA	All Vertical Split Head defects	-	TBA	On Event	Varies	If found at night and full requirements for inspection cannot be carried out, defects classified as Medium (M) or larger shall be reinspected in daylight hours the next day. Similarly Small (S) defects shall be reinspected in daylight hours within 7 days.
	S	Small Vertical Split Head defects	-		14 days	NIL	To commence at end of 5 week period after detection
Rail wear and condition examination	S	All main lines and crossing loops	P03003	SSC 033	1 year	36 days	Rails that are visually wearing
Rail corrosion examination	S	Rail in Tunnels	P00017	SSC 035	1 year	36 days	Other locations where corrosion is an actual or potential problem (including electrolytic corrosion)
		Rail in other wet locations					
Test Weld	S	All new aluminothermic field welds	P03006	SSC 036	14 days	NIL	To be tested after installation Test ATI where possible
		All new wirefeed welds	P03007	SSC 037	14 days	NIL	To be tested after installation Test ATI where possible

Technical Maintenance Plan														
Service Description	Safety Importance	Applicability						Standard Job no	Service Schedule	Period	Latitude	Comments		
Cleaning Rail head	NA	All rails						NA	NA	On Event	N/A	Event Trigger: Clean or grind at time of installation		
Grind Rail	NA	All new rail installed on tracks with heavy duty and general freight traffic as part of re-railing (and not as closures for replacement of defects) Existing rail on ALL mainline tracks when concrete sleepers are installed. Existing rail on ALL mainline tracks when substantial backcanting is corrected. Cascading or transposing of rail on ALL mainline tracks						NA	NA	ATI	N/A	To be profile ground within 5 MGT (or 20% of the grinding cycle for preventive grinding (whichever is the larger) following the re-railing		
Grind Rail (cont'd)	NA	All new rail installed on tracks with passenger traffic only as part of re-railing (and not as closures for replacement of defects)						NA	NA	ATI	N/A	To be profile ground within 10 MGT (or 20% of the grinding cycle for preventive grinding (whichever is the larger) following the re-railing		
	NA	Track Curvature (m)	Nominal Period Between Grinds (MGT)								NA	NA	Various	3MGT or 20% of cycle tonnage, whichever is the larger
			Tracks with Heavy Duty Freight Traffic		Tracks with General Freight Traffic or Empty Heavy Duty Freight Traffic		Tracks with Passenger Traffic							
			Std	HH	Std	HH	Std	HH						
			450 or less	NA	20	15	20	20	30					
	> 450 to 1000	10	20	15	20	20	30							
> 1000	20	30	25	35	30	40								
NA	NA	New turnouts (or new turnout steelwork) on mainline track						NA	NA	ATI	N/A	To be profile ground within 8 MGT for Standard Carbon rails and 10 MGT for Head Hardened rails (or 20% of the grinding cycle for preventive grinding of turnouts (whichever is the larger) following installation. Use targeted grinding strategies for specific lines where approved through the Senior Manager Track Engineering (NMD)		
NA	NA	Rail Type		NA				NA	NA	Various	20% of cycle tonnage	The recommended guidelines for preventive rail grinding are to be the more stringent of the requirements for the main line and for the turnout road.		
		1:8.25		≥ 1:15										
		Head Hardened	13	18	25									
Standard Carbon	8	13	18											

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Examination of Insulated Joints (includes non-operational joints)	S	Electrified tracks	P05001	SSC 038	6 months	18 days	
		Non electrified tracks			1 year	36 days	
Examination of Mechanical Joints	S	Jointed mainline track	P05002	SSC 039	1 year	36 days	Visual as part of the Welded Track Stability Examinations.
Rail Lubricator examination	NA	All Mechanical Lubricators	P28002	SSC 040	6 months	18 days	
		All Electrical Lubricators (Remotely monitored)			On Event	N/A	Event trigger from remote monitoring
Rail Lubricator / TORFMA and GFL service	NA	All Lubricators / TORFMA and GFL Equipment	P28001	SSC 041	As required	N/A	Event trigger: to be filled and serviced at appropriate interval to ensure service is carried out prior to lubricator running empty.
Rail Lubricator check of rail head	NA	All Lubricators	P28005	SSC 042	On Event	N/A	Event trigger: Review lubrication prior to ultrasonic rail testing.
General Examination	NA	TORFMA - (Solar panel & drive belt check)	P28003	SSC 043	1 year	36 days	Or as required by specific equipment/situation
TORFMA – Change battery & calibrate	NA	All TORFMA	P28004	SSC 044	5 year	180 days	Or as required by specific equipment/situation
Electronic Rail Lubricator - Change Track Mount	NA	All Electric Rail Lubricators	P28006	SSC 070	5 years	180 days	
Electronic Rail Lubricator – Change Electronics Sys	NA	All Electric Rail Lubricators	P28007	SSC 071	10 years	365 days	
Electronic Rail Lubricator – Change Grease Units	NA	All Electric Rail Lubricators	P28008	SSC 072	15 years	440 days	
<b>A-3 – Sleepers / Bearers</b>							
Detailed Sleeper examination	S	Track with fully concrete sleepers/slabs	P06001	SSC 046	2 years	72 days	
		Track with FFU / Timber sleepers			1 year	36 days	
		Sidings with fully concrete sleepers/slabs			5 years	180 days	
		Sidings with FFU / Timber sleepers			2 years	72 days	
	S	All track (Wet weather patrol)	P00020	SSC 007	Variable	N/A	As part of Detailed walking

Technical Maintenance Plan								
Service Description	Safety Importance	Applicability		Standard Job no	Service Schedule	Period	Latitude	Comments
Resilient baseplate examination	S	Resilient baseplates on FFU / Timber support		P06005	SSC 047	1 year	36 days	
	S	Resilient baseplates on concrete support				2 years	72 days	
<b>A-4 – Ballast</b>								
Ballast Examination	S	Welded Track		P16001	SSC 048	1 year	36 days	As part of Welded Track Stability Examination
<b>A-5 – Turnouts</b>								
Examination of Special Track Layouts (including turnout, catchpoints, diamonds, slips and Jointed Bearer System)	S	Heavy Freight Lines		P08001	SSC 052	1 year	36 days	
		Passenger Main Lines						
		Mixed Passenger Freight Main Lines						
		Freight Main Lines	carrying > 10mgt per annum					
	carrying ≤ 10mgt per annum							
		Siding				2 years	72 days	
	S	Complete service of manual non-interlocking Levers		P02004	SSC 066	2 years	72 days	
S	Examination of Manual Point Lever (Racor Lever)		P02005	SSC 067	14 days	1 day	As part of Track Patrol	
S	Servicing of Manual Point Lever (Racor Lever)		P02006	SSC 068	3 months	18 days		
Swing Nose Crossing Examination	S	Level 1 Detailed Examination	Applies to PRE and VAE Swing nose installations	P08024	SSC 060	4 months	12 days	As part of Detailed Walking Examination
	S	Level 2 Detailed Examination		P08025	SSC 061	1 year	36 days	As part of Examination of Special Track Layouts
	S	Ultrasonic Examination		P08026	SSC 064	6 months	18 days	As part of Ultrasonic testing of crossing and turnout rails
In-bearer examination	S	All locations		P08001	SSC 052	1 year	36 days	As part of Examination of Special Track Layouts
Special Turnout examination	S	Similar flexure turnouts and tangential turnouts on main lines		P08099	SSC 053	6 months	18 days	Particular attention is drawn to any similar flexure turnouts (ie where the outside rail nominally the 'high rail' is the stockrail) which are subject to curve wear. For such cases, the fit of the switch against the stockrail, the condition of the switch, the stockrail and the switch tip height, width and angle should be assessed
Special Switch FFU / Timber Examination	NA	Interlocked points on FFU / Timber bearers (locations with a history of points failures)		P09002	SSC 054	On event	N/A	Event trigger: Prior to periods of extreme temperature such as Summer or Winter
Inspection of Crossing condition	NA	Lines carrying > 15MGT per annum		P08004	SSC 055	On event	N/A	After installation: 1 month for 12 months. Grinding: one off first month and as required after one month. Reference: EI-T-18-01 & EI-T-18-02
	NA	Lines carrying ≤ 15MGT per annum				On event	N/A	After installation: Each month till first grind then each 3 months for 6 months After repair (building up): each 2 months until first grind In service: as part of Turnout Examination



Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Examination of Manganese crossings	S	All manganese crossings	P08028	SSC 063	3 months	9 days	Additional examination due to ultrasonic examination being of limited effectiveness
Visual Examination of High rail Tangential Switches	C	Olympic Park and other nominated locations subject to high wear	P08005	SSC 056	7 days	N/A	For tangential turnouts where the main line route has been bent to a sharp curve and the high rail switch is subject to high wear rates. These locations shall be determined in conjunction with the Senior Manager Track Engineering (NMD) Can be done in conjunction with normal track patrol
Wear Examination of High rail Tangential Switches	S	Olympic Park and other nominated locations subject to high wear	P08003	SSC 057	2 months	6 days	For tangential turnouts where the main line route has been bent to a sharp curve and the high rail switch is subject to high wear rates. These locations shall be determined in conjunction with the Senior Manager Track Engineering (NMD) This period is to be reduced to one month should any significant wear on the switches be detected
Expansion switch examination	S	VAE 300mm Expansion Switches	P08008	SSC 058	1 year	36 days	Where fitted. Examination to be completed during winter months at time of maximum switch contraction
	S	All OTHER Expansion switches			1 year	36 days	
Ultrasonic testing of switches crossing and turnout rails (including, catchpoints, diamonds & slips)	S	All Main Lines and Crossing Loops (except as below)	P08002	SSC 062	6 months	18 days	
	S	Unanderra – Nowra			1 year	36 days	
Ultrasonic Examination of Expansion Switches	S	All Expansion switches	P08007	SSC 065	6 months	18 days	
Ultrasonic testing of switches	S	Heeled switches with recorded crack predictors	P08002	SSC 062	3 months	9 days	
<b>A-6 – Drainage</b>							
Wet weather - special examination	NA	All operational lines	P23003	SSC 091	On event	N/A	Event trigger: at times of heavy rain (>50mm in 24 hours) or potential flooding (includes functioning of drainage structures such as trash racks, sedimentation basins and flow control structures)
Surface drain examination	S	All operational lines			1 year	36 days	Prior to period of greatest rainfall (Aug or Dec) (includes functioning of drainage structures such as trash racks, sedimentation basins and flow control structures)
	NA	All sidings	1 year	36 days			
Sub-surface drain examination	S	All lines	P23003	SSC 091	1 year	36 days	Prior to period of greatest rainfall (Aug or Dec)
	NA	All sidings			1 year	36 days	Prior to period of greatest rainfall (Aug or Dec)

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Sub-surface drain Rubbish collection	S	All operational lines (where applicable)			6 month	18 days	Currently applicable to City inner and outer, up shore & down shore, ESR Up and Down, Illawarra relief up and down, Engine Dive and Illawarra Dive up and down
Pump system examination	S	All	P23005	SSC 242	6 months	18 days	May be varied in accordance with operational criticality of system
		All sumps and drainage pit structures (where applicable)			3 month	9 days	CBD area only
					1 year	36 days	
<b>A-7 – Train Monitoring Equipment</b>							
Track Magnet Routine Maintenance Examination	S	All mainline locations (where installed)	P01001	SSC 096	7 days	N/A	In conjunction with Track Patrol - Examination of Signs and Magnets present
		All siding locations (where installed)			14 days	N/A	In conjunction with Siding Patrol - Examination of Signs and Magnets present
		All locations (where installed)		SSC 096	6 months	18 days	In conjunction with Detailed Walking - Examination of magnets and fastenings
<b>A-8 – Track Equipment</b>							
Detailed Examination	S	All fixed buffer stops and lower order protection devices	P15011	SSC 233	4 years	145 days	
		All energy absorbing buffer stops	P15029	SSC 234	1 year	36 days	Includes friction and combination hydraulic/friction buffer stops
Special Examination	N/A	All energy absorbing buffer stops	P15030	SSC 235	On event	-	After an impact from track machinery/rolling stock or following damage by road or rail vehicles
<b>A-9 – Earthworks</b>							
General Examination	S	All Cuttings & Embankments which are not risk assessed	P15009	SSC 404	1 year	36 days	In conjunction with Detailed Walking Examination
Detailed Examination	S	All Cuttings which are not risk assessed	P15031	SSC 400	On event	N/A	Subject to the finding of General Examination (Job P15009) and assessment from Civil Engineer.
		All Embankments which are not risk assessed	P15032	SSC 401			

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Geotechnical risk site examination (By Track patrol)	C	All risk rank A sites without EWS (slip detector) Safety critical sites should be classified as defects and managed separately.	For Cutting P15031	SSC 400	Continuous on event	None	Event trigger: Prior to and during passage of trains in dry weather
		All risk rank A sites with EWS (slip detector)			1 day	None	
	S	All risk rank B+ sites without EWS in wet weather	For Embank P15032	SSC 401	1 day	None	
		All risk rank B+ sites without EWS in dry weather			Two per week	None	
		All risk rank B+ sites with EWS in wet weather			Two per week	None	
		All risk rank B+ sites with EWS in dry weather			1 month	6 days	
		All risk rank B-,P1 sites without EWS in wet weather	For Shotcrete/ Fibrecrete P15033	SSC 402	Various	*	* For monthly period, 6 days; otherwise in conjunction with Detailed Walking Examination.
		All risk rank B-,P1 sites without EWS in dry weather			1 month	6 days	
		All risk rank B-,P1 sites with EWS in wet weather	For Rocknets/ Catch Fences/ Rockfall Barriers P15034	SSC 403	1 month	6 days	
		All risk rank B-,P1 sites with EWS in dry weather			Various	*	* For monthly period, 6 days; otherwise in conjunction with Detailed Walking Examination.
		All risk rank B-,P2 sites without EWS in wet weather			1 month	6 days	
		All risk rank B-,P2 sites with EWS in wet weather			Various	*	* For monthly period, 6 days; otherwise in conjunction with Detailed Walking Examination.
		All risk rank B-,P2 sites without EWS in dry weather			Various	*	* For monthly period, 6 days; otherwise in conjunction with Detailed Walking Examination.
		All risk rank C+P1, C+P2, C- and D sites with or without EWS and in both wet and dry weather			Various	*	* For monthly period, 6 days; otherwise in conjunction with Detailed Walking Examination.

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Geotechnical risk review inspection for cutting and embankments  (By Geotech. Engineer.)	S	All risk rank A sites without EWS (slip detector)	P15004	SSC 405	7 days	None	
		All risk rank A sites with EWS (slip detector)			1 month	3 days	
		All risk rank B+ sites without EWS in wet weather			1 month	6 days	
		All risk rank B+ sites without EWS in dry weather			1 month	6 days	
		All risk rank B+ sites with EWS in wet weather			6 months	36 days	
		All risk rank B+ sites with EWS in dry weather			6 months	36 days	
		All risk rank B-,P1 sites without EWS in wet weather			6 months	36 days	
		All risk rank B-,P1 sites without EWS in dry weather			6 months	36 days	
		All risk rank B-,P1 sites with EWS in wet weather			6 months	36 days	
		All risk rank B-,P1 sites with EWS in dry weather			6 months	36 days	
		All risk rank B-,P2 sites without EWS in wet weather			6 months	36 days	
		All risk rank B-,P2 sites with EWS in wet weather			6 months	36 days	
		All risk rank B-,P2 sites without EWS in dry weather			6 months	36 days	
		All risk rank C+P1 sites with or without EWS and in both wet and dry weather			Various	*	* For 6-month period, 36 days; for 1- year period, 72 days)
		All other risk rank C+P2, C- & D sites with or without EWS and in both wet and dry weather			1 year	72 days	
Monitoring of Geotechnical Instruments	NA	De-Vegetation around all inclinometer and piezometers	P15035	-	1 year	36 days	
	S	Flushing of piezometers	P15036	SSC 406	2 year	72 days	
<b>A-10 – Level Crossings</b>							
Level crossing examination	S	Level crossings, track vehicle access points and track vehicle take offs on lines with passenger traffic Level crossings, track vehicle access points and track vehicle take offs on lines carrying more than 10mgt pa	P24001	SSC 301	1 year	36 days	Note – includes all signs and road markings
Sight distance Assessment	NA	All level crossings	-	TBA	On event	N/A	Event Trigger: Changes to sight distance standards, notification of changes in road or rail traffic patterns (volume, speed, vehicle type)

