AMDS PROGRAMME
Lifecycle Methodology

AMDS DATA STANDARD WORKSTREAM

23 MARCH 2022

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OVERVIEW

The Lifecycle aspect of AMDS broadly covers the Maintenance, Renewals and Planning elements required in the management of AMDS Assets (Inventory). This includes the following key areas (Faults, Maintenance Activity, Condition & Renewal Activity):

- **Faults:** An observed issue (or symptom) on an asset. A new element that is a combination of the RAMM Rating and the RAMM Contractor Dispatch. Faults have:

    o   an Extent (how big it is),

    o   a Severity (how bad it is),

    o   a Priority (how quickly a response is required),

    o   a Cause (reason it occurred) and

    o   an Activity (which has been decoupled from the Faults and treated as its own entity (Maintenance Activity). Each Fault can only relate to one Activity).

- **Maintenance Activity:** The treatment selection for remedy (repair) of the Fault, limited by size of repair (excludes renewals). Functions relate to the day-to-day running and upkeep of assets. A new element that is a combination of the RAMM Maintenance Cost Table and RAMM Contractor Dispatch. Activities have:

    o   an Extent (how big the repair is – may differ from the Fault Extent) and

    o   each Activity can relate to one or many Faults.

- **Condition:** 'Reflects the physical state of the asset'[1]. Condition can be continuous or aggregated and typically spans the full breadth of an asset lifecycle from New (excellent condition) through to Decommissioned (very poor condition). Refinement of the current Condition Tables in RAMM, including a new framework for non-pavement/surfacing assets.

The relationship between Faults and Condition is represented in Figure 1. This animation demonstrates that Faults will typically identify areas that are already progressing toward Poor condition and therefore act as lag indicators from a planning perspective (bits that already need to be fixed). Condition covers the full lifecycle range from New (Excellent) to Very Poor enabling pro-active or lead planning of the asset.

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[1] IIMM 2020; Section 1.2.2 Lifecycle Asset Management, IIMM 2020 - NAMS+ (namsplus.org)
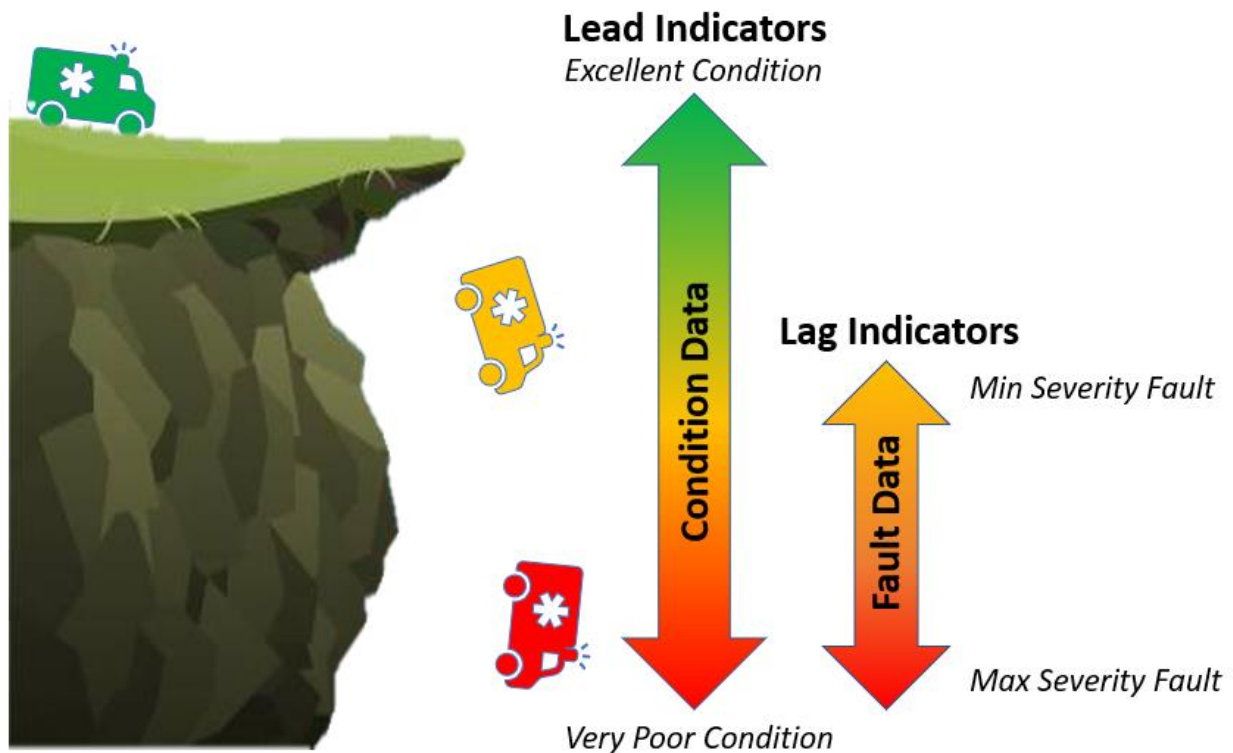
Figure 1: Animated representation of Condition vs Fault

