Division / Business Unit: Enterprise Services
Function: Track & Civil / Signalling
Document Type: Procedure

Asset Management System

EGP-10-01

Applicability

ARTC Network Wide

SMS

Publication Requirement

Internal / External

Primary Source

Document Status

Version #	Date Reviewed	Prepared by	Reviewed by	Endorsed	Approved
2.0	15/05/2017	Standards Engineer	Stakeholders	Manager Standards	A/General Manager Technical Standards 20/06/2017

Amendment Record

Amendment Version #	Date Reviewed	Clause	Description of Amendment
1.0	30 Jul 13		First issue of procedure – Supersedes PP-166 (v2.2). Approved by OS&ERG subject to update to reference TCR's being created in SIMS and published in the daily shift journal
2.0	15 May 17		Reissue of procedure – Supersedes EGP-10-01 (v1.0). Reissue of procedure brings the documentation of the Asset Management System up to date with the current configuration within Ellipse.

Table of Contents

1 Introduction

1.1 Purpose

ARTC maintains a computerised asset management system to ensure that assets are fit for the purpose of allowing the operation of trains over ARTC infrastructure. The AMS enables ARTC to perform the following core responsibilities;

- Capital investment in the network
- Manage the infrastructure comprising the network
- Maintain the infrastructure comprising the network

The purpose of this procedure is to describe the computerised systems related to asset management and the mandatory attributes required by the system as currently configured (to achieve the stated purpose above).

1.2 Scope

This procedure currently applies to ARTC's infrastructure assets as follows;

- All Track and Civil, Structures, and Signals assets
- The entire ARTC Network

This procedure applies to the following aspects of the computerised assessment management system;

- The management of assets
    - Register of infrastructure assets, including configuration and engineering data
    - Register of deficiencies affecting infrastructure assets
    - Implementation of Network Alteration Notices (NAN's)
    - Implementation of the short term asset management plan (AWP)
    - Implementation of the medium to long term asset management plan (AMP)
- The Works Management System
    - Implementation of the Technical Maintenance Plans (TMP's)
    - Recording of inspections (required and performed)
    - Recording of corrective maintenance (required and performed)
    - Allocation of work activities
    - Management of risk associated with asset deficiencies

This procedure excludes the following aspects of the ARTC asset, and the computerised asset management system;

- Financial data relating to the ARTC asset (Ci Financials)
- Management of infrastructure documentation (this is configuration management)
- Governance of required scheduled reporting (this is managed by engineering compliance)

- Engineering governance of infrastructure (this is managed by engineering compliance)

1.3 Document Owner

The General Manager Technical Standards is the Document Owner and is the initial point of contact for all queries relating to this procedure.

1.4 Responsibilities

Business Unit management is responsible for delegating (and documenting) responsibility for each function of the asset management system, as described by this procedure.

Business Unit management is responsible for ensuring that all inspection, assessment, monitoring and review functions of the asset management system are delegated to (and carried out by) competent rail industry workers.

1.5 Reference Documents

This procedure supports the following documents and systems:

- ARTC Safety Management System (SMS)
- EGP-03-01 Rail Network Configuration Management
- EGP-20-01 Project Management
- EGW-20-01 Managing Complex Projects
- EGW-20-02 Managing Simple Projects

The following documents support this procedure:

- ETE-00-03 Civil Technical Maintenance Plan (Track and Civil)
- ESM-26-01 Maintenance, Responsibilities , Frequencies, Reporting (Signals)
- ESM-26-02 Technical Maintenance Plan (Signals)
- EGP-04-01 Engineering Drawings and Documentation
- EGP-04-02 Drawing Management System
- EGW-10-01 Data Classification – Structures

1.6 Definitions

The following terms and acronyms are used within this document:

Term or acronym	Description
AAA	Automatic Assignment Allocation
ADA	Asset Data Administrator
AK Car	An automated track geometry recording car
AMP	Asset Management Plan
AMS	Asset Management System
ARTC	Australian Rail Track Corporation Ltd.

Term or acronym	Description
Attribute	Single component of a record. Similar to a database field.
AWP	Annual Works Program
CAP	Capital Works
Defect	Any unsatisfactory condition which has the potential to develop into asset failure. May be a discrete fault against a component of the asset, or the overall condition of the asset
DMS	Drawing Management System
EC	Equipment Class
EGI	Equipment Group Identifier
Inspection	The examination of an infrastructure asset, for the purposes of ensuring the asset is safe and capable of performing to operation requirements
km	Kilometrage
MPM	Major Periodic Maintenance
MST	Maintenance Schedule Task
Nameplate	Instrument used to store engineering characteristics against an asset in Ellipse
NDT	Non-Destructive Testing
PU	Productive Unit, used to group assets within the business hierarchy
RCRM	Routine Corrective and Reactive Maintenance
Responsible Manager	ARTC personnel with designated responsibility for management of the asset, or an aspect of the management of the asset
RFD	Rail Flaw Defect
RPPD	Revised Priority or Planned Date
SMS	Safety Management System
SPN	Structured Plant Number
TCR	Train Control Report
TMP	Technical Maintenance Plan
TSR	Temporary Speed Restriction
URFD Car	Ultrasonic Rail Flaw Detection Car
User	A suitably competent person, authorised to interact with the AMS in accordance with this procedure
Value	The stored contents of an attribute within the AMS
WMS	Works Management System
WO	Work Order

2 Overview

Asset management is the lifecycle management of assets, with four key stages (refer to Figure 1 below). Ellipse is currently used by ARTC to implement the 'operate and maintain' processes (although it is capable of implementing all four stages). The 'acquire' and 'dispose of' stages will generate a record against the asset in Ellipse.

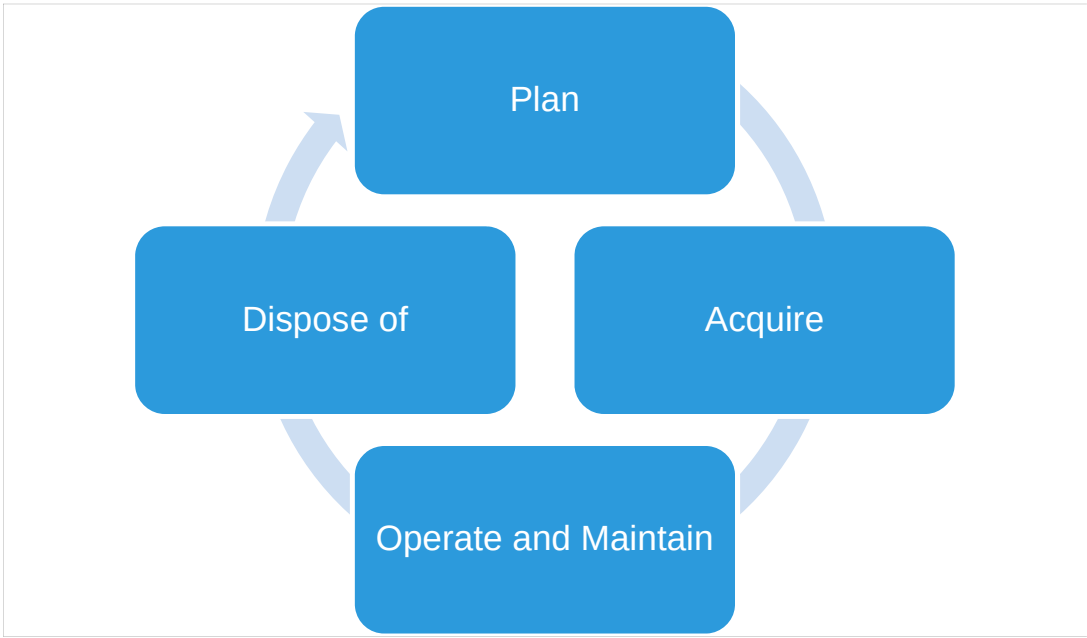


Figure 1 - Asset Lifecycle

2.1 Constituent Components of the Computerised Systems Related to Asset Management

The current computerised systems related to asset management require multiple components to implement the required processes.

There is a relationship between Ellipse and the other constituent components of the computerised systems. Any record stored in a constituent of the systems must contain the unique identifier of the record in Ellipse (i.e. the equipment number or the work order number) to allow data to be cross-referenced.

The current constituent components of the computerised systems are described in Table 1 below;

Title	Purpose
Ellipse	The principal component of the ARTC computerised AMS
AMP Interim Database	AWP and AMP data
Geotechnical Database	Geological assets and deficiencies
SIMS	Investigation of Train Control Reports (TCR)
Infringement Register	Clearance infringements
Basecode Database	Basecode records

Title	Purpose
Trackdata	Track information
LXM Level Crossing Database	Level crossing data
TRIMS HP	Records management
DMS	Management of drawings and related data [Note 1]

Table 1 - Constituent Components of the computerised AMS

Note 1: As Built drawings for ARTC assets are currently stored in DMS, Acconex and DMS (Victoria).

DMS is ARTC's current drawing management system, with ARTC transitioning to its successor system Acconex. It is a condition of ARTC's lease in Victoria that VicTrack's DMS (Victoria) is used to store the As Built drawings for assets in Victoria.

There is an opportunity to consolidate the various systems into the Ellipse asset management system.

2.2 Ellipse Modules

Ellipse operates a number of different modules to perform the required AMS processes. The available modules and their functionality will depend on the access granted by the user's profile. Refer to Table 2 below for a list of Ellipse modules commonly used by ARTC.

For a full list of modules currently installed in ARTC's implementation of Ellipse refer to MSE010/MD (refer to cl 3.2.4 for note on nomenclature).

Module Code	Module Title	Description
MSE600	Equipment register	Used to store and search for registered equipment and associated equipment items (assets)
MSEWDA	Alarms and Defects	Used to enter and search defects
MSEWOT	Work Order	Used to enter and search for work orders. Optimised for interaction with individual work orders
MSEWJO	Jobs	Used to search and forecast MST's and work orders. Optimised for interaction with multiple work orders (or MST's)
MSE541	Work Request	Used to enter and search for work requests
MSE580	Document Manager	Used to search for a document
MSEWAB	Attributes	Used to search the register of defined defects in Ellipse
MSEWLA	Attributes Link	Used to search the register of defects (attribute link ID's) stored against an EGI
MSE010	Search Table	Used to search enabling files that have been defined in Ellipse
MSO011	Review Table File	Used to search enabling files that have been defined in Ellipse
MSE700	Maintenance Schedule Task	Used to search MST's that have been recorded against an asset

Module Code	Module Title	Description
MSE690	Standard Job	Used to search the register of standard jobs in Ellipse
MSE603	Search Equipment List	Used to search static user defined equipment lists
ARBWOEA	WO, WR and defect compliance extract	Used to create user defined equipment and work order lists based on attribute value filters

Table 2 – Commonly used Ellipse Modules

Ellipse modules can be accessed via the context menus (refer to Figure 2).