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
<b>A-11 – Structures</b>							
Detailed Structures Examination	S	All timber bridges on operational lines	P26002 P26036	SSC 200 SSC 201	2 years	72 days	Includes steel and concrete components of timber bridges and timber components of steel or concrete bridges
	S/C	All underbridges, overbridges and footbridges in <b>poor condition</b> including masonry bridges All bridges with cast iron components (Note: One general examination in between two detailed)		SSC 200 SSC 201	2 year (DT) 2 year (G) (see App D)	72 days	<b>Note:</b> All steel underbridges (superstructure) over the age of 100 years shall be considered as <b>poor condition</b> until a detailed/ engineering assessment determines its new examination regime
	S	All steel or concrete underbridges including flyover, dives, multilevel stations,		SSC 200 SSC 201	As defined in table 6 & 7 in Appendix D	Variable	Steel includes Wrought and Cast iron Concrete includes reinforced and prestressed concrete, brick, and stone bridges, PVC, or similar.
	S	All steel or concrete overbridges	P25001 P25003	SSC 210 SSC 211	4 years	145 days	
	S	All steel or concrete footbridges including stepways*	P27001 P27003	SSC 213 SSC 214	4 years	145 days	includes footbridges of compressed fibro
	S	All pedestrian subway (steel, concrete or masonry)	P32001	SSC 204	4 years	145 days	
		All concrete or masonry culverts	P31001	SSC 204	4 years	145 days	Culverts includes undertrack pipes greater than 300m opening
		All steel culverts	P31001	SSC 204	1 years	36 days	Culverts includes undertrack pipes greater than 300m opening
	S	All Overhead wiring structures and signal bridges All Combined OHW and Pantograph Condition Monitoring System bridges	P15019	SSC 220	4 years	145 days	Members identified as deteriorated during basic examination, but inaccessible from ground level, are to be noted for subsequent detailed examination under "power outage" conditions.
	S	All Tunnels	P22001	SSC 222	4 years	145 days	Ref: MNA 00119
	S	All cattle stops, ash/sand traps, traffic barriers, bridge balustrades, sedimentation basins storm water flow controls and similar structures)	P21002	SSC 224	4 years	145 days	
	S	All air space developments	P25005	SSC 225	4 years	145 days	
	S	<b>Miscellaneous Structures:</b> lighting towers, service crossings, loading banks & stages, turntables, fixed cranes, weighbridges, overhead water tanks, sedimentation basins, stormwater flow controls and similar structures,	P21002	SSC 224	4 years	145 days	
	S	All Retaining Walls, Noise Abatement Walls and Platform Walls	P21001	SSC 223	4 years	145 days	
	S	Crib walls and reinforced soil walls	P21001	SSC 223	2 years	72 days	
S	All track Rigid slabs	P06003	SSC 227	2 years	72 days		
S	All track Floating slabs	P06004					

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Underwater examination	S	All underbridges with pier/column bases permanently underwater	P26038	SSC 230	6 years	216 days	Depending on deterioration shown at the previous examination, or if major scouring is suspected. Separate post flood examination to protect against occasional damage - frequency should be based on condition or major structures over continuously moving waterway such as the Hawkesbury river or Como bridge
Broad flange beam exam	S	All broad flange beams over roadways	P26001	SSC 203	1 month	6 days	
Special examinations	NA	All structures	UB P26041  OB P25004  Culvert P31003	SSC 231	On event	N/A	Event Trigger: during periods of heavy rain, of flooding, fire, earthquake, geotechnical activity or following damage by road or rail vehicles.
General Structures Examination	S	All timber transoms / on underbridges on operational lines. All FFU (Fibre Reinforced Foamed Urethane) Transoms and Walkway components (including joists, bearers and decking material)	P26050	SSC 208	1 years	36 days	In conjunction with 90 days detailed walk (where practical)
		All timber bridges	UB P26012	SSC 202	2 year	72 days	At least once in the period between Detailed Structures examinations
		All steel or concrete underbridges including flyover, dives, multilevel stations,	UB(Steel) P26036	SSC 202	As defined in table 6 & 7 in Appendix D	Variable	Steel includes Wrought and Cast iron Concrete includes reinforced and prestressed concrete, brick, and stone bridges, PVC, or similar. This includes inspection of timber transoms over underbridges.
		All steel or concrete overbridges*	P25002	SSC 212	4 years	145 days	(* The new TMP will be in line with underbridges)
		All steel or concrete footbridges including stepways	P27002	SSC 215	4 years	145 days	Include footbridges of compressed fibro
		All pedestrian subways (steel, concrete or masonry)	P32002	SSC 205	4 years	145 days	
		All concrete or masonry culverts	P31002	SSC 205	4 years	145 days	Culverts includes undertrack pipes greater than 300m opening
		All Overhead wiring structures and signal bridges All Combined OHW and Pantograph Condition Monitoring System bridges	P15020	SSC 221	4 years	145 days	

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Structures Assessment (To follow detailed structures examinations)	S	All timber bridges	P00041	SSC 232	2 years	72 days	<b>To follow detailed structures examinations</b> As assessment of detailed examination results in order to ensure the continuing integrity of each structure. Variable Latitude 1 year = 36 days 2 years = 72 days 4 years = 145 days 6 years = 216 days
		All underbridges, overbridges & footbridges in poor condition including masonry bridges.			1 year	36 days	
		All other Under bridges			Variable	Variable	
		All other overbridges, culverts, pedestrian subways tunnels, retaining walls over 2m high supporting rail embankments or adjacent to mainline			4 years	145 days	
		Piers & column above waterline after underwater examination			6 year	216 days	
Engineering Assessment	NA	All underbridges over 30 years of age	P00055	See Appendix D	30 years	3 years	Engineering assessment includes fatigue assessment.
Structure damage assessment	NA	All Structures	P00042	SSC 231	On event	N/A	Event trigger: Any irregular event potentially affecting the integrity of the structure. E.g. Rail or road vehicle impact, flood, land slide/slip, earth tremor, etc.
Routine Cleaning	NA	All underbridges, culverts and subways	UB P26054	SSC 206	2 years	72 days	
		All overbridges and footbridges	OB P26055 FB P26056	SSC 216	4 years	145 days	
	S	Surface drain / Track Slab Jet / Hydrovac (where applicable)		TBA	1 year	36 days	Currently applicable to Boronia & Zigzag tunnels
	S	Sub-surface drain - Jet / Hydrovac (where applicable)		TBA	2 years	72 days	Currently applicable to City inner and outer, up shore & down shore, ESR Up and Down and Illawarra relief up and down
Servicing of Bearings	NA	All underbridges (where applicable)	UB P26032	SSC 207	2 years	72 days	
		All overbridges and footbridges (where applicable)	OB P26057 FB P26058	SSC 217	4 years	145 days	
<b>A-12 – Right of Way</b>							
Right of Way examination	S	All operational lines	P29001	SSC 310	1 year	36 Days	As part of Detailed Walking Examination (includes fencing , vegetation, access roads, firebreaks, vermin control, cattle grids, site litter control)
	S	All sidings			2 year	72 Days	
Railway sign & 8 Car Markers examination	S	All lines	P15008	SSC 311	1 year	36 Days	As part of Detailed Walking Examination Includes Speed boards and Safety Signs
	S	All sidings			2 year	72 Days	

Technical Maintenance Plan							
Service Description	Safety Importance	Applicability	Standard Job no	Service Schedule	Period	Latitude	Comments
Permanent Speed sign examination	S	All lines	P15006	SSC 312	1 year	36 days	As part of Detailed Walking Examination - correctness of signs (for position, speed shown , track indicated etc)
Special warning device examination	S	Devices connected to signals (e.g. slip detector)	-	TBA	90 days	9 days	In accordance with Signals TMP SC0780 "Field Equipment – Trackside Warning Devices"
		Other devices	-	TBA	1 month	6 days	or as required by design for specific equipment/situation (includes, geotechnical and hydrological warning devices)
Evacuation signs cleaning and inspection	S	City Underground Tunnels, North Sydney Tunnels, Eastern Suburbs Railway Tunnels, Airport Line Tunnels	P22006	SSC 240	1 year	36 days	
Boat ramps cleaning and inspection	S	Hawkesbury River Long Island, Wondabyne and other locations where applicable	P21003	SSC 245	1 year	36 days	