- **Renewal Activity (Forward Work Program):** The planning of and treatment selection and timing for renewal of the Asset. Is the significant upgrading or replacement of an asset or asset component, and associated planning, to restore the asset to its required functional condition and performance? Equivalent to the current NOMAD module in RAMM

FRAMEWORK

AMDS Lifecycle elements each include the following common features.

- **Asset Inclusive:** Each element will be structured to accommodate all assets. Initial development will focus on Pavement & Surfacing assets. The exception will be Condition where a number of structures will exist to accommodate all condition types required for pavement and surfacing assets.

- **Status Tracking:** Each element (e.g. Fault, Condition or Activity) will be tracked through its life from identification through to completion/closing. A status flag will identify the key stage of the element at any point in time. For example (refer Figure 2 with changes in red), a renewals site may be identified on a pavement in 7-years' time, as this time draws nearer, the work site may change size, timing or treatment and this information will be captured against the same single Activity ID.

- **Temporal**: Ability to roll back the clock to view historical information

Figure 3 shows the inter-relationship between the four key AMDS Lifecycle elements (blue boxes) and linkage into the AMDS inventory.
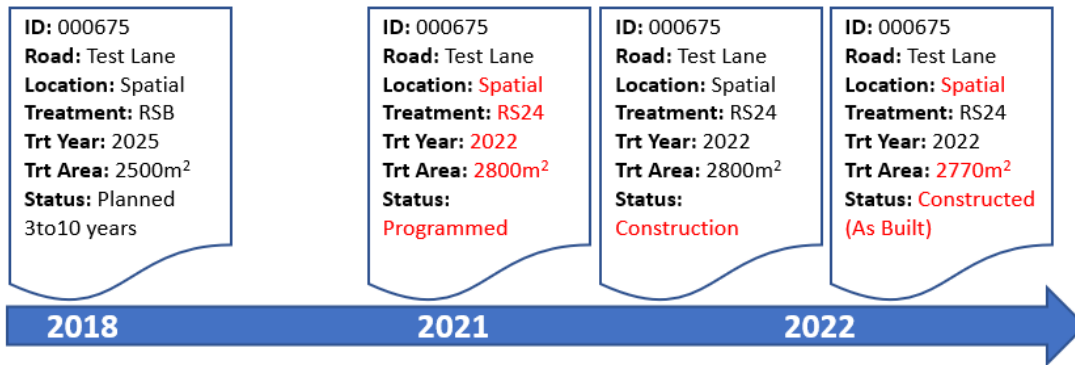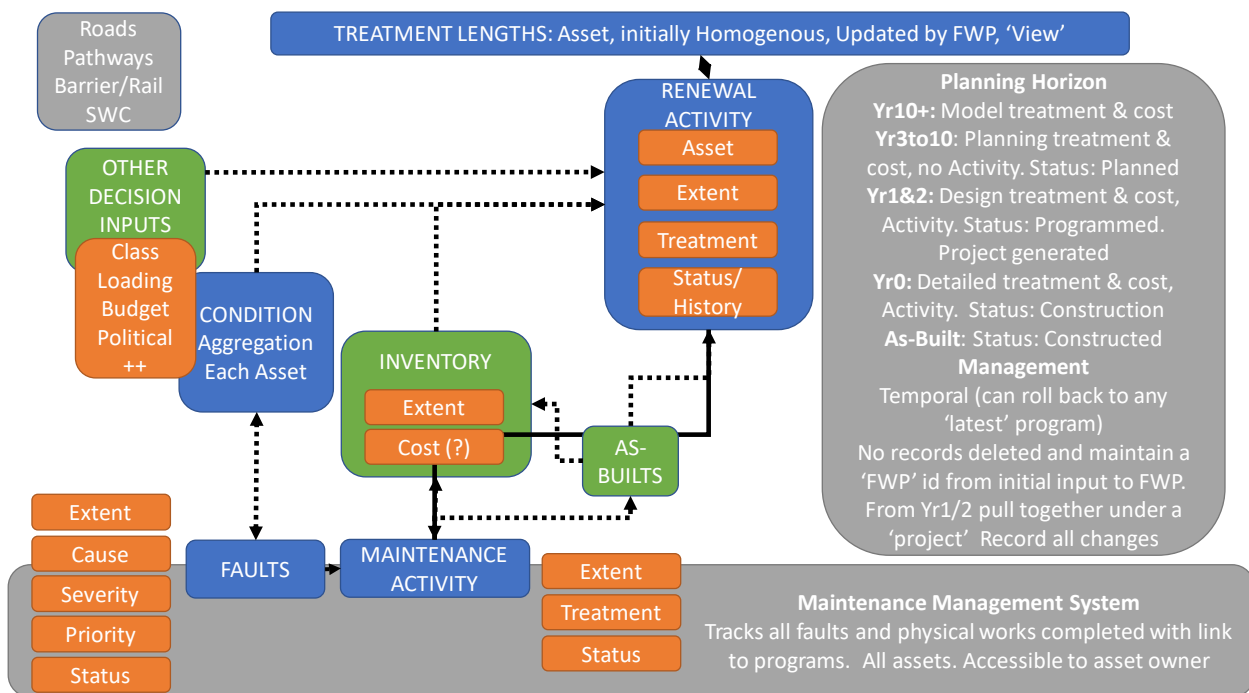
Figure 2: Renewal Activity Tracking Example