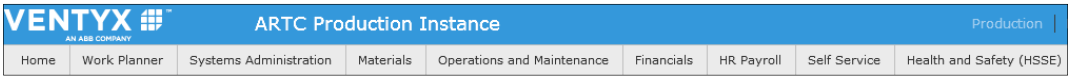


Figure 2 - Ellipse Context Menu

Alternatively, access to Ellipse modules is available via the quick launch box (refer to Figure 3).

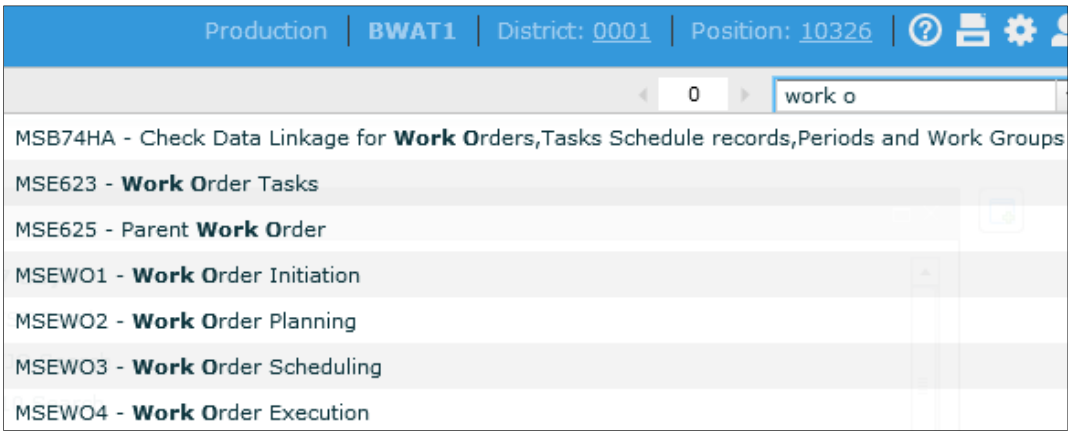


Figure 3 - Quick Launch Dialog Box (showing drop down menu)

3 Equipment Register

The Ellipse Equipment Register [MSE600] is the primary asset management tool in the AMS.

The data stored in the Equipment Register module drives the other modules in Ellipse.

Every asset on the ARTC network must have a record in the Equipment Register. For each asset the Equipment Register record shall describe ‘what’ the asset is and ‘where’ the asset is on the ARTC network.

The definition (and controls) of information for each asset type are defined in the relevant data management work instruction (refer to cl 1.5 above). Ellipse defines this information as data attributes.

3.1 Data Attributes (Asset Information)

Data attributes are either;

- Uncontrolled attributes
- Controlled value attributes

Uncontrolled attributes can hold any data (subject to the attribute character limit).

Controlled value attributes have a data filter. The filter may limit the data type that is entered in the attribute (e.g. numeric or date values), or restrict data entry to values from a drop down list (the data is stored in an enabling file).

3.2 Data Attributes Controls

There are 4 types of control that may be applied to an attribute;

- Character limit
- Data type
- Special edit
- Enabling files

Some data attributes have predefined controls applied to them. However, the data attribute controls described in this section are typically applied to attributes that are defined by ARTC (e.g. bridge ‘deck material’, which is a nameplate attribute).

3.2.1 Character Limit

The character limit specifies the maximum number of characters that may be entered into an attribute. It is recorded as a prefix to the data type. E.g. 30N indicates that a maximum of 30 numbers may be entered into an attribute.

3.2.2 Data Type

The Data Type specifies what types of data may be recorded in an attribute. Refer to Table 3 for more information.

Type	Description
A	Alpha
AN	Alphanumeric
D	Date (dd/mm/yyyy)
N	Numeric
>Z	Numerical, greater than zero
Z>Z	Numerical, greater than or equal to zero

Table 3 – Commonly Used Attribute Type Controls

3.2.3 Special Edit

The Special Edit limits the format of the data that can be recorded in an attribute. It is most commonly used to limit decimal places in numerical attributes and to create yes/no attributes. Refer to Table 4 for more information.

Type	Description
DEC1-5	Number of decimal places. E.g. DEC2 specifies 2 decimal places
YN	Yes or No
YNS	Yes or No or Space

Table 4 – Commonly Used Special Edit Controls

3.2.4 Enabling Files (for drop down lists)

The Enabling File limits the contents of an attribute to values stored in a control table. The control table can be either a;

- System control table (e.g. the Equipment Class ‘EC’ table)
- ARTC defined table.

ARTC defined tables have the naming of ‘+ABC’.

Enabling files can be viewed in either MSO011 or MSE010 by entering the table code in the ‘Table Type’ attribute. Refer to Figure 4.

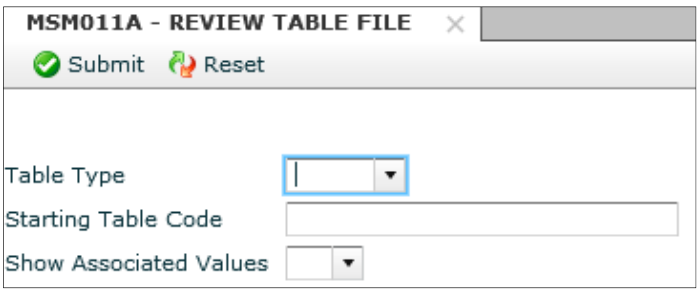


Figure 4 - Enabling File Search Frame

The enabling file for a given attribute (where applicable) can be determined by enabling the “show attribute tooltips” option from the configuration menu (i.e. the gear icon in the top right corner), as shown in Figure 5. When the user’s mouse is over the attribute a tooltip box will appear describing the location of the enabling file.

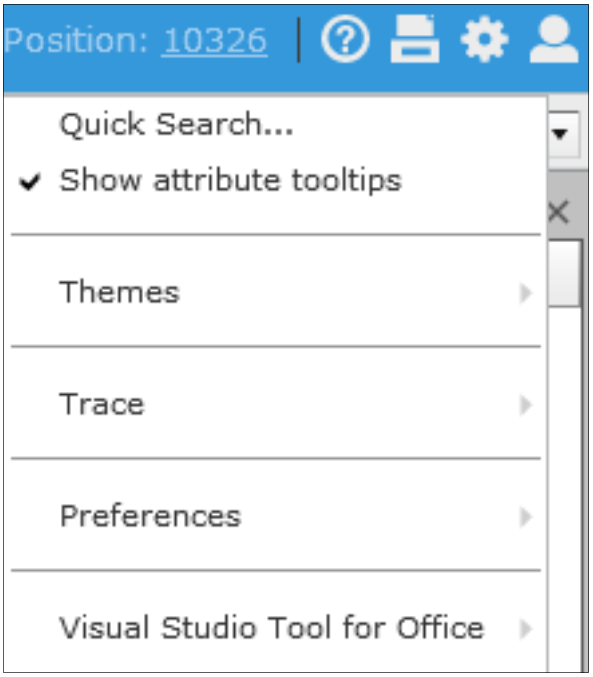


Figure 5 - Enable Attribute Tooltips

Note: Where referenced in this procedure, the enabling files will have the naming of MSE010/EC, MSE010/+SPE etc.

3.3 Mandatory Universal Data Attributes

The following clauses prescribe the minimum data attributes that must be completed for each equipment record in the equipment register [MSE600].

3.3.1 Equipment Number

The Equipment Number is a controlled attribute. It contains a 12 character numeric code that is the unique identifier for equipment in Ellipse. The Equipment Number is automatically generated by Ellipse for new assets.

Any infrastructure data contained in another constituent system (refer to 2.1) shall be related back to the Equipment Number of the asset in Ellipse.

An example of a valid Equipment Number would be ‘000000038276’.

3.3.2 Description

The Description is an uncontrolled attribute. It comprises two lines of text (with a maximum of 40 characters per line), located above the tabbed sub-frames in the equipment record. The purpose of the Description is to provide an easy visual indication of what the asset is.

The Description attributes are searchable in the ‘Primary Search’ or ‘Advanced Search’ sub-frames. Ideally, data should be recorded in these attributes that will assist in the easy retrieval of the asset from the equipment register. An example of this would be the given name of the asset (e.g. Maribyrnong Viaduct).

Refer to the relevant data classification work instruction for the recommended data format of the Description attributes.

3.3.3 Associated Equipment Item

Associated Equipment Item is a controlled attribute. It is a Yes/No value. The Associated Equipment Item attribute indicates the location of the equipment record within the ARTC equipment hierarchy (refer to 3.3.7 below). This is most commonly referred to as the Parent – Child relationship.

Value	Hierarchy Level	Description
No	6	The parent to equipment record is the provisioning centre
Yes	7	the parent to the equipment record is the parent asset

Table 5 - Associated Equipment Item Values

Note: Associate Equipment has different requirements and controls for certain attributes. This procedure will only describe the requirements for parent equipment records.

3.3.4 Equipment Class

The Equipment Class is a controlled attribute. It contains a 2 character alpha code. The Equipment Class is the highest level of the equipment hierarchy used to organise assets in Ellipse. The equipment hierarchy is defined in Table 6;

Level	Description	Example
1	Equipment Class	Bridge
2	Equipment Group Identifier	Bridge – Steel
3	Function (Plant Segment 2)	Underbridge

Table 6 - Equipment Hierarchy

The valid Equipment Classes values in Ellipse are defined in MSE010/EC. The values defined in this enabling file shall be derived from the relevant ARTC technical standards.

Note: The Equipment Class controls the SPN. The Equipment Class cannot be altered without providing a new SPN number. Similarly, the SPN format cannot be altered without providing a new Equipment Class.

3.3.5 Structured Plant Number (SPN)

The ARTC Structured Plant Number (Also known colloquially as the Plant Number or SPN) is the non-unique identifier for an equipment record. The SPN is a string of controlled value attributes, derived from the data stored in up to 6 ‘plant segments’. The Equipment Class associated with an asset record shall determine;

- The specific SPN data requirements for the record
- The controls applied to the SPN plant segments
- The format in which the data is displayed.