## Appendix B Detailed Plain Track Rail Testing Schedule

Line	Section	Kilometrage	RIS Database
<b>North</b>			
North Shore	North Shore Up & Down	0.000 – 5.968	4 Months
North Shore	Gordon Up Road Platform	17.016 - 17.343	12 Months
Epping to Chatswood	Epping – Chatswood Up & Down	11.294 - 25.632	4 Months
North Shore	Lindfield Up Road Platform		12 Months
Main North	Main North Up & Down	12.759- 163.762	4 Months
Main North	Main North Suburban Up & Down		4 Months
Main North	Strathfield to Rhodes Relief Down		4 Months
Main North	Epping Refuge Down		4 Months
Main North	Epping Up Main to Down Main Connection		4 Months
Main North	Pennant Hills to Thornleigh Relief Up & Down		4 Months
Main North	Hornsby No1 Turnback Road Down		4 Months
Main North	Hornsby No 2 Turnback Road	34.600 - 34.850	12 Months
Main North	Hornsby Down Refuge	34.100 - 34.600	6 Months
Main North	Hornsby Loop Up		4 Months
Main North	Berowra Loop Down		4 Months
Main North	Cowan Refuge Up	46.900 - 48.685	6 Months
Main North	Hawkesbury River Refuge Up	57.175 - 57.875	6 Months
Main North	Gosford Refuge Up & Down	81.010 - 81.598	6 Months
Main North	Wyong Refuge Up	100.735 - 101.160	6 Months
Main North	Awaba Refuge Up & Down		6 Months
Main North	Morisset Refuge Up	123.470 - 124.030	12 Months
Main North	Adamstown to Woodville Jct Relief Up	161.400 - 163.750	4 Months
Main North	Sulphide Jct Refuge Loop Up & Down		6 Months
Main North	Sulphide Jct Siding Up	152.778 - 153.330	12 Months
Broadmeadow Via Dn Relief	Broadmeadow via Relief Down	161.000 - 163.736	4 Months
Broadmeadow Via Dn Relief	Broadmeadow via Relief Down	163.736 - 164.295	8 Months
Main North	Broadmeadow Yard Up & Down Through Road	161.300 - 162.300	6 Months
Woodville Jct To Newcastle	Woodville Jct to Newcastle Up & Down	163.762 - 164.408	4 Months
Hamilton Jct to Islington Jct	Hamilton Jct to Islington Jct Main Up & Down	163.797 - 168.216	4 Months
Newcastle	Newcastle Platform No3 & 4 Road	167.918 - 168.216	12 Months
<b>Illawarra</b>			
Illawarra	Illawarra Main Up & Down	2.800 - 59.939	4 Months
Illawarra	Illawarra Local Up & Down	2.800 - 15.036	4 Months
Illawarra	Illawarra Single Line	59.939 - 61.825	4 Months
Illawarra	Illawarra Main Up & Down	61.825 - 84.377	4 Months
Illawarra	Illawarra Single Line	84.377 - 85.324	6 Months
Illawarra	Illawarra Main Up & Down	85.324 - 87.844	6 Months
Illawarra	Illawarra Single Line	87.844 - 153.63	6 Months
Illawarra	Illawarra Loops Dapto - Kiama		12 Months
Illawarra	Nowra No 2 Down Goods Siding	153.221 - 153.600	12 Months
Illawarra	Sutherland Platform Road & Platform Road to Cronulla Branch Connection		6 Months
Inner Harbour Branch	Inner Harbour Branch Up & Down, South Fork Flyover Up & Down, No.1-4 Arrival Road & No.0-5 Departure Road, Oil Siding, No. 1-2 Storage Siding		6 Months

Line	Section	Kilometrage	RIS Database
Coniston To Port Kembla	Unanderra North to Allens Creek Loop Triangle	85.316 - 86.382	6 Months
Coniston To Port Kembla	Inner Harbour Yard Port Corporation No1-2 Siding	84.200 - 85.500	6 Months
Coniston To Port Kembla	Port Kembla Up & Down	84.317 - 88.644	6 Months
Coniston To Port Kembla	Port Kembla Refuge Loop Up	88.950 - 89.850	6 Months
Coniston To Port Kembla	Port Kembla Single Line	88.644 - 90.390	6 Months
Illawarra	Sutherland Refuge Up & Down		8 Months
Illawarra	Coalcliff Refuge Down	58.980 - 60.345	8 Months
Illawarra	Thirroul Refuge Down, Refuge Loop Up, Platform Road		8 Months
Illawarra	Waterfall Goods Up, Refuge Loop Up & Down		8 Months
Illawarra	Wollongong Refuge Up & Down	82.996 - 83.951	8 Months
Sutherland To Cronulla	Sutherland to Cronulla Main Up & Down & Single	24.896 - 35.009	6 Months
Tempe To Glenfield Jct	East Hills Local Up & Down	7.285 – 33.000	4 Months
Tempe To Glenfield Jct	East Hills Main Up & Down		4 Months
New Southern Railway	Airport Line Up & Down		4 Months
<b>Central</b>			
North Shore	North Shore Up & Down	5.968 - 25.397	4 Months
Eastern Suburbs	Eastern Suburbs Up & Down		4 Months
Illawarra	Illawarra Main Up & Down	0.510 – 2.800	4 Months
Illawarra	Redfern Eveleigh Dive Up		12 Months
Illawarra	Illawarra Local Up & Down	0.000 - 2.800	4 Months
Illawarra	Illawarra Relief Up & Down	0.000 - 2.800	4 Months
Illawarra	Central Illawarra Terminal Road Down	0.180 - 0.520	12 Months
Illawarra	Illawarra Dive Up & Down	1.430 - 2.365	4 Months
Main	Central Platform 23 Crossover 625		4 Months
Main	Sydney Platform No3 - 15 Road Platform		12 Months
City Circle	City Circle City Inner & City Outer	0.00 - 5.893	4 Months
City Circle	Central City Outer 2 Platform 23		4 Months
City Circle	Central City Inner 2 Platform 21		4 Months
Main North	Main North Up & Down	11.6 – 12.759	4 Months
Suburban	Suburban Up & Down	0.00 - 17.995	4 Months
Main	Main Up & Down	0.000 - 17.995	4 Months
Local	Local Up & Down	0.000 - 12.577	4 Months
Main	Ashfield Terminal Rd Road Platform		12 Months
Main	Strathfield Back Platform Road		4 Months
Main	Homebush Local Terminal Road Platform		4 Months
Main	Lidcombe Shuttle Road Up		4 Months
Main	Olympic Park Loop Inner Platform Loop		4 Months
Flemington Junction	Homebush Bay West Fork Up & Down		4 Months
Flemington Junction	Homebush Bay Connection Single Line	15.078 - 15.328	4 Months
Flemington Junction	Flemington Goods Connection Single Line	15.192 - 15.374	6 Months
Flemington Goods	Enfield East Fork Up & Down Loop Triangle	19.813 - 20.100	6 Months
Flemington Goods	Flemington Goods Up	13.587 - 15.444	6 Months
Flemington Goods	North Strathfield Goods Single Line	12.700 - 15.444	6 Months
Olympic Park Loop	Homebush Bay East Fork Up & Down		4 Months
Olympic Park Loop	Olympic Park Balloon Loop		4 Months
Bankstown Line	Bankstown Line Up & Down	5.113 - 22.730	4 Months
Bankstown Line	Bankstown Up Loop		12 Months
Main South	Main South Up & Down	16.740 – 17.995	4 Months
Main South	Lidcombe Western Loop Triangle		4 Months

Line	Section	Kilometrage	RIS Database
Main South	Sefton Park Jct East Fork Down		4 Months
Main South	Sefton Park Jct East Fork Up		4 Months
Botany Line	Botany Line Up & Down & Single Line	6.663 – 16.000	12 Months
Metropolitan Goods	Meeks Road East Fork Up & Down & North Fork Up		6 Months
Metropolitan Goods	Metrop Goods Up & Down (South Fork) & Down North Fork		12 Months
Metropolitan Goods	Metropolitan Goods Up & Down	6.064 - 20.334	6 Months
Chullora Jct To Sefton Park Jct	Chullora Jct North Fork Up		6 Months
Chullora Jct To Sefton Park Jct	Chullora Jct to Sefton Park Jct Up & Down	17.083 - 22.27	6 Months
<b>West</b>			
Main South	Main South Up & Down	17.995 - 28.210	4 Months
Main South	Liverpool Refuge Down		12 Months
Main South	Ingleburn Glenfield Loop Up	40.701 - 46.435	6 Months
Main South	Glenfield Terminating Road Platform		12 Months
Main South	Campbelltown Up Refuge		12 Months
Main South	Campbelltown Down Refuge	53.690 - 54.353	6 Months
Main South	Macarthur Terminating Road Up		12 Months
Granville To Cabramatta	Granville to Cabramatta Main Up & Down		4 Months
Merrylands To Harris Park	South West Inner & Outer Loop Triangle		4 Months
Main West	Main Up & Down	17.500 - 155.78	4 Months
Main West	Main West Up & Down	155.780 - 171.427	6 Months
Suburban	Suburban Up & Down	17.230 - 47.655	4 Months
Main West	Blacktown Refuge & Loop Up	35.084 - 35.627	4 Months
Main West	Richmond Branch Up & Down	32.270 - 34.734	12 Months
Blacktown To Richmond	Blacktown to Richmond Branch Up & Down & Single	34.726 - 60.550	12 Months
Blacktown To Richmond	Blacktown to Richmond Branch Loops		12 Months
Main West	Penrith to Lithgow Refuges	109.223 - 110.437	12 Months
Main West	Penrith No1 Down Siding & Up Road Platform	55.175 - 55.788	12 Months
Clarence Colliery Balloon Loop	Clarence Colliery Balloon Loop		12 Months
Main West	Lithgow Coal Stage No1 Down Reception Siding Down	153.310 - 154.110	12 Months
Main	Clyde Branch Platform Road Up & Platform Road to Up Branch Connection		12 Months
Main	Clyde Up Yard Up & Down Through Road		12 Months
Clyde To Carlingford	Clyde to Carlingford Up & Down & Single	20.754 - 28.067	12 Months
Rosehill To Sandown	Rosehill to Sandown Single Line	22.302 - 24.163	12 Months
Rosehill To Sandown	Sandown Loop Down	23.680 - 24.186	12 Months