Figure 3: Inter-relationship between AMDS Lifecycle elements

LIFECYCLE ELEMENTS

Faults

The value list for Faults has been established through a combination of Subject Matter Expert judgement and industry consultation.

- **Pavement, Surfacing & Shoulder assets**: Definitions were developed as part of the RIMS Fault Guideline project (2021) which underwent industry-wide engagement prior to finalising the initial fault list.

- **All other assets**: Definitions have been developed by industry SME's and will be published for industry review and feedback through AMDS.

Faults will enter the system when a minimum severity is reached. The definition of minimum severity is being established in parallel through the RIMS group and is not directly part of the AMDS project. Each fault will be tracked through its life from:

- **Identification**: Fault enters system when initially picked up through customer, owner, supplier, inspection or other means. An ID will be assigned as well as all fault details including the date and proposed Maintenance Activity.

- **Review**: Subsequent inspections which may (or may not) result in changes to fault (extent, severity, maintenance activity). Date of review should be captured. Accurate locational referencing will be critical, particularly if automated or machine learning inspections are being used.

- **Status (Change Management)**: Each Fault will link to a single Maintenance Activity (which may be "No Action"). When the Activity is completed the Fault Status will be updated – effectively ending the life of the Fault. Business rules should also consider closing out Faults located within Renewal Activities extents when they are completed.

Maintenance Activity

The value list for Maintenance Activity has been established through Subject Mater Expert judgement drawing on current supplier practice.

Maintenance Activities are decoupled from and have a one-to-many relationship with Faults. Similar to all AMDS Lifecycle elements. Activities are tracked through life using their unique ID. Change Management attributes will capture details of changes to any Activity record, capturing as a minimum, the date when the Activity is initiated and when it is completed. The Extent of the Maintenance Activity will commonly be larger than the Extent of the Fault.