Track and Civil, and Structures share common root SPN formats. There are SPN formats specific to signals assets, comms assets etc. Refer to the relevant data classification work instruction for more information of the SPN format and specific controls applied to the plant segments.

There are two typical SPN formats for Track and Civil (and structures);

- Continuous assets – 4 plant segment SPN (Track and Civil)
- Discrete assets - 5 plant segment SPN (Structures)

An example of a valid continuous asset SPN would be;

- N51TR10007SNGL
  - N51 (North Coast)
  - TR (Track)
  - 10007 (North Coast Single Line, 875.480km to 986.885km)
  - SNGL (Single Track)

An example of a valid discrete asset SPN would be;

- V02UB37000MAIN0024.064
  - V02 (Tottenham to NSW Border)
  - UB (Underbridge)
  - 37000 (Tottenham Junction to Jacana, 9.978km to 27.000km)
  - MAIN (Main Line)
  - 0024.064 (Discrete Kilometrage)

The typical full-form SPN for Track and Civil, and Structures assets is shown in Table 7.

Order	Field	Size
1	ROUTE	3AN Note 1
2	FUNCTION	2A Note 1
3	BASECODE	5N
4	TRACK	4AN
5	KMS	8N

Table 7 - Structured Plant Number (SPN)

Note1: The size indicates the visible size of the attribute data. Refer to the relevant clause for more information on the attribute constraints.

Note: It should be noted that whilst the Equipment Number and SPN can often be used interchangeably to identify a specific asset, it is theoretically possible for two assets to share the same SPN (e.g. when equipment is disposed of and replaced on a like for like basis). Only the Equipment Number is unique.

3.3.5.1 Route (Plant Segment 1)

The Route is a controlled value attribute. It contains a (visible) 3 character alphanumeric code. The visible format of the route code is 'ANN'. The route code is used in a number of different ARTC systems.

The enabling file stores the full 5 character alphanumeric code, in the format "ANANN". The first 2 characters of the full code describe the controlling Equipment Class (i.e. the route code may only be selected against assets with the controlling equipment class). The last 3 characters describe the route code displayed in the SPN.

The enabling file in Ellipse that contains the active route codes shall not be altered without the approval of the owner of this procedure.

The enabling file for plant segment 1 is MSE010/P1.

The master table describing valid routes for use in Ellipse is MSE010/+COR.

3.3.5.2 Function (Plant Segment 2)

The Function is a controlled value attribute. It contains a (visible) 2 character alpha code.

The enabling file stores the full 4 character alpha code, in the format "AAAA". The first 2 characters of the full code describe the controlling Equipment Class (i.e. the function code may only be selected against assets with the controlling equipment class). The last 2 characters describe the function code displayed in the SPN.

For example, an underbridge would be stored in the enabling file as 'BRUB' because the equipment class is 'bridge' (BR). However, it would display in the SPN as 'UB'.

Refer to the relevant data classification work instruction for the valid Function codes.

The enabling file for plant segment 2 is MSE010/P2.

Note: Any future changes or additions to the valid Function codes shall ensure that the last 2 characters are unique across all asset types.

3.3.5.3 Basecode (Plant Segment 3)

The Basecode is a controlled value attribute. It contains a 5 character numeric code. The basecode denotes a continuous length of track, spanning between two physical nodes (e.g. turnouts points).

The register of basecodes is contained on an MS Access database (RIC TRACK CODES PRODUCTION) that is maintained by Transport for NSW. The basecode database is linked to the Track speed system that ARTC also shares with Transport for NSW.

The valid basecodes that appear in Ellipse shall be controlled by those described in the basecode database. Any basecodes in Ellipse that do not appear in the basecode database shall be marked as inactive.

The enabling file for plant segment 3 is MSE010/P3.

The master table describing valid basecodes for use in Ellipse is MSE010/+BAS.

3.3.5.4 Track (Plant Segment 4)

Track is a controlled value attribute. It contains a 4 character alphanumeric code.

The enabling file in Ellipse that contains the active track codes will not be altered without the approval of the owner of this procedure.

The enabling file for plant segment 4 is MSE010/P4.

3.3.5.5 KMS (Plant Segment 5)

The 'km's' is a controlled value attribute. It contains an 8 character numeric code in the format "0000.000".

Refer to the relevant data classification work instruction for equipment classes that require plant segment 5 data.

Where applicable, the enabling file for plant segment 5 is MSE010/P5.

Note: Historic km's data was entered in a number of formats. The responsible manager shall identify any km's data that is not in the format "0000.000" and correct it. A consistent km's format is important for calculation and sorting purposes.

3.3.6 Status

The Status is a controlled attribute. It contains a 2 character alpha code. The Status is used (in conjunction with the equipment hierarchy attributes) to determine the appropriate inspection schedule for an asset.

The responsible manager shall ensure that the correct Status is assigned to all assets. Refer to Table 8 for valid codes;

Code	Description	MST Required
BO	Booked Out	N
CM	Contractor Maintained	N
DI	Disposed Of	N
GM	Within Group MST	N [Note 2]
IS	In Service	Y
NM	Not Maintained	N [Note 1]
PM	Partially Maintained	N
PN	Project New	N
RI	Redundant Infrastructure	Y
SO	Seasonal Only	N
SW	Service Withdrawn	N

Table 8 - Asset Status

Note 1: Not Maintained (NM) shall be used for assets that interact with the rail corridor but are not the responsibility of ARTC (e.g. road bridges, electricity pylons). ARTC is not responsible for the inspection or maintenance of these assets, but they must be included in the equipment register for completeness. The responsible manager shall ensure that all such assets are identified and recorded in Ellipse. ARTC shall perform due diligence against all assets with the Status 'Not Maintained'. The responsible manager shall ensure that the relevant Shared Infrastructure Agreement (SIA) is stored against the asset and that all pertinent inspection records are obtained from the asset maintainer when they fall due.

Note 2: Within Group MST (GM) indicates that the asset is covered by an MST recorded against a different piece of equipment. For example, a drainage inspection will not be recorded as an MST against each applicable asset.

3.3.7 Productive Unit

The Productive Unit is a controlled attribute. The Productive Unit specifies the parent relationship of the asset within ARTC's business hierarchy. The business hierarchy levels are shown in Table 9;

Level	Description	Example
1	Company	ARTC
2	Network	Interstate Network
3	Corridor	East-West
4	Delivery Unit	Melbourne to Crystal Brook
5	Provisioning Centre	Geelong PC
6	Equipment Number	Moonee Ponds Viaduct
7	Associate Equipment	bridge approach slab

Table 9 - Business Hierarchy

Refer to Table 10 for the current ARTC business hierarchy. The most commonly used Productive Unit used when interacting with Ellipse is the Provisioning Centre. Provisioning Centre Productive Units have the format 'P0000'.

Productive Unit	Description	Level
ARTC	ARTC Top of Hierarchy	Company
NHVY	Hunter Valley	Network
NINT	Interstate	Network
NSTC	Systems and Technology	Network
NPMR	Plant Manager	Network
CHVY	Hunter Valley	Corridor
CEWT	East West	Corridor
CNSH	North South	Corridor
CPMR	Plant Manager	Corridor
CSTC	Systems and Technology	Corridor
DHVY	Hunter Valley	Delivery Unit
DKFC	Kalgoorlie to Cootamundra	Delivery Unit
DMAC	Melbourne to Crystal Brook	Delivery Unit
DNSN	North South (North)	Delivery Unit
DNSS	North South (South)	Delivery Unit
DPMR	Plant Manager	Delivery Unit

Productive Unit	Description	Level
DRLN	Residual Lease Network	Delivery Unit
DNCM	NSW Comms	Delivery Unit
DNCCN	NSW Control Systems	Delivery Unit
P0116	Kalgoorlie	Provisioning Centre
P0125	Adelaide	Provisioning Centre
P0131	Port Augusta	Provisioning Centre
P0179	Ararat	Provisioning Centre
P0177	Geelong	Provisioning Centre
P0180	Seymour	Provisioning Centre
P0310	Taree	Provisioning Centre
P0320	Coffs Harbour	Provisioning Centre
P0330	Casino	Provisioning Centre
P0865	Binnaway	Provisioning Centre
P0540	Parkes	Provisioning Centre
P0570	Broken Hill	Provisioning Centre
P0580	Dubbo	Provisioning Centre
P0710	Mittagong	Provisioning Centre
P0770	Enfield West	Provisioning Centre
P0720	Goulburn	Provisioning Centre
P0740	Cootamundra	Provisioning Centre
P0760	Wagga Wagga	Provisioning Centre
P0910	Port Waratah	Provisioning Centre
P0935	Maitland	Provisioning Centre
P0950	Muswellbrook	Provisioning Centre
P0980	Scone	Provisioning Centre
P0992	Gunnedah	Provisioning Centre
P0993	Narrabri	Provisioning Centre
PLANT	Plant Manager	Provisioning Centre
P0382	Grafton Comms	Provisioning Centre
PNCCN	NSW Control Systems	Provisioning Centre
P0861	Goulburn Comms	Provisioning Centre
P0999	Muswellbrook Comms	Provisioning Centre
P0998	Broadmeadow Comms	Provisioning Centre
P0862	Junee Comms	Provisioning Centre
PBTYC	Botany Comms	Provisioning Centre

Productive Unit	Description	Level
P0997	NSW Wayside	Provisioning Centre
P0162	Murray Bridge	Provisioning Centre

Table 10 - Business Hierarchy Productive Unit Values

Note: The responsible manager shall verify that the Productive Unit and Location assigned to an asset are in agreement. The Location is used by Ellipse to determine the work group that a work order is assigned to by default (refer to cl 3.3.11 and cl 8.4).

The Location ↔ work group relationship is defined in the enabling file MSE010/AAA.

3.3.8 Input By

Input is a controlled attribute. It contains a 10 character numeric code. The Input attribute records the employee ID number of the user who created the new equipment record.

Note: If the Input attribute is left blank during the creation of a new equipment record, the value will default to the employee ID of the 'logged in' user.

3.3.9 Active

Active is a controlled attribute. It is a Yes/No value. The attribute indicates whether the equipment record is active or inactive in Ellipse.

Inactive assets will not appear in user defined equipment lists, such as those created via MSE603 or ARBWOEA.

Note: All assets in the ARTC Equipment Register should be set to active, even if the asset is 'not maintained' or 'disposed of'.