## Appendix C Implementation of Varied Track Patrol Arrangements

### C-1 – Adjacent Track Patrol and Night Patrol

Adjacent Track Patrols and Night Patrols allow the replacement of some Walking patrol with Adjacent Track Patrols and Night Patrols subject to the requirements detailed below.

Adjacent Track Patrols and Night Patrols may only be implemented as part of a Tailored Technical Maintenance Plan approved through the Track Engineering Manager.

Three patrol regimes are available, as follows, and as shown in Table 1.

- Two daytime Adjacent Track Patrols plus one Walking Patrol of special trackwork (can be a Night Patrol). Adjacent tracks to be observed from both sides during the weekly cycle.
- A daytime Walking Patrol plus one Engine Patrol plus one additional Standard Track Patrol of special trackwork
- Two daytime Adjacent Track Patrols plus one Walking Patrol per fortnight (can be a Night Patrol), plus one Engine Patrol per fortnight. Walking Patrol and Engine Patrol are to be staggered so that one or other is undertaken each week.

An Adjacent Track Patrol is where the track is inspected from the adjacent track or from further away than the adjacent track but no more than a distance equivalent to two track widths.

Examinations of all plain track , turnouts and special trackwork					
		Week 1		Week 2	
1	Plain Track & Special Trackwork	Adjacent Track Patrol	Adjacent Track Patrol	Adjacent Track Patrol	Adjacent Track Patrol
		Walking Patrol OR Night Patrol		Walking Patrol OR Night Patrol	
2	Plain Track	Walking Patrol	Engine Patrol	Walking Patrol	Engine Patrol
	Special Trackwork		Walking Patrol		Walking Patrol
3	Plain Track & Special Trackwork	Adjacent Track Patrol	Walking Patrol OR Night Patrol	Adjacent Track Patrol	Engine Patrol

**Table 1 – Adjacent Track patrol Regime**

The following conditions apply to Adjacent Track Patrols:

- Adjacent tracks shall be observed from both sides during each weekly cycle.

### C-2 – Engine Patrol

A routine Track Patrol may be carried out from the front of an engine instead of by walking or by track vehicle. This may only occur:

- where by Engine Patrol is included in an Integrated Track Patrol regime, OR
- when a patrol opportunity is lost due to strike/loss of possession etc, a single standard patrol may be replaced by an Engine Patrol, OR
- to supplement routine patrols such as during special events.

The following conditions apply to Engine Patrols:

- they cannot be used for consecutive routine track patrols except where permitted as part of an integrated track patrol regime,
- the previous scheduled routine track patrol shall have been carried out normally,
- Any serious safety issues identified shall be followed up with a site inspection.

Use of Engine Patrols to replace a single standard patrol opportunity lost due to strike/loss of possession is subject to the following additional requirements:

- use shall be approved by the Senior Manager Track Engineering (NMD) individual patrol requirements shall be reviewed by the Senior Manager Track Engineering (NMD) for the patrol area
- the Senior Manager Track Engineering (NMD) shall keep a written record of the use of engine patrols including date, locations patrolled by engine, last normal patrol date, and special inspections or patrol methods used
- the Senior Manager Track Engineering (NMD) shall forward written advice of these details to the Professional Head Track (ESI), within 24 hrs.

### C-3 – Integrated Track Patrol Regime

The "Integrated Track Patrol" regime allows the replacement of some Walking/Hi-rail patrols with Mechanised Track Patrol and Engine Patrol subject to the requirements detailed below.

Four patrol regimes are available, as follows

1. Basic Integrated Patrol of all plain track, turnouts and special trackwork (See Table 2)  
This uses a combination of Walking Patrol, Engine Patrol, Mechanised Track Patrol and Supplementary Patrol  
It is applicable on main lines in the Metropolitan area.
2. Special Integrated Patrol of all plain track, turnouts and special trackwork (See Table 3).  
This uses a combination of less frequent Walking Patrol with Engine Patrol, Weekly Mechanised Track Patrol and Supplementary Patrol.  
It is applicable on main lines in the Metropolitan area.
3. Examinations of all plain track, turnouts and special trackwork in Hi-Rail Patrol Areas (See Table 4).  
This uses a combination of Hi-Rail Patrol, Walking Patrol, Engine Patrol, Mechanised Track Patrol and Supplementary Patrol.  
It is applicable on main lines in Outer Suburban and Regional areas north of Hornsby, west of Emu Plains and south of Waterfall.
4. Examinations of all ancillary lines (See Table 5).  
This uses a combination of Hi-Rail Patrol, Walking Patrol, Engine Patrol, Mechanised Track Patrol and Supplementary Patrol.  
It is applicable on relief lines, refuges, crossing loops, passing loops, goods loops, turnbacks and platform roads where the operating speed is  $\leq 80$ kph.

Where, for any reason, the standard patrol (Walking Patrol or Hi-Rail Patrol) cannot be undertaken on the day on which it is planned, it may NOT be substituted by an Engine Patrol. Senior Manager Track Engineering (NMD) may, however, authorise a delay of one day only. This would mean that Walking Patrol or Hi-Rail Patrol may be conducted on the eighth day after the previous Walking Patrol or Hi-Rail Patrol. Any further delay requires authorisation through the Professional Head Track (ESI).

## (EXTRACTS FROM EI 14/03 MTP Camera Failure Protocols)

In the event that Mechanised Track Patrol cameras fail, alternative procedures may need to be implemented.

### Camera Failure Strategies

#### 'Track View' Cameras

- If one of the 'Track View' cameras has failed – is there a satisfactory track camera image (front or rear) available?

#### Normal Day Light Conditions

If YES – MTP Review can proceed (even using the Infrared Camera).

If NO – The run has failed. A re-run must be programmed for the following day.

### Tunnels and Low Light Areas (Infrared Camera)

As there is only one Infrared Track camera, the run would fail. A re-run must be programmed for the following day.

Notes:

1. Some sections may be affected by sunlight, shadowing, or over exposure. These sections can be reviewed using the 'Rail Cameras'

#### **'Rail Cameras' – Loss of One Camera**

If there is a loss of one of the 'Rail Cameras', then the response will vary depending on the track condition and the infrastructure involved; i.e.

- **Plain Track in good condition**

MTP review can proceed, assuming that the previous MTP review of this section had both 'Rail Cameras' working correctly.

- **Supplementary Patrol Areas and GIJ's in poor condition**  
The section must be manually patrolled within 24 hours.
- **Turnouts and Special Trackwork**  
The action required is dependant upon the current walking patrol frequency for that particular turnout / asset:
  - a. 7 day cycle – No further action.
  - b. 14 day cycle – Manually patrol within 7 days, and inspect the rail affected by the missing camera. (If turnout patrols are mid-cycle offset from the mechanised patrol, then this will be addressed by the next turnout patrol).
  - c. 28 day cycle – Manually patrol within 7 days, and inspect the rail affected by the missing camera.

#### **'Rail Cameras' – Failure Criteria**

If there is a loss of more than one 'Rail Camera', the run has failed. A re-run must be programmed for the following day.

There must not be failed 'Rail Cameras' on consecutive runs.

If there were 'Rail Camera' failures on the previous patrol then a re-run is required.