Figure 4 shows the linkage between Maintenance Activity and Renewal Activity. The number of Activities recorded will be much higher for Maintenance, though will span a much shorter time period, typically less than one year compared to more than 10 years and up to 50 years for the Renewal Activity.
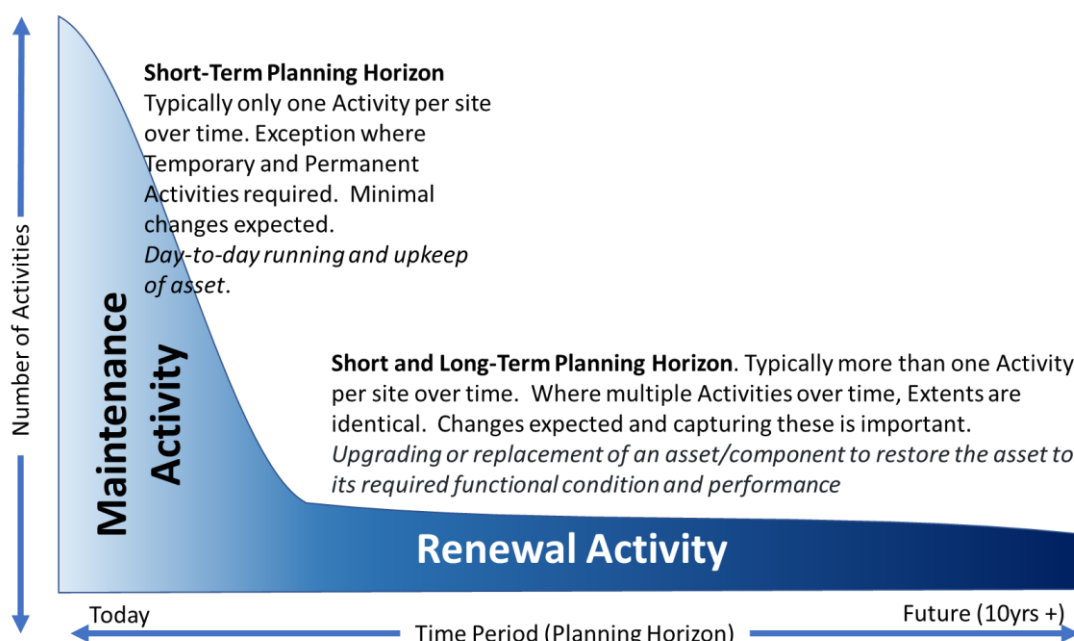

Figure 4: Activity Continuum

Condition

The most significant change proposed is for non-pavement and surfacing assets, whereby condition is removed from the Inventory and included in a common Condition structure. Decoupling condition from inventory enables the benefit of timeseries data for improved forward planning and decision making.

Minimal change is proposed for pavement and surfacing assets. As the REG Consistent Data Collection project progresses, minor, non-structural changes to the condition tables for these assets is expected.

Renewal Activity (Forward Works Programme)

The value list for Renewal Activity has been established through Waka Kotahi Asset Investment Advisor team and Subject Mater Expert judgement drawing on current supplier practice.

- **Pavement & Surface Assets**: Definitions have been adopted from the Waka Kotahi Asset Investment Advisor team. Definitions for the same Activity vary based on Planning Horizon (e.g. a Resurfacing Activity may be called a Reseal Big Chip when Activity is more than 3 years away and reclassified as Reseal Grade 2 as it moves into the 1 to 3-year program). This ensures that long-term Activity requirements can be captured at planning level and refined for accurate costing as they approach design and construction stage.

- **All other assets**: Definitions have been developed by industry SME's and will be published for industry review and feedback through AMDS.

The AMDS proposal for this element represents a notable shift from the current RAMM NOMAD approach with the following key features.

- Renewal Activity is tracked through its life from initiation through to construction as built through the unique Activity ID.

- All asset types included

- Each Activity belongs to a Project. Multiple Activities (including Activities on different assets) are grouped under an umbrella Project.

- Removing the hierarchical dependency on centreline Treatment Lengths (TL)

- Linear asset Activities (Pavement, Surfacing, Pathways, Drainage, Shoulder, Barriers/Railings) have associated TL definition.

    o Different TL segmentation for each asset type

    o Base TL segmentation established using industry good practice for each asset type

    o First Treatment: Changes to Activity Extent (start and end on the first treatment on a site) will drive changes to TL segmentation.

    o Subsequent Treatments: Activity Extents will auto update to match the TL or first Activity on the site.

    o Lane or Side definitions accepted