3.3.10 Equipment Group Identifier

The EGI is a controlled attribute. It contains a 6 character alphanumeric code. The EGI is the primary mechanism used by Ellipse to identify what type of asset is being described by an asset record.

It is essential that the EGI associated with an asset is accurate, as the EGI controls the following functions;

- Assignment of nameplate attributes
- Defect entry (via the defect attribute link)
    - Automatic work order allocation (via the defect attribute link → work activity classification)

If an asset's EGI is changed, the existing nameplate attributes (and any values recorded against them) will be deleted and replaced with the nameplate attributes of the new EGI.

Refer to the relevant data classification work instruction for the rules pertaining to the correct allocation of EGI to an asset.

Note: The Equipment Group Identifier is not directly linked in Ellipse to either the Equipment Class or SPN (plant segment 2). The responsible manager shall ensure that the Equipment Class, Equipment Group Identifier and plant segment 2 are correctly aligned

for an asset, in accordance with the restrictions imposed in the relevant data classification work instruction.

3.3.11 Equipment Location

The Equipment Location is a controlled value attribute. It contains a 3 character alpha code. The code refers to the geographic location of the asset on the Network (i.e. Jacana, VIC).

The Equipment Location is not part of the ARTC equipment hierarchy, and the attribute values are not directly controlled by another related attribute (e.g. Productive Unit, Basecode or Account Code).

Note: The responsible manager shall verify that the Productive Unit and Location assigned to an asset are in agreement. The Location is used by Ellipse to determine the work group that a work order is assigned to by default. The Location ↔ work group relationship is defined in the AAA table (refer to cl 8.4).

3.3.12 Account Code

The account code (also known colloquially as line segment or cost centre) is used to link the assets position within ARTC's business (refer to cl 3.3.7 above) and financial hierarchies (refer to FIN-GL-018, cl 2). The account code determines which delivery unit and division any costs accrued against the asset will appear. The account code in the equipment register allows Ellipse data to be merged with data from ARTC's financial system (CI Financial) for report creation.

The valid account codes that appear in Ellipse shall be controlled by those used in CI Financial, as described in FIN-RG-006.

Any account codes in Ellipse that do not appear in either CI Financial or FIN-RG-006 shall be marked as inactive.

3.4 Updating the Equipment Register

Modification of the ARTC equipment register (e.g. creation, disposal, or modification of equipment records) must be performed in accordance with EGP-03-01. Any requested changes must be submitted to the Ellipse system administrator, supported by;

- EGP0301F-01 Network Alteration Notice
- EGP0302F-01 Change Authorisation Form

4 Inspections

Inspection activities are performed by suitably competent staff in accordance with the relevant ARTC technical standards. Inspections provide the information required for asset planning and risk management. The four main types of inspection are;

- Scheduled inspections
- Unscheduled inspections
- Automated inspections
- External Reports

Note: External reports are included in the inspection types as they yield similar asset data as inspections.

4.1 Scheduled Inspections

The purpose, frequency, latitude and scope of scheduled inspections are governed by the relevant ARTC technical maintenance plan or technical standard. A MST for each scheduled inspection must be created in Ellipse against all relevant assets.

4.2 Unscheduled Inspections

An unscheduled inspection is undertaken outside of the prescribed scheduled inspection regime. The reasons for performing an unscheduled inspection are varied, including;

- Monitor a specific defect to manage risk (e.g. RPPD re-inspection)
- Reassessment of reported defect (e.g. to confirm the defect measurements and priority assigned by inspector)
- Inspect asset for potential hazards following an unexpected event (e.g. heavy rain, fire, bridge strike)

The scope of an unscheduled inspection must satisfy the inspection trigger. Unscheduled inspections do not have a MST in Ellipse.

A record of the unscheduled inspection should be created in Ellipse by creating and closing a work order (even if no defects were found or amended). Any defects found during an unscheduled inspection should be recorded in the alarms and defect module as described in section 5 of this procedure.

4.3 Automated Inspections

Automated inspections are performed by vehicles travelling the ARTC network. These may be dedicated vehicles or vehicles mounting rail NDT apparatus. The vehicles produce a large quantity of data pertaining to ARTC's continuous rail assets (e.g. ride quality, internal rail flaws). This data is processed and any results that fall outside of accepted limits shall be entered into Ellipse as a defect in the alarms and defects module [MSEWDA].

ARTC currently has two principal methods for performing automated inspections;

- Track recording car (AK Car)
    - Track geometry defects

- Ultrasonic rail flaw detection car (URFD Car)
    - Rail flaw defects

The process for managing automated inspections (recording of results, transfer of defects to Ellipse, verifying the defects, and programming remedial actions etc.) is prescribed in the relevant ARTC technical maintenance plan or technical standard.

4.4 External Reports

External reports may be generated by a number of sources, including;

- Members of the public
- Local authorities
- Train drivers

Such reports should be forwarded by the initial recipient to the relevant stakeholders for review (always including the Area Manager).

The typical process (unless otherwise specified) for assessing and recording the actions generated by an external report would be;

- Enter the reported deficiency into Ellipse as a defect via the alarms and defects
- RPPD the generated work order in MSEWJO, using the appropriate Alarm Defect User Status to specify the required by date for assessment of the defect by a competent ARTC manager (this will create a new work order for the inspection of the defect)
- Once the reported defect has been inspected and verified, the inspection work order is closed (or subjected to RPPD if further monitoring is required) and any further deficiencies identified recorded as defects.

4.5 Maintenance Scheduled Task (MST)

Maintenance schedule tasks within Ellipse are based on the technical maintenance plans.

MST's can be reviewed in MSE700, and interacted with in MSEWJO.

A MST is required for every 'in service' asset recorded in the equipment register. This requirement is validated via the COM004 report (refer to cl 9.1.1 below). Unless stated otherwise in the relevant TMP, the schedule indicator for all MST's recorded against ARTC assets shall be '1' (last scheduled date).

Refer to Table 11 below for a description of the MST attributes recorded in MSE700.

Attribute Title	Control Type	Enabling File / Table	Description
Equipment Reference	12N	MSE600	Links MST to asset
Work Group	8AN	MSE720	Links MST to Work Group
Standard Job Number	6AN	MSE690	Description of task
Schedule Indicator	1N	MSE010/MI	Determines schedule for creation of future work orders
Schedule Frequency 1	4N	-	Number of days until next

			schedule task
Last Scheduled Date	D	-	Calculated based on schedule indicator
Last Performed Date	D	-	Date updated by work order completion
Next Scheduled Date	D	-	Calculated based on schedule indicator

Table 11 - MST Attributes

Note: The MST inspection latitude is not recorded in the MSE700 MST inspection record. MST latitudes are stored in MSE010/+LAT on a per equipment ↔ task basis. Latitudes are recorded as No. days.

4.5.1 Creation of MST's

Creation, deletion, or modification of MST's recorded against an asset must be performed in accordance with EGP-03-01. Any requested changes must be submitted to the Ellipse system administrator, supported by;

- EGP0301F-01 Network Alteration Notice
- EGP0302F-01 Change Authorisation Form

Any modifications to an assets MST regime shall be in strict accordance with the relevant Technical Maintenance Plan.

Description	Size	Enabling File / Table	Example Data
SPN or Equipment Number	-	MSE600	V02TR37000MAIN
MST Task #	4AN	-	SC02
MST Description 1	45AN	-	Check Structure Clearance
MST Description 2	45AN	-	(SPN of Structure)
Schedule Indicator	1N	MSE010/MI	1 (last scheduled date)
Frequency	4N	-	365
Latitude (Days)	3N	-	36
Work Group	8AN	MSE720	177CIV
Standard Job No	6AN	MSE690	P00010
Next Scheduled Date	D	-	30/06/2015
Km From	8N	-	269.620
Km To	8N	-	269.620

Table 12 - MST Creation Attributes

Note: Where an asset is subject to a pattern of multiple MST tasks (e.g. underbridges requiring visual and engineering inspections) MST suppression should be used, to ensure there is only one MST per asset.

Maintaining a one MST per asset relationship minimises the risk of human error in the event that the MST regime is modified or otherwise varied.

4.5.2 MST Forecasting

The two principal activities undertaken against MST's by delegated AMS users are;

- Forecasting of future programmed reactive maintenance works
- Committal of upcoming MST's into work orders

Committal of upcoming MST's into work orders is required to roll over the MST to the next date in the reactive work sequence, as governed by the relevant TMP order (refer to EGP-10-02 for the detailed process). The generated work order will have the same standard job number as the original MST and is used to facilitate the engineering compliance of the required work activity.

Once committed into a work order, the MST shall roll over to the next scheduled date for the inspection (based on the 'schedule frequency' and 'last performed date').

Forecasting and committal of MST's can be performed in the MSEWJO module, as shown in Figure 6 below.

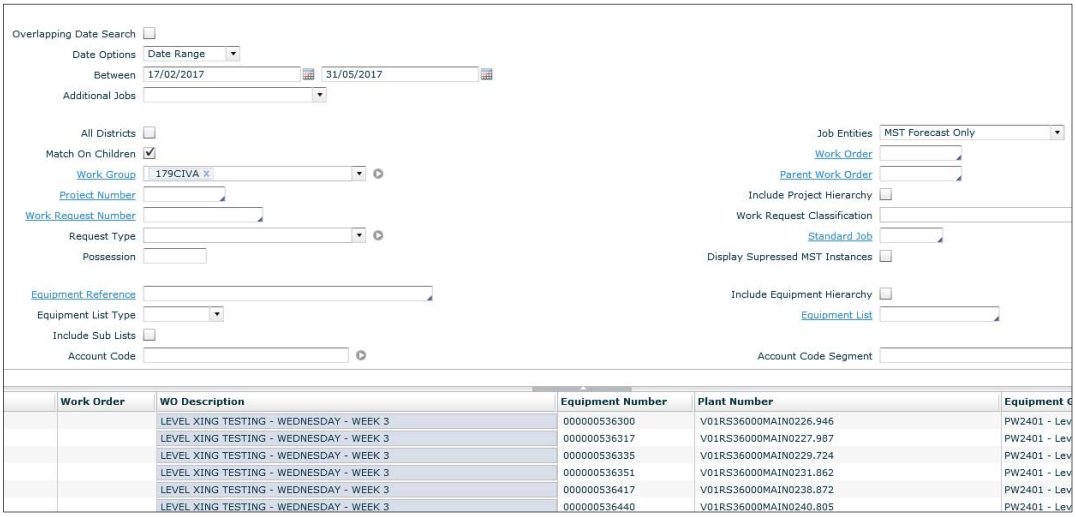


Figure 6 - MST Forecasting

5 Equipment Deficiencies

Asset deficiency data is used to determine;

- The necessity and urgency of preventative maintenance
- The scope of reactive maintenance
- The scope of the Annual Works Program (AWP) and the Asset Management Plan (AMP).