#### **'Easement View' cameras**

##### **Normal Day Light Conditions**

If one of the 'Easement View' cameras has failed, and there is a satisfactory 'Easement View' camera image (either Front or Rear), then the standard review can be undertaken using the alternative imagery.

##### **Tunnels and Low Light Areas (Infrared Cameras)**

If one of the 'Infrared Easement View' cameras has failed, and there is satisfactory 'Infrared Easement View' camera image (either Front or Rear), then the standard review can be undertaken using alternative imagery.

**Note:** Upon commencement of using the Infrared Imagery system the Front Easement view will be darker due to less lighting. It is only permissible to use this camera imagery in this failure scenario for a maximum of 1 week in a row. Once equal light has been achieved on both cameras this requirement does not apply.

If both cameras are lost, then there is a further alternative available which requires:

The front of engine inspection having been satisfactorily completed by the patroller on the Mechanised Patrol vehicle, and

Splicing the successfully recorded 'Easement View' imagery from the previous run, into the office review. This is required to provide context to the patroller.

If these alternatives cannot be provided, the run has failed, and a re-run must be programmed for the following day.

**General Requirements**

The actions apply to only those sections of track affected by the camera failure. If only small sections are affected, it may be more efficient to manually patrol those areas, rather than conduct a re-run.

All missed camera sections are to be recorded on the Certification Form.

The MTP team must accurately record all missed camera sections, and flag them for resolution.

The basis of the altered requirements is that the camera failures are rare. The overall efficacy of the inspection regime should not be affected. If the camera failures were to become common, then the inspection regime would require a complete review and reassessment

<b>Examinations of all plain track , turnouts and special trackwork</b>				
	<b>Week 1</b>		<b>Week 2</b>	
Plain Track	Walking Patrol	Engine Patrol	Walking Patrol or MTP	Engine Patrol
Turnouts and Special Trackwork	Walking Patrol	Engine Patrol	Walking Patrol or MTP	Engine Patrol
<b>Additional examinations at locations where applicability requirements ARE NOT met</b>				
	<b>Week 1</b>		<b>Week 2</b>	
Plain Track In Poor Condition		Supplementary Patrol		Supplementary Patrol
Plain Track Glued Insulated Joints in Poor Condition		Supplementary Patrol		Supplementary Patrol
T/O and Special Trackwork in Poor Condition		Supplementary Patrol	Supplementary Patrol (if Turnout and Special Trackwork examination is by MTP)	Supplementary Patrol
<b>Notes:</b>				
<ul style="list-style-type: none"> <li>• Two patrols per 7 day week</li> <li>• A maximum of 3 calendar days between consecutive examination days</li> <li>• MTP to occur at least every 14 days, with imagery review within 24hrs of patrol (MTP can occur on 15th day, with imagery reviewed within 24hrs of patrol)</li> <li>• Common schedules to be aligned with each other</li> <li>• MTP &amp; EP on running road through turnouts and special trackwork</li> <li>• Regime may also be used in Hi-Rail Patrol lengths in Outer Suburban &amp; Regional areas.</li> </ul>				

**Table 2 – Basic Integrated Patrol – Main line**

<b>Integrated Walking examinations of all plain track , turnouts and special trackwork</b>					
		<b>Week1</b>	<b>Week2</b>	<b>Week3</b>	<b>Week4</b>
Plain Track		MTP+ Engine Patrol	Engine Patrol + Engine Patrol	MTP + Engine Patrol	Engine Patrol + Engine Patrol
Turnouts and Special Trackwork	Option1	MTP+ Engine Patrol	½ Walking Patrol + Engine Patrol	MTP + Engine Patrol	½ Walking Patrol + Engine Patrol
	Option2	MTP + Engine Patrol	Walking Patrol + Engine Patrol	MTP + Engine Patrol	Engine Patrol + Engine Patrol
Tunnels	CBD	MTP+ Engine Patrol	Walking Patrol + Engine Patrol	MTP + Engine Patrol	Engine Patrol + Engine Patrol
	Other	MTP+ Engine Patrol	Engine Patrol + Engine Patrol	MTP + Engine Patrol	Engine Patrol + Engine Patrol
<b>Additional examinations at locations where applicability requirements ARE NOT met</b>					
		<b>Week1</b>	<b>Week2</b>	<b>Week3</b>	<b>Week4</b>
Plain Track with known issues		MTP + Engine Patrol	Engine Patrol + Engine Patrol	MTP + Engine Patrol	Engine Patrol+ Engine Patrol
+ Supplementary Patrol as required					
T/O and Special Trackwork with known issues		MTP + Engine Patrol	Walking Patrol + Engine Patrol	MTP + Engine Patrol	Walking Patrol + Engine Patrol
+ Supplementary Patrol as required					
<b>Notes:</b>					
<ul style="list-style-type: none"> <li>• Plus Walking Patrol every 90 days for plain track</li> <li>• The Walking Patrol may be aligned with the Detailed Walking Examination and carried out at the same time, however the smaller latitude applies for tasks that are common between the two service schedules.</li> <li>• Turnouts can be inspected by either Option 1 or Option 2. Option 1 allows for turnout inspections is to be staggered so half are done each second week</li> <li>• Two patrols per 7 day week</li> <li>• A maximum of 3 calendar days between consecutive examination days</li> <li>• MTP to occur at least every 14 days, with imagery review within 24hrs of patrol (MTP can occur on 15th day, with imagery reviewed within 24hrs of patrol)</li> <li>• Common schedules to be aligned with each other</li> <li>• MTP &amp; EP on running road through turnouts and special track work</li> <li>• Regime may also be used in Hi-Rail Patrol lengths in Outer Suburban &amp; Regional areas.</li> </ul>					

**Table 3 –Special Integrated Patrol– Main line**



<b>Examinations of all plain track , turnouts and special trackwork in Hi-Rail Patrol lengths in Outer Suburban &amp; Regional areas</b>				
Plain Track	<b>Week 1</b>		<b>Week 2</b>	
		Hi-Rail Patrol	Engine Patrol	Hi-Rail Patrol or MTP
Turnouts and Special Trackwork	Hi-Rail Patrol	Walking Patrol	Hi-Rail Patrol or MTP	Engine Patrol
<b>Additional examinations at locations where applicability requirements ARE NOT met</b>				
Plain Track In Poor Condition	<b>Week 1</b>		<b>Week 2</b>	
		Supplementary Patrol		Supplementary Patrol
Plain Track Glued Insulated Joints in Poor Condition		Supplementary Patrol		Supplementary Patrol
T/O and Special Trackwork in Poor Condition			Supplementary Patrol (if Turnout and Special Trackwork examination is by MTP)	Supplementary Patrol
<b>Notes:</b>				
<ul style="list-style-type: none"> <li>• Two patrols per 7 day week.</li> <li>• A maximum of 3 calendar days between consecutive examination days.</li> <li>• MTP to occur at least every 14 days, with imagery review within 24hrs of patrol (MTP can occur on 15th day, with imagery reviewed within 24hrs of patrol)</li> <li>• Common schedules to be aligned with each other.</li> <li>• MTP and EP on running road through turnouts and special trackwork.</li> </ul>				

**Table 4 – Integrated Patrol – with Hi-Rail**

<b>Examinations of all ancillary lines</b>				
Plain Track	<b>Week 1</b>		<b>Week 2</b>	
		Walking Patrol or Hi-Rail Patrol		Walking Patrol or Hi-Rail Patrol or MTP
Turnouts and Special Trackwork	Walking Patrol		Walking Patrol or Hi-Rail Patrol or MTP	
<b>Additional examinations at locations where applicability requirements ARE NOT met</b>				
Plain Track In Poor Condition	<b>Week 1</b>		<b>Week 2</b>	
		Supplementary Patrol		Supplementary Patrol
Plain Track Glued Insulated Joints in Poor Condition		Supplementary Patrol		Supplementary Patrol
T/O and Special Trackwork in Poor Condition		Supplementary Patrol		Supplementary Patrol
<b>Notes:</b>				
<ul style="list-style-type: none"> <li>• One patrol per seven day week.</li> <li>• A maximum of seven calendar days between consecutive examination days.</li> <li>• MTP to occur at least every 14 days, with imagery review within 24hrs of patrol (MTP can occur on 15th day, with imagery reviewed within 24hrs of patrol)</li> <li>• Common schedules to be aligned with each other.</li> <li>• MTP and EP on running road through turnouts and special trackwork.</li> </ul>				

**Table 5 - Integrated Patrol – Ancillary lines**

## **C-4 – Applicability**

The Integrated Track Patrol regimes are ONLY applicable to track sections (including turnouts and special trackwork within the section) meeting the following mandatory requirements:

## **C-5 – Mandatory Requirements for Operation of the Integrated Walking Regime:**

The plain track, turnouts and special trackwork shall be tested weekly by MTP.

Each track shall be individually walked.

This regime shall not operate on whole tracks that are not signalled e.g. Kiama to Bomaderry Line.

This regime shall not operate in Sydney Yard (between Central and Cleveland St), an area with very intense and complex turnout infrastructure.

## **C-6 – Mandatory Requirements for Mainline Track Sections:**

The plain mainline track within the section shall meet the following criteria:

1. CONCRETE sleepered track, or
2. TIMBER sleepered track that satisfies ALL of the following criteria:
  - Rail is continuously welded (CWR).
  - Track is standard configuration.
  - The overall Track length is well tied for five years and sleepers provide adequate vertical support in accordance with the requirements of Engineering Manual MNT 20203 – Track Inspection, as assessed in Detailed Sleeper Examination Service Schedule SSC 046 (MNT 20101).

## C-7 – Mandatory Requirements for Ancillary Line Track Sections:

The ancillary line shall meet the following criteria:

1. For operating speeds > 50 kph and ≤ 80kph, the track section shall be fully concrete sleepersed, CWR, signal track circuited and the turnouts and special track work shall have concrete bearers.

This does not include turnouts and special trackwork connecting to the mainline, which are within the scope of the mainline patrols. If there are individual timber turnouts and special trackwork within a concrete sleepersed ancillary line section, these turnouts and special trackwork require additional examination in accordance with Table 5.

2. For operating speeds > 25 kph and ≤ 50 kph, the track section shall be CWR, signal track circuited and in moderate to good track condition considering speed and traffic.
3. For operating speeds ≤ 25kph or less, the track section shall be signal track circuited and in fair track condition considering speed and traffic.

## C-8 – Conditions Requiring Supplementary Patrol

Locations where the following requirements for additional examination apply shall be examined in accordance with additional examinations in Table 2, Table 4 and Table 5 above.

Rail affected by rail squats may require supplementary patrols. Current standards and any relevant Engineering Instructions should be considered in determining supplementary inspection requirement.

## C-9 – Plain track

1. Individual timber sleepersed track locations that do not satisfy each of the following criteria, require Supplementary Patrol as per Table 2 or Table 4:
  - track is well tied for 5 years and all sleepers within the vicinity of the location provide adequate vertical support in accordance with the requirements of MNT 20203 – Track Inspection as assessed in Detailed Tie/Sleeper Examination.
  - effective transoms in accordance with the requirements of MNC 10302, as assessed in Detailed Structures Examination.
2. Glued insulated joints (GIJs) in poor condition require Supplementary Patrol as per Table 2, Table 4, as per Table 2 or Table 4, where any of the following criteria exist within the area of the GIJ:
  - visible evidence of top or twist conditions (that may be assessed as P2 or worse) affecting the joint
  - visible signs of formation failure affecting the joint i.e. heaving beyond the ends of the sleepers or between the sleepers
  - bog holes affecting the joint i.e. track and ballast fouled and/or with mud pumping through the ballast
  - chipped rail ends at GIJs and/or evidence of heavy impact (extensive whitened ballast
  - GIJ plates working loose
  - timber sleepers that do not meet "good sleeper" condition within 2m of the GIJ
  - timber transoms that do not meet "effective transom" condition within 2m of the GIJ.

## C-10 – Turnouts and Special Trackwork

Turnouts and special trackwork in poor condition (up to but excluding the insulated joint at the plain track interface) require Supplementary Patrol as per Table 2 or Table 4. Supplementary Patrol is required where any of the following criteria exist:

### Conditions requiring inspection twice weekly by walking

1. Rail joints including non-glued insulated joints
2. 47kg/m, 53kg/m switches or heeled switches

### Conditions requiring inspection twice weekly by walking

1. Joints with poor vertical support (flogging joint) within turnout, indicated by one or more of the following:
  - visible evidence of poor top or twist conditions (that may be assessed as P2 or worse) affecting the joint
  - visible signs of formation failure affecting the joint. i.e. “heaving” beyond the ends of sleepers or between sleepers
  - “bog holes” affecting the joint. i.e. track and ballast fouled and/or with mud actively pumping through the ballast
  - chipped or battered rail ends at the rail joint and/or evidence of heavy impact (extensive whitened ballast)
  - loose bolts in joint, indicating Fish plates working loose
2. Joints with poor lateral support within turnouts or special trackwork i.e. sleepers/bearers/fastenings failed, or poor fastenings and bearers at crossing/checkrail. This will be indicated by bearers and sleepers not satisfying all of the following criteria:
  - effective bearers in accordance with the requirements of MNT 20203 – Track Inspection as assessed in Detailed Sleeper Examination and Examination of Special Track Layouts
  - sleepers and sleeper fastenings as per the plain track applicability requirements above
3. Locations with heeled switches (jointed) with the following conditions:
  - flogging heels or poor track condition in the area of the heel, as defined in 1. above
  - where the Rail flaw operators advise that strong crack predictors were assessed to be present in the heel of the switch or present in the closure rail at the heel
  - heels damaged in other ways, e.g. deformation or excessive wear in the heel block
  - proud rail ends and battered rail ends
  - flexible switches are not subject to this limitation.
4. Locations with K crossings on curves.
5. Locations with swing nose crossings in turnouts. There is insufficient experience with their behaviour at this time. This requirement will be reviewed when specific failure modes are better understood.

Where heeled jointed main line turnouts are attached to loops, refuges, platform roads and turnbacks, and they are patrolled by foot each week as part of the Ancillary Line requirements, Supplementary Patrol is not required.

## C-11 – Ancillary Lines

Ancillary lines with locations in poor condition require Supplementary Patrol, as per Table 5.

Additional examination is required as per the conditions requiring additional examination on mainline track. When applying these requirements to ancillary lines, the speed and use of the line should be taken into account.

## Appendix D Examination Frequencies for Underbridges

The frequency and type of examination required for steel and concrete underbridges are contained in table 6 & table 7. The type of examination required for bridge structure will vary depending on the age of the structure. The table below contain abbreviations for the type of examination required for underbridges. The definitions for those abbreviations are as follow;

- DT means Detailed Structure Examination
- G means General Structural Examination
- EA means Engineering Assessment

**Table 6 – Underbridges 1 – 100 years**

Age (years)	1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
Examinations	DT	DT	DT	DT	G	G	DT	G	G	DT	G	G	DT	G	G	DT + EA
Age (years)		32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
Examinations		G	G	DT	G	G	DT	G	G	DT	G	G	DT	G	G	DT+EA
Age (years)		62	64	66	68	70	72	74	76	78	80	82	84	86	88	90
Examinations		G	G	DT	G	G	DT	G	G	DT	G	G	DT	G	G	DT+EA
Age (years)		92	94	96	98	100										
Examinations		G	G	DT	G	DT										

**Table 7 – Underbridges 101 – onwards (till end of design life)**

Age (years)	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Examinations	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT + EA
Age (years)	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Examinations	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT
Age (years)	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
Examinations	G	DT	G	DT	G	DT	G	DT	G	DT+EA	G	DT	G	DT	G	DT	G	DT	G	DT
Age (years)	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Examinations	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT	G	DT + EA
Age (years)	Age > 180 years -----One year Detail and next year General till remaining life of the structure plus EA every 30 years																			

Variable Latitude: 1 year = 36 days, 2 years = 72 days, 4 years = 145 days, 6 years = 216 day

## D-1 – Engineering Assessment (EA)

Every steel or concrete underbridge must undergo an engineering assessment review at regular intervals by a suitably qualified professional engineer. The purpose of this review is to evaluate the safety, stability and functionality of the bridge structure, the conformity of its design and construction with good practice and safety standards and to determine appropriate remedial measures. The review must be conducted no later than 30 years after the commissioning of the new bridge and updated at least every 30 years. It should be noted that the examination frequency for a particular bridge can be reset as a result of EA findings.

For bridges assessed to be in a poor condition defined below, the new examination frequencies shall be implemented only after an Engineering Assessment (EA) has been conducted and any identified remedial works have been carried out. It is to be noted that the EA might identify that it may be necessary to implement examination frequencies different from the standard new frequencies.

For the remaining bridges, the new examination frequencies shall be implemented and a program of 'catch up' EAs, in ranking order based on condition shall be initiated. EAs must be completed within three years of commencement of the new examination frequencies for each bridge. For programming reasons it may be decided that for certain bridges, the current examination frequencies are to continue for a nominated timeframe.