Defects (along with inspections) are the primary triggers of work orders in Ellipse.

5.1 Defects

The Alarms and Defects module [MSEWDA] is where defect data can be entered and stored in Ellipse. The Alarms and Defects module is used to both enter new defects into Ellipse, and search the registry of existing equipment defects.

Unless otherwise described in this procedure, the use and controls applied to each defect attribute shall be prescribed in the relevant data classification work instruction. The default Track and Civil defect attributes are described in Table 13;

Attribute Title	Size	Control Type	Mandatory
Equipment Reference	12N	MSE600	Y
Defect Attribute Link	12AN	MSEWLA	Y
Km From	8N	-	N
Km To	8N	-	N
Size (UoM)	50AN	-	N
Category	2AN	MSE010/W7	N
Action	5AN	MSE010/W4	N
Raised By	10AN	MSE81H	N
Raised Date	D	-	Y
Priority Code	2AN	MSE010/PY	Y
Work Activity Classification	1AN	MSE010/ACL	N
Comments	255AN	-	N
Standard Job No	6AN	MSE690	N
Request Type	4AN	MSE010/RQTY	N
Standard Job District	4N	-	N

Table 13 - Track and Civil (Default) Defect Attributes

Note: Ellipse users with a structures profile will view a different Alarms and Defects frame than the default track and civil frame. The layout and attribute descriptions for structures are prescribed in the relevant data classification work instruction.

5.1.1 Defect Type Link

The Defect Type Link is a controlled value attribute. It contains a 12 character alphanumeric code.

The Defect Attribute Link defines the actual defect and is controlled by the EGI. Depending on the technical discipline, the defect type link may also be controlled by other attributes (e.g. for structures assets, the defect type link is controlled by both the value stored in the EGI and the component code).

The Defect Type Link codes are stored in the Search Attributes Link module [MSEWLA]. The stored defect type link codes should be aligned with the intervention criteria specified in the relevant ARTC technical standard.

Refer to the relevant data classification work instruction for more information on the specific Defect Type Link codes (and governing rules) for a particular EGI.

5.1.2 Work Activity Classification

Work Activity Classification is a controlled value attribute. It contains a 1 character alphanumeric code. The default work activity classification is determined by the value recorded against the defect type link (which in turn contributes to determining the default work group a work order is assigned to).

The Work Activity Classification codes currently active in Ellipse are described in Table 14.

Work Activity Classification	Description
1	Signals & Communication
2	Track & Civil
3	Structures
4	Mobile Plant
5	Property
A	AK Car
S	Non-Destructive Testing

Table 14 - Work Activity Classification Codes

5.1.3 Priority

Refer to cl 8.2 below for more information on the particulars of priority codes and their use in the AMS.

The priority recorded against the original defect represents the inspector's initial (in the field) assessment of the response required for the severity of the defect. This priority may be subsequently reviewed and adjusted by a suitably competent manager, or in some cases the process for varying priority is specified in ARTC technical standards. The original priority recorded in the alarms and defect module shall not be altered or amended.

If the ARTC technical standard governing the priority codes for an asset class is amended then the priority recorded against the defect's current work order may be updated. However, the priority recorded against the defect shall not be retrospectively changed.

5.1.4 Raised By

The Raised By attribute is a controlled value attribute. It contains a 12 character numeric code. The Raised By attribute shall record an employee ID number, identifying the inspector that entered the defect.

If the Raised By attribute is left blank during the creation of a new defect record, the value will default to the employee ID of the ‘logged in’ user.

Note: The responsible manager shall ensure that credentials are created in Ellipse for each user who shall be performing inspection works. The responsible manager shall ensure that the prospective inspector is competent to perform the works before creating credentials in Ellipse.

6 Equipment Technical Maintenance

Maintenance activities must be performed on assets to maintain a predictable level of performance. The Technical Maintenance Plans describe the routine inspection policy for assets on the ARTC network;

- Mandatory inspection tasks
- Minimum inspection frequencies
- Maximum inspection latitude
- What assets (and elements) are to be inspected
- What inspection or maintenance tasks are to be performed

Activities prescribed in the Technical Maintenance Plans are mandatory. Any deviation from the prescribed activities constitutes an engineering non-compliance and an engineering waiver should be obtained prior to enacting any deviation. All maintenance activities performed in accordance with the Technical Maintenance Plans must be performed by a suitably competent person.

Type of Inspection	Infrastructure Element	Description	Reference		Minimum Frequency	Conducted by
			Standard/ Manual	Ellipse Std Job		
Section 0 - Track System						
Track Patrol Inspection (By Road/Rail vehicle or by walking. When patrol is by Engine Patrol, ETE-00-02 clause 3.4 applies.)	Rails and Joints	Includes: Rail; New Welds; Mechanical and Insulated Joints; Rail Wear; Lubrication.	CoP Sect 1 ETE-00-02	P00001	For SA , WA & Vic: 1 Patrol / 7 days (1 day latitude) For NSW/QLD: Concrete Sleepers: Passenger lines or Freight only lines >10 MGT/year 1 Patrol / 7 days (1 day latitude) Timber or steel sleepers: Passenger Lines or Freight only lines > 10 MGT/year 2 Patrols / 7 days (maximum 3 days between days of Patrol) Freight only lines 1 MGT/yr to 10 MGT/yr also Lower Hunter lines on Kooragang Is and Port Waratah where >10MGT, but train speed is <=25 km/h 1 Patrol / 7 days (1 day latitude) Freight only lines < 1 MGT/yr also Lower Hunter	Track Inspector
	Sleepers & Fastenings	Includes: Sleepers, Turnout Bearers, and Bridge Transoms; Timber, Steel, and Concrete; Resilient and Non Resilient Fastenings.	CoP Sect 2 ETE-00-02			
	Points and Crossing arrangements	Includes: Turnouts; Catchpoints; Diamonds; Slips; Expansion Switches; etc.	CoP Sect 3 ETE-00-02			
	Ballast	Includes: ballast type, condition, and profile.	CoP Sect 4 ETE-00-02			
	Geometry, Clearances and Stability	Includes: Top, Twist, Line and Gauge; Transit Space; Track Centres; Track Buckling.	CoP Sect 5 ETE-00-02			
	Earthworks and Drainage	Includes: Cuttings and Embankments; Waterways; Cess, Top, and Toe Drains.	CoP Sect 8 ETE-00-02			
	Bridges and Structures	Includes: Underbridges; Overbridges; Tunnels; Timber, Steel, Concrete, and Masonry.	CoP Sect 9 ETE-00-02			
	Level crossings	Includes: Public, Private, and Service crossings; Passive or Active.	CoP Sec 16 ETE-00-02			
	Signage	Includes: Permanent Speed Boards; Temporary Speed Boards; Safety signs.	CoP Sec 11 ETE-00-02			

Figure 7 – Typical TMP Data Requirements

6.1 Equipment Maintenance

The equipment maintenance strategy is documented in the relevant technical maintenance plan (TMP). The technical maintenance plans are the documents that govern the creation and specification for Maintenance Scheduled Tasks (MST's) against any given asset in Ellipse.

The equipment maintenance strategy prescribes three types of maintenance activities to be performed on an asset;

- Preventative Maintenance

- Planned Corrective Maintenance
- Reactive Corrective Maintenance

6.1.1 Preventative Maintenance

Preventative maintenance is performed to preserve an asset's expected operating condition. Preventative maintenance consists of;

- Planned maintenance
- Scheduled inspections

6.1.2 Planned Corrective Maintenance

Planned corrective maintenance is undertaken to restore an asset to operating condition by repairing or replacing the asset, before the asset condition deteriorates below an operationally acceptable minimum. Planned corrective maintenance includes (but is not limited to);

- Rail flaw defect removal
- AK car defect correction
- Structural defect repairs
- Resurfacing and ballasting
- Rail grinding
- Replacement of turnout components

6.1.3 Reactive Corrective Maintenance

Reactive corrective maintenance is unplanned work, undertaken to restore assets to operational condition. Reactive corrective maintenance is undertaken as a result of a serious asset defect identified during preventative maintenance (e.g. inspections) or as a result of an external report.

Reactive corrective maintenance is usually performed within a relatively short timeframe to remove a TCR or TSR and is to be avoided wherever possible, as it is the most costly form of maintenance (both financially and operationally).

6.2 Train Control Reports

A Train Control Reports (TCR) is created by Network Control when a potential defect is identified by ARTC Operations staff or train crews.

TCR's are created in SIMS and published in the daily shift journal. The TCR will be investigated in accordance with the relevant train control report procedure. Any defects discovered during the investigation shall also be recorded and managed in Ellipse in accordance with the provisions of this procedure.

The original TCR ID number must be recorded against the defect (and work order) and will be used as the unique identifier when interfacing with other ARTC systems or reporting (as opposed to the Ellipse work order number).

Note: TCR defect records are an exception to the normal AMS relationship, as prescribed in section 2.1 above.

7 Asset Performance and Planning

Asset performance and planning is currently delivered using the AMP Interim Database.

The purpose of the AMP Interim Database is to deliver a consistent and uniform asset management model across ARTC's Business Units, facilitating strategic engineering decisions that are supported by sound evidence of asset condition.

7.1 Asset Management Plan

The asset management plan is developed in accordance with the AMP process control plan. The template for the AMP process control plan is located in the asset management section of the Safety Management System (SMS).

An AMP process control plan will be created and approved for each maintenance team (e.g. corridor), creating the calendar of reviews and identifying the stakeholders. Responsibility for each stage of the AMP process control plan and what AMS system is used is shown in Table 15.

The asset management plan focuses on the following;

- Management of discrete assets – repair of wear and tear to asset (e.g. turnouts, level crossings)
- Management of linear assets – program of cyclical works along the track structure (e.g. re-railing, grinding, drainage, resurfacing, ballast cleaning, vegetation control)
- Management of the technical maintenance plans (e.g. inspections, preventative maintenance derived from inspections)

Stage	Responsibility	Managed In
RCRM Inspections	Maintenance	Ellipse
Area Manager Planning	Maintenance	Ellipse
Delivery Unit Planning	Asset Management	AMP Interim Database
10yr AMP Updated	Asset Management	AMP Interim Database
Validate AMP Work Requests	Asset Management	AMP Interim Database
Finalise Division AMP Priorities	Asset Management	AMP Interim Database
Approval	Business Unit Management	-

Table 15 - AMP Process Control Plan Responsibilities

The managers responsible for infrastructure maintenance (e.g. Area Managers) shall submit requests for work to the asset management team for approval and incorporation into the AMP. Requests for work shall be submitted in accordance with the process approved by the relevant asset management team. Requests for work should be supported by appropriate evidence, such as;

- Defects recorded in Ellipse
- Information on the overall condition of the asset
- Any other pertinent factors.

Requests for work that are approved by the asset management team shall be recorded as projects in the AMP interim database, against the relevant programmed funding stream and planned financial year. Work requests (or projects) residing in the AMP Interim Database are reviewed and validated by the relevant stakeholders as part of the annual condition inspections.

7.2 Annual Works Plan

The annual works plan is the approved maintenance activities and budget for a given financial year. The annual works plan is developed from a variety of sources and will typically include a mixture of preventative and corrective maintenance, major periodic maintenance and capital works.

The AWP is managed manually (offline) in accordance with EGP-20-01. The principle interactions with the AMS during this process are as follows;

- The annual works program is initiated using data supplied via an excel export of 'year one' from the AMP Interim Database.
- The AMP data is processed by the relevant manager into a project using the simple project management plan (EGW2002T-01) and simple project work package (EGW2002T-03) templates.
- As part of this project development stage the asset configuration and deficiency data shall be retrieved from Ellipse and incorporated in the project work package.
- Any configuration changes will be identified and managed in accordance with the Rail Network Configuration Management procedure (EGP-03-01).
- Any Ellipse defects that will not be removed by the project will be recorded on the project handover checklist (EGW2001T-18) and supplied to the relevant infrastructure maintenance team
- The relevant infrastructure maintenance team will be responsible for inspecting the asset at the completion of the project and;
    - Confirming that the captured configuration data is correct
    - Removal of any defects still recorded against the asset that have been removed by the project works

7.3 AMP Interim Database

The long term (10 year) asset management plan is produced in the AMP Interim Database. The AMP Interim Database is a MS Access Database that is designed to capture the required attribute data for each proposed project. The AMP Interim Database is populated in accordance with the AMP process control plan (refer to cl 7.1).

The AMP Interim Database was implemented prior to the Ellipse go-live and was originally designed to sync with Ellipse 5 and WMS. The primary functions of the AMP Interim Database are described in Table 16;

Frame Title	Description
Home	Displays database version number and update notes
Assets [Note 1]	Displays asset attribute data (periodically synced from Ellipse)

Frame Title	Description
Projects	Displays AMP planning and financial data
Defects Note 2	Displays defect attribute data
Budgets	Displays budget data for reference against AMP planning
Unit Rates Note 3	Sub-database containing activity unit rates. Used to produce project cost estimates
Exports	Report generation tool
Imports	Database update tool (load asset, defect, unit rate data etc.)
Sighting Distances	Level crossings sighting distances sub-database and calculator Note 4

Table 16 - Interim AMP Database Frames

Note 1: Certain equipment classes (e.g. signals, level crossings) have additional configuration data recorded against them. This data shall be transferred to the Ellipse nameplate when the AMP Interim Database is transitioned out of active use.

Note 2: The defects frame was made redundant at Ellipse go-live and is no longer updated.

Note 3: The unit rate database shall be transferred into Ellipse when the AMP Interim Database is transitioned out of active use.

Note 4: The sighting distances database shall be transferred into LXM when the AMP Interim Database is transitioned out of active use.

The AMP Interim Database is capable of programming cyclic work (e.g. grinding, scheduled inspections) that originates from a single project that spans multiple financial years.

The AMP Interim database will produce (and populate) the required configuration management forms for the project manager, if appropriate.

7.3.1 Work Requests (Projects)

The Projects frame contains the data attributes necessary to produce the AMP. For each work request (or project) the record must contain sufficient data to satisfy;

- The AMP approval process
- The transfer of the project to the relevant project manager in year one (i.e. the AWP).

The data attributes currently captured by the AMP Interim Database for each project is described in Table 17.

Attribute Type	Attribute Title	Data Type / Control	Mandatory
Project Details	Project No	Numeric	Automatic
	Ci Financials Job Number	Numeric	N
	BVR Number	Numeric	N
	Project Description	Alpha	N
	Account Code	Table List	Y
	HVY Pricing Zone	Numeric	N
	Activity	Table List	Y

Attribute Type	Attribute Title	Data Type / Control	Mandatory
	Start Date	Date	Y
	End Date	Date	Y
	Unit Rate	Currency	Y
	Quantity	Numeric	Y
	Estimate Year	Table List	Y
	Total (inc. CPI)	Currency	Calculated
	Km from	Numeric	N
	Km to	Numeric	N
	Project Notes	Alpha	N
	Deferred Notes	Alpha	N
Activity Details	UoM	Pre-populated values based on the Activity selected	
	Program		
	Group		
	Long Description		
	Activity Objective		
Delivery Details	Project Type	Table List	Y Note 1
	Delivery Method	Table List	N
	Environmental Approvals	Alpha	N
	TBEIA	Table List	N
	Heritage Item	Y/N	N
	Configuration Change	Y/N	N Note 2
Project Manager	User ID	Table List	N

Table 17 - AMP Interim Database Project Attributes

Note 1: The AMP Interim Database will generate the appropriate (pre-populated) work pack documents depending on the value of this attribute.

Note 2: The AMP Interim Database will generate the appropriate configuration management form if a 'yes' value is recorded.

8 Works Management

ARTC's WMS is currently implemented in Ellipse. Ellipse has a range of instruments available to execute the required processes, including;

- Work Orders
- Work Requests
- Maintenance Scheduled Tasks

Ellipse functions available to execute the required processes include;

- Automatic Assignment Allocation (AAA)
- Automatic generation of work orders from defects
- Alarm Defect User Status

With the exception of work requests, the above functions are used in the implementation of the ARTC WMS.

8.1 Work Order

Work orders are the principal instrument of the works management process within Ellipse. A work order represents a work activity that must be performed to comply with ARTC technical standards.

There are three ways that work orders are created in Ellipse;

- Automatically generated when a defect is entered into the alarms and defects module
- Automatically created when a MST is committed
- Manually created for an ad hoc purpose (e.g. to record an unscheduled inspection)

Work orders can be accessed and manipulated in two Ellipse modules;

- Work Order (MSEWOT)
- Jobs (MSEWJO)

The Ellipse module used to access a work order record will determine the visible record attributes and functionality available. It is recommended that the Ellipse modules be used as described in Table 18.

Ellipse Module	Recommended use
MSEWOT	For review, management, and assessment of individual work orders
MSEWJO	For bulk changes to work orders, RPPD of work orders and committal of MST's into work orders

Table 18 - Recommended Ellipse modules for actioning work orders

Note: Work order attributes not described in the clauses below are typically populated with data imported from the parent defect or MST record. These attributes may contain data that is used to inform the actioning manager, but are not used to enable the WMS processes. These attributes are described in the appropriate section of this procedure.

8.1.1 Work Order Type

The Work Order Type is a controlled value attribute. The control values are indicated in Table 19 below. The Work Order Type is editable by the responsible manager after the Work Order is created.

The Work Order Type describes the programmed funding stream for the work activity.

Work Order Type	Description
RM	Routine Corrective Maintenance
MP	Major Periodic Maintenance
CP	Capital Project
IN	Incident

Table 19 - Work Order Type

8.1.1.1 Routine Corrective and Reactive Maintenance (RCRM)

RCRM activities are routine work activities that are scheduled (or undertaken) within 12 months. Work activities typically funded as RCRM include;

- Preventative maintenance (e.g. scheduled inspections)
- Corrective Maintenance (e.g. repair of defect that is effecting the operation of the ARTC network)
- Reactive Maintenance (e.g. repair of defect not identified during scheduled inspections)

Note: By default, all Work Orders that are automatically generated from a defect or MST will be coded as 'RM – Routine Corrective Reactive Maintenance'.

8.1.1.2 Major Periodic Maintenance (MPM)

MPM activities are cyclical planned activities that are part of a strategy to maintain an asset at a sustainable operational capacity and prevent premature life expiry. MPM activities are designed to;

- Maintain the current frequency of preventative maintenance
- Reduce the frequency of corrective and reactive maintenance

MPM activities can be programmed based on cyclic maintenance, condition based maintenance, or a combination of both.

8.1.1.3 Capital (CAP)

CAP activities provide ARTC with a future economic benefit that can be identified or measured. CAP activities include;

- upgrading the capacity of the asset (in order to increase the capacity of the ARTC network)
- Replacement or renewal of an asset
- Extending the lifecycle of an asset

CAP activities can either be Corridor Capital or Major Capital (Add capacity to the network) work.

8.1.1.4 Incident

Incident activities are reactive maintenance, performed in response to a major incident that has compromised the safety or operational capacity of the ARTC network. An incident number will be raised in Ci Financials to record any activities performed against the asset, with the costs being claimed against ARTC's insurance.

Incident is recorded against the REPAIR work order to describe that zero sum work has been performed against the asset.

8.1.2 Required Start Date

The required start date is a controlled value attribute. It records a calendar date value (i.e. dd/mm/yyyy). The required start date should not be edited for work orders that have been generated by a defect or MST.

By default the required start date will be populated with the 'raised date' from the defect, or the 'last scheduled date' from the MST

8.1.3 Required By Date

The required by date is a controlled value attribute. It is a calculated value. The required by date shall not be edited directly (it can be altered by changing the planners priority).

The required by date calculation is;

$$(Required\ by\ date) = (required\ start\ date)^{MSEWOT} + (work\ order\ days)^{MSO011/PY}$$

8.1.4 Standard Job

The Standard Job is a controlled value attribute. It contains a 6 character alphanumeric code. It defines the activity that the Work Order represents.

By default all defects automatically generate Work Orders with the 'REPAIR' Standard Job. MST's that have been committed will generate a work order with the same standard job as the MST.

The stored standard job value is editable by the responsible manager after the Work Order is generated.

Users should refer to the relevant data classification work instruction for more comprehensive information on the available Standard Jobs, and any associated business rules.

Active Standard Jobs are described in the Standard Job module [MSE690].

8.1.5 Work Group

The Work Group is a controlled value attribute. It contains a (maximum) 8 character alphanumeric code. The allocated Work Group is editable by the responsible manager after the Work Order is created.

The default Work Group for the Work Order shall be generated as follows:

- Inspections – Determined by the Work Group recorded against the originating MST
- Defect Repairs – allocated in accordance with the AAA table (refer to 8.3.2 below)

Active Work Group codes are described in the Search Work Group module [MSE720].

8.1.6 Originators Priority

The originators priority is a controlled value attribute. It contains a 2 character alphanumeric code. The originators priority is locked to prevent editing of the recorded value in the work order.

By default the originators priority will be populated with the value of the priority recorded against the defect. For work orders generated from MST's the originators priority will default to 'Z'.

The priority 'Z' is not an active priority. It is allocated to prevent the calculation of the 'required by date' from the 'required start date' (i.e. the 'required by date' and 'required start date' in the work order are the same as the 'last scheduled date' in the MST).

Refer to cl 8.2 below for more information on the particulars of priority and its use in the AMS.

8.1.7 Planners Priority

The planners priority is a controlled value attribute. It contains a 2 character alphanumeric code. The planers priority may be edited by the responsible manager, in accordance with the relevant ARTC technical standard.

By default the planners priority will be populated with the value of the priority recorded against the defect. For work orders generated from MST's the originators priority will default to 'Z'.

Refer to cl 8.2 below for more information on the particulars of priority and its use in the AMS.

8.1.8 Activity Code

The activity code (also known colloquially as the natural activity) is a controlled value attribute. It contains a 2 character alphanumeric code. The Activity Code is used to describe the activity that is being undertaken, in terms used by ATRC's expenditure classification system.

The valid account codes that appear in Ellipse shall be controlled by those used in CI Financial, as described in FIN-RG-009. Any account codes in Ellipse that do not appear in either CI Financial or FIN-RG-009 shall be marked as inactive.

8.1.9 Extended Text

Extended text is an uncontrolled attribute. The extended text is editable by the responsible manager after the work order has been created.

By default the extended text will be auto-filled with the defect data transcript (for work orders automatically generated from defects).

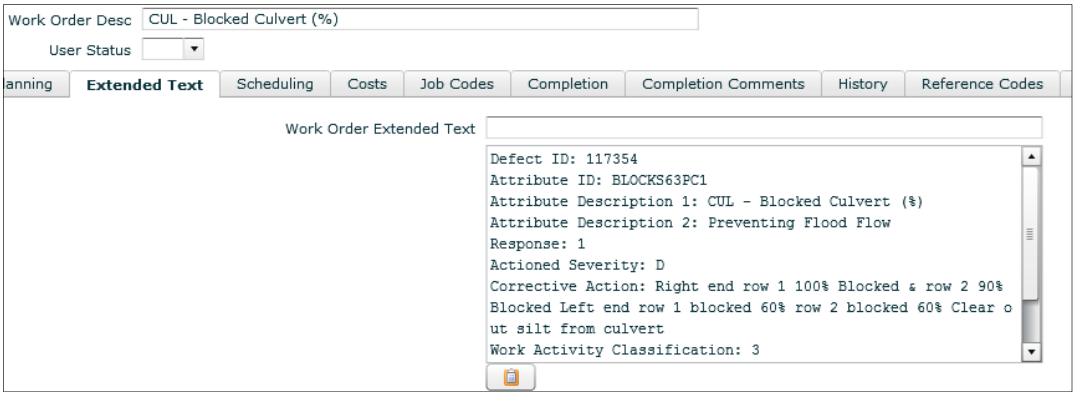


Figure 8 - Work Order Extended Text

8.1.10 Automatic Generation of Work Orders

ARTC's implementation of Ellipse has been customised to automatically batch process all new records entered into the alarms and defects module [MSEWDA] and action the defects into work orders.

The batch processing is configured in the ARBWDA module and is executed every 15 minutes.

Note: The 'out of the box' Ellipse system requires the review of the defect record by a suitably competent manager. The reviewing manager determines the most appropriate works management instrument to commit the defect into from the available options (e.g. create work order, create work request, create estimate, or close the defect).

8.2 Prioritisation

All defect work orders must be assessed in accordance with ARTC technical standards by an appropriate and competent manager, to determine what actions are required (to mitigate the risk imposed by the defect) and the urgency of the actions required.

It is important to note that the management of defects is performed in the work order module [MSEWOT], not in the alarms and defects module [MSEWDA]. The defect stored in the alarms and defects module is only a record of the originators (i.e. the inspectors) initial assessment of the defect.

The priority assigned to a defect describes the timeframe within which the work order must be completed (defect remediated, inspection performed etc.).

In certain prescribed situations the required by date may be extended by using the RPPD process to mitigate the risk imposed by the defect (refer to cl 8.3 below).

Work order actions that are neither completed or mitigated using the RPPD process will impose a non-compliance with ARTC technical standards.

8.2.1 Priority Code

The Repair Priority attribute is a controlled value attribute. It contains a 2 character alphanumeric code. The Repair Priorities of both the inspector (Originator Priority) and the responsible manager (Planners Priority) are stored in the 'Planning' sub-frame of the Work Order.

The Originator Priority is prepopulated using the value stored in the associated defect or MST when the work order is generated. The Originator Priority attribute is locked within the work order to prevent editing.

The Planner Priority attribute shall default to the same value as the Originators Priority. The responsible manager may vary the Planner Priority in accordance with the relevant ARTC technical standard.

The Priority Code is used by Ellipse to calculate the 'Required By Date' of the work order, which is used for the reporting of engineering compliance. All work orders created in Ellipse need a 'Required By Date'. Where the originators priority and planners priority are different, the planners priority will take precedence for the purposes of calculating the required by date. Refer to cl 8.1.3 for the 'Required By Date' calculation.

Note: All current Priority Codes are available for use against any work orders in Ellipse. However, the responsible manager should only use the priority codes appropriate for the asset, as prescribed by the governing standard (refer to Table 20 below).

The current Priority Codes in Ellipse can be reviewed in MSE010/PY.

Code	Description	Constraints	Governing Standard
E	Do immediately	Track & Civil (generic)	EGP-10-01 Note 1
1	Within 7 days	Track & Civil (generic)	EGP-10-01 Note 1
2	Within 28 days	Track & Civil (generic)	EGP-10-01 Note 1
3	Planned Maintenance	Track & Civil (generic)	EGP-10-01 Note 1
B1	(RM1) Repair within 1 month	Structures	ETE-09-01
B2	(RM6) Repair within 6 months	Structures	ETE-09-01
B3	(RY1) Repair within 1 year	Structures	ETE-09-01
B4	(RY2) Repair within 2 years	Structures	ETE-09-01
M1	(MM1) Reinspect monthly	Structures	ETE-09-01
M2	(MM6) Reinspect 6 monthly	Structures	ETE-09-01
M3	(MY1) Reinspect annually	Structures	ETE-09-01
XX	(AXX) Reinspect at next inspection	Structures	ETE-09-01
R1	RFD 1 day	Rail	ETG-01-02
R2	RFD 2 days	Rail	ETG-01-02
R3	RFD 5 days	Rail	ETG-01-02
R4	RFD 7 days	Rail	ETG-01-02
R5	RFD 14 days	Rail	ETG-01-02
R6	RFD 30 days	Rail	ETG-01-02
R7	RFD 35 days	Rail	ETG-01-02
R8	RFD 45 days	Rail	ETG-01-02
R9	RFD 60 days	Rail	ETG-01-02
S1	RFD 90 days	Rail	ETG-01-02
S2	RFD 5 months	Rail	ETG-01-02
S3	RFD 6 months	Rail	ETG-01-02
S4	RFD 12 months	Rail	ETG-01-02

Table 20 - Priority Codes

Note 1: The timeframes and actions required for defects are defined in the governing ARTC technical standard(s). Where the relevant ARTC technical standard does not prescribe the priority codes to be used the generic track and civil priority codes may be adopted.

8.3 Revised Priority or Planned Date (RPPD)

Revised Priority or Planned Date (RPPD) is the process of managing the risk associated with a corrective maintenance task that is deferred beyond its original ‘required by’ date.

The RPPD process involves the on-going reassessment of a defect via intermediate inspections (i.e. out with the TMP scheduled inspections) to verify that the asset is not deteriorating. This allows the risk imposed by the defect to be mitigated and the remediation timeframe to be pushed back to a more advantageous date for ARTC. RPPD may only be performed by a nominated manager who is suitably competent (with regards to the asset type and defect).

A defects initial/originators priority (and 'required by date') are based on the assessment made at the time of the original inspection by a competent inspector. The inspector records the priority code that represents the anticipated maximum timeframe that corrective maintenance can be deferred; until deterioration of the asset has the potential to impact operation of the ARTC network.

The intervention criteria and required timeframes are prescribed in the relevant ARTC technical standards. RPPD should only be performed by a suitably competent person (it is not an administrative function).

Note: *There is an anomaly in the implementation of the works management within Ellipse. Due to the automatic generation of work orders from defects the P3 defects generate work orders with a 'required by date' = 'raised date' + 1 year.*

ARTC technical standards do not prescribe a remediation timeframe for P3 defects.

Administrative RPPD of P3 defects is permitted.

P3 defect work orders may be omitted from engineering compliance reporting.

8.3.1 Ellipse RPPD Process

Within Ellipse, RPPD is performed against work orders via the MSEWJO module.

Through RPPD, the work order is closed and coded using the alarm defect user status (refer to Table 21 below).

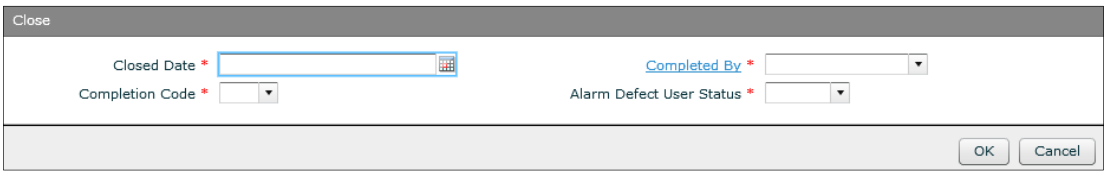


Figure 9 - MSEWJO work order close menu

Use of an appropriate Alarm Defect User Status code will trigger Ellipse to close the original REPAIR work order and generate a new reinspect (REINSP) work order. The new work order will have a 'Required By Date' calculated from the new RPPD Priority and the 'Raised Date' of the new work order (i.e. when the original work order was RPPD assessed).

The reinspect work order will be auditable back through previous work orders to the original defect, providing evidence of the ongoing management of the defect.

The current Alarm Defect User Status values are described in Table 21 and Table 21 - Alarm Defect User Statusstored In MSE010/+DFP;

Code	Description	Frequency	Constraints	Governing Standard
CNOA	Closed no action		Track & Civil (generic)	EGP-10-01
CNWC	Closed no work completed		Track & Civil (generic)	EGP-10-01
CWOD	Closed work done		Track & Civil (generic)	EGP-10-01
REIN	Reinspect		Track & Civil (generic)	EGP-10-01
REN1	Reinspect priority 1		Track & Civil (generic)	EGP-10-01
REN2	Reinspect priority 2		Track & Civil (generic)	EGP-10-01
REN3	Reinspect priority 3		Track & Civil (generic)	EGP-10-01
RENE	Reinspect emergency		Track & Civil (generic)	EGP-10-01
REOP	Reopen actioned defect		Track & Civil (generic)	EGP-10-01
MM1	Reinspect monthly		Structures	ETE-09-01
MM6	Reinspect 6 monthly		Structures	ETE-09-01
MY1	Reinspect annually		Structures	ETE-09-01
AXX	Reinspect at next MST		Structures	ETE-09-01
S001	RFD 1 day		Rail	ETG-01-02
S002	RFD 2 days		Rail	ETG-01-02
S005	RFD 5 days		Rail	ETG-01-02
S007	RFD 7 days		Rail	ETG-01-02
S014	RFD 14 days		Rail	ETG-01-02
S030	RFD 30 days		Rail	ETG-01-02
S035	RFD 35 days		Rail	ETG-01-02
S045	RFD 45 days		Rail	ETG-01-02
S060	RFD 60 days		Rail	ETG-01-02
S090	RFD 90 days		Rail	ETG-01-02
S147	RFD 5 months		Rail	ETG-01-02
S182	RFD 6 months		Rail	ETG-01-02
S364	RFD 12 months		Rail	ETG-01-02

Table 21 - Alarm Defect User Status

A completion code must also be recorded by the user during the RPPD assessment process. The purpose of the Completion Code (refer to Table 22 below) is to provide context to the record that is being closed out.

Code	Description
AC	Work completed
AK	New AK car run
CA	Cancelled

Code	Description
CC	Costing completed
DF	Deferred
PC	Partially complete
RT	Rescheduled

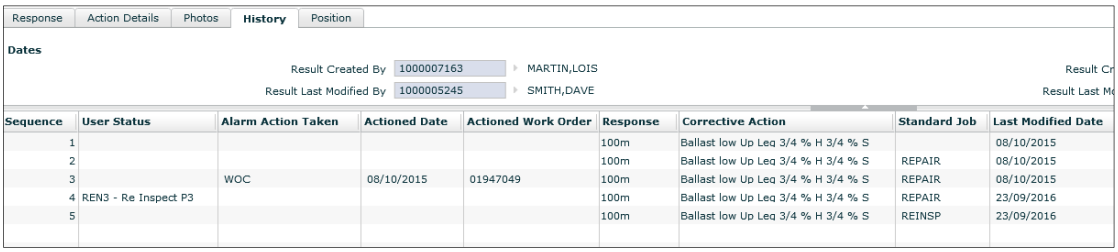
Table 22 - Completion Codes

8.3.2 RPPD History

Multiple cycles of RPPD assessment may be administered against a defects work order within Ellipse. These cycles may be reviewed in both the work order and defect modules.

Within the work order modules [MSEWOT and MSEWJO] a work order is created by each RPPD action. The RPPD history can be generated by performing an asset specific search in either of the work order modules. Each identical record will describe an RPPD cycle, with the active work order being the current iteration.

Within the alarms and defects module the defect record will remain linked to the current work order record. Each time the linked work order is actioned a record will be created in the alarms and defects history sub-frame (Refer to Figure 10).



Sequence	User Status	Alarm Action Taken	Actioned Date	Actioned Work Order	Response	Corrective Action	Standard Job	Last Modified Date
1					100m	Ballast low Up Leq 3/4 % H 3/4 % S		08/10/2015
2					100m	Ballast low Up Leq 3/4 % H 3/4 % S	REPAIR	08/10/2015
3		WOC	08/10/2015	01947049	100m	Ballast low Up Leq 3/4 % H 3/4 % S	REPAIR	08/10/2015
4	REN3 - Re Inspect P3				100m	Ballast low Up Leq 3/4 % H 3/4 % S	REPAIR	23/09/2016
5					100m	Ballast low Up Leq 3/4 % H 3/4 % S	REINSP	23/09/2016

Figure 10 - Alarms and Defects History Frame

The information provided in Figure 10 is broken down and described in Figure 11.

Sequence	Description
1	Creation of defect in alarms and defects
2	Batch processing adding default mandatory work order data to defect (refer cl 8.1.10)
3	Batch processing creating REPAIR work order using AAA (refer cl 8.4)
4	REPAIR work order assessed using RPPD and closed out (refer cl 8.3.1)
5	REINSP work order created

Figure 11 - Breakdown of Figure 10 Record

8.4 Automatic Assignment Allocation (AAA)

The Automatic Assignment Allocation (AAA) table is an integral part of ARTC's Ellipse work order auto-generation process.

The generated AAA code is used to enable the automatic allocation of a generated work order to either a;

- Work group

- Work crew
- Individual
- Work request

Currently, ARTC's AAA table is configured to allocate all work orders to a work group.

The AAA code is a concatenation of the work activity (recorded against the defect type link) and the location (recorded against the equipment record). The AAA code also defines the default standard job that is allocated to a work order.

The responsible manger may change any of the default values assigned by the AAA code once the work order has been created.

The AAA table can be reviewed at MSE010/AAA. An example of a valid AAA code would be;

- 2ABY
  - o 2 = Track & Civil (Work Activity Classification)
  - o ABY = Albury NSW (Location)

Refer to Figure 12 below for details of a typical AAA table record.

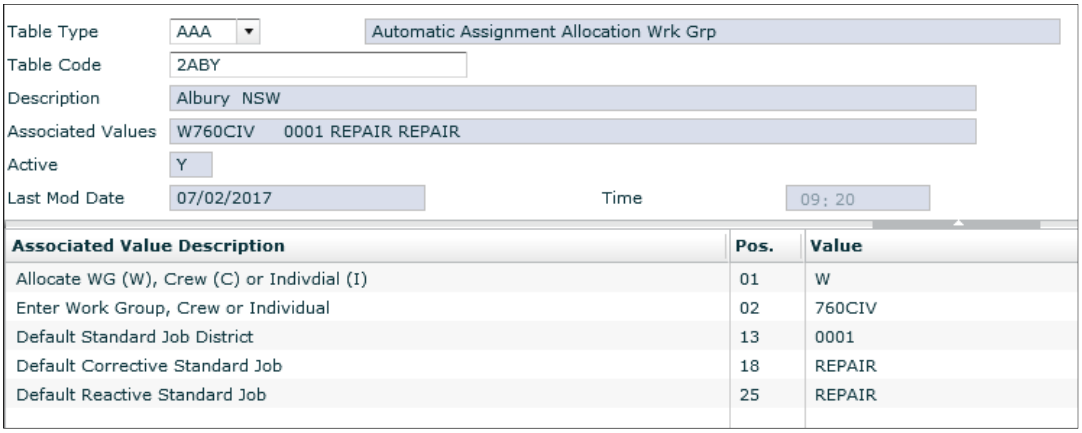


Figure 12 - AAA Table Record

Note: The nominated responsible managers shall ensure that the AAA table is up to date and correct at all time. Inaccuracies in the AAA table can cause defects and MST's to generate work orders to the wrong work group (i.e. under a different provisioning centre).

9 Engineering Compliance

Engineering compliance provides oversight of all maintenance and infrastructure works; to confirm that the configuration and administration of the AMS is in accordance with the relevant ARTC technical standards and that ARTC's business interests and accreditation are not compromised.

9.1 Scheduled Reports

The reports produced from the asset management system are typically managed and prepared by the ADA's (or as nominated by Business Unit management). There are 3 types of scheduled reports;

- Manually generated and distributed
- Automatically generated and distributed
- Automatically generated and manually distributed

Automatically generated reports are typically produced via the data warehouse, using data retrieved from Ellipse. Manually generated reports are typically produced via the user extracting the required data (using ARBWOEA to generate a WO, WR or defect compliance extract) and then processing the data using a macro enabled excel spreadsheet supplied by compliance management.

9.1.1 Data Warehouse

The data warehouse is a corporate reporting environment that is capable of merging data from various systems to create standard reports. Table 23 describes standard compliance reports (that must be regularly generated) that are generated via the data warehouse without the need to extract and manipulate the data directly from Ellipse.

Code	Title	Type	Description
COM001	MST Work Order Compliance	Compliance	
COM002	Defect Work Order Compliance	Compliance	
COM004	In Service Equipment Without MST	Compliance	
DEF001	Defect Type Report	Defect	
PLA001	MST Work Order Planning	Planning	
PLA002	Defect Work Order Planning	Planning	

Table 23 - Data Warehouse Standard Generated Reports

9.2 Verification of Data

The delegated responsible manager (refer to cl 1.4) shall ensure that there is an equipment record in the Ellipse equipment register for all assets on the ARTC network. The responsible manager shall also ensure that the equipment record (including the nameplate where such attributes are defined) is accurate and complete, as far as is practical.

To facilitate this function of the responsible manager, a number of standardised data extract reports are available via the ARTC Ellipse SharePoint page, as described in Table 24 below;

Discipline	Title	Description
Track and Civil	ARTC Track Asset Listing	ARTC track asset nameplate details
Track and Civil	Turnout Nameplate Details	In service turnout nameplate details
Track and Civil	Level Crossing Nameplate Details	In Service and group maintained level crossing details
Structures	Structures Assets Summary Asset Count Report	All structures asset count for PC by class and function type
Structures	Bridges Nameplate Details	In service and not maintained UB, OB details
Structures	Culvert Nameplate Details	In service nameplate details, has VS and VL info in structure type
Structures	Tunnel Nameplate Details	Tunnel nameplate details

Table 24 - Data Warehouse Ellipse Reports