After the 'catch up' EA has been carried out, the next EA shall be undertaken in accordance with the new examination frequencies. For example, if a bridge is 110 years old and its 'catch up' EA occurs at age 112 years then the next EA would be undertaken at age 120 years.

### Steps involved in engineering assessment

- a. Collect background information on the bridge. (This shall include all relevant historical investigation, design, construction, remedial, operation and maintenance, monitoring and inspection data).
- b. Carry out a detailed examination of the bridge to assess all relevant condition parameters including detailed measurements of section loss to permit accurate assessment of 'as is' load rating.
- c. Carry out sufficient sampling and testing of materials for all major elements of the bridge to determine remaining life and associated relevant maintenance activities (for example, testing of depth of chloride penetration for estimating time to onset of corrosion).
- d. Compare the performance of the bridge with original design and assess the theoretical performance of the bridge against current standard and guidelines.
- e. In case of incomplete documentation, further investigation may be required for the first engineering assessment. Typical investigation activities include:
  - i. survey to establish lines and dimensions
  - ii. testing of foundation material if required
  - iii. geological drilling and mapping if required
  - iv. research or calculate recent flood estimates
  - v. updating of earthquake forces
- f. Particular attention to be given to changes in operation of a bridge that may have occurred since construction. Check as to whether it can withstand appropriate loadings (including seismic) in accordance with current engineering practice.
- g. Recommendations shall be made for the following:
  - i. live load 'as new' and 'as is' load rating
  - ii. remaining fatigue life
  - iii. necessary repairs including preliminary sketches and cost estimates
  - iv. time frames for implementation of repairs
  - v. any restrictions on operations required (for example load restriction)
  - vi. any changes to the examination program
  - vii. the adequacy of the bridge examination, operation and maintenance activities to date and any identified areas for improvement

Engineering assessment is generally based on the age of the bridge and a maximum 30 year cycle but may also be initiated in response to issues such as:

- an absence of design and construction documentation
- a regulatory requirement
- detection of abnormal behaviour
- proposal to modify a bridge
- changes in loading condition

Asset Engineer must ensure that Bridge Management System (BMS) Engineer upload all engineering assessment reports in the appropriate database.

**Guidelines for determination of examination cycle based on bridge age**

The revised program of examinations for each bridge is based on the age of the bridge as defined in Appendix D:

- if a bridge is 12 years old, it is due for a detailed examination
- if a bridge is 33 years old, it is due for a general examination next year

**Table 8: Guidelines for subjective rating of bridge condition**

Subjective Rating	Description
Excellent	Free of defects more severe than category “E” defects
Good	Free of defects affecting structural performance, integrity and durability
Acceptable	Free of defects affecting structural performance, Defects affecting the durability which require monitoring, detailed structural engineering inspection or maintenance
Poor	Defects affecting the performance and structural integrity of the structure which require urgent action as determined by detailed structural engineering inspection
Unacceptable	Bridge must be closed

		TABLE 9: Condition Assessment of Concrete, Masonry & Steel Bridges					
Equipment /Component		Asset Attributes: Confirmation of current data					
Asset ID:	System Attribute Name:	Location	SPN	Date of Construction	Number of Spans	Major Renewal/Replacement	
		1	2	3	4	5	
	Condition Rating	Excellent	Good	Acceptable	Poor	Unacceptable	
Critical Elements for Masonry, Concrete and Steel Bridges	Criteria 1 Age & Service	Based on age & Service life	0 to 20 years in service. Fully functional, within specification, reliability & availability. No unscheduled service downtime per annum.	0 to 60 years of service life. Functional performance within specification, reliability & availability. No unscheduled service downtime.	0 to 120 years of service life. Functional performance within specification, reliability & availability. No unscheduled service downtime.	0 to greater than 120 years of service life, renewal & major equipment change out required to maintain reliability & availability, unscheduled service downtime around several occasions per annum.	Over 120 years reliability & availability impacted due to unscheduled service downtime over extreme occasions per annum.
	Criteria 2 Specific to Concrete elements	Based on condition or degradation rate of asset component.	The element shows no deterioration. There may be discolouration, efflorescence and/or superficial cracking	Minor cracks and spalls may be present but there is no exposed reinforcement or evidence of corrosion or deterioration.	Some delaminations, significant cracks or spalls may be present. No evidence of deterioration, or significant corrosion but loss of section is minor.	Delaminations or spalls or cracks or corrosion are prevalent. Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis to ascertain the impact on the strength on an element or the bridge.	Defects category exceeds A
	Criteria 3 Specific to Masonry elements		There is little or no vertical (differential) settlement, lateral or rotational movement, scour or failure of the construction material.	There may be vertical (differential) settlement, lateral or rotational movement, voids scour or failure of the construction material but the strength is not significantly affected.	There may be vertical (differential) settlement, lateral or rotational movement, voids scour or failure of the construction material to produce a loss of strength of the element but not of significant magnitude to affect the serviceability.	Vertical (differential) settlement, lateral or rotational movement, voids scour or failure of the construction material has occurred. There is a sufficient concern to warrant an analysis to ascertain the impact on the strength of the element or the bridge.	Defects category exceeds A
	Criteria 4 Specific to Timber elements		New	Good and intact	Minor deterioration and degradation	Severe deterioration and degradation	Extreme deterioration and degradation, beyond repair
	Criteria 5 Specific to Foundation		New	Good and intact	Minor deterioration and degradation	Severe deterioration and degradation	Extreme deterioration and degradation, beyond repair
	Criteria 6 Specific to Substructures - G		New	Good and intact	Minor deterioration and degradation	Severe deterioration and degradation	Extreme deterioration and degradation, beyond repair
	Criteria 7 Specific to Superstructures - G		New	Good and intact	Minor deterioration and degradation	Severe deterioration and degradation	Extreme deterioration and degradation, beyond repair
	Criteria 8 Specific to Steel elements		There is no evidence of section loss or damage or cracking. There are no signs of distress at anchors, socket or saddles. No corrosion, no potholes and connectors are sound (weld, rivets etc.)	Surface rust or minor pitting has formed or is forming. There is no measurable loss of section. Minor deformation that do not affect the integrity of the element. No cracks in the steel welds, All bolts & rivets are in sound condition.	Heavy pitting may be present. Section loss is present but not critical to structural integrity and/or serviceability of the element. May be some loose or missing bolts or rivets. Defects assessed but not significant impact on the structural integrity.	Section loss is sufficient to warrant analysis to ascertain the impact on the ultimate strength of the bridge element. May be cracks and deformations in the steel or welds. Failed or missing bolts or rivets. Defect may impact on ultimate strength of the bridge element.	Defects category exceeds A
	Criteria 5 PAINTING Specific to Steel elements		Based on condition or degradation rate of Painting.	Paint Index = P3 (Paint in satisfactory condition)	Paint Index P3 --- 50% P2--50%	Paint Index = P2 --100% (Paint broken down locally)	Paint Index = P1 (Paint broken down throughout)
		Very Good - only Routine Maintenance Required	Only routine maintenance required- Minor defects	Additional maintenance required to maintain acceptable service level	Requires significant renewal / upgrade.	Asset not providing required level of service. Renewal or upgrade required	



## Appendix E Tailored Technical Maintenance Plans

District	Location	Asset Class	Task	Document Reference
Central	Bondi Diamond Crossover	Turnouts	Track Inspection	MN C 20102
North	Epping to Chatswood Rail Line	Track and turnouts	Track Inspection	MN C 20103
Illawarra	Stanwell Park Viaduct	Underbridge	Bridge Examination	MN C 10111
Illawarra	Georges River Bridge Como	Underbridge	Bridge Examination	MN C 10112
North	Hawkesbury River Bridge	Underbridge	Bridge Examination	MN C 10113
West	Knapsack Gully Viaduct	Underbridge	Bridge Examination	MN C 10114
West	Nepean River Bridge	Underbridge	Bridge Examination	MN C 10115
Central	Woolloomooloo Viaduct	Underbridge	Bridge Examination	MN C 10116
Illawarra	Georges River East Hills	Underbridge	Bridge Examination	MN C 10117
Central	Rushcutters Bay Viaduct	Underbridge	Bridge Examination	MN C 10118
North	Chatswood Rail Enclosure Structure	Tunnel	Structures Examination	MN C 10131
North	Epping to Chatswood Rail Line Tunnels	Tunnel	Structures Examination	MN C 10132
Central	West Terrace Underbridge Bankstown	Underbridge	Structure Examination	MN C 10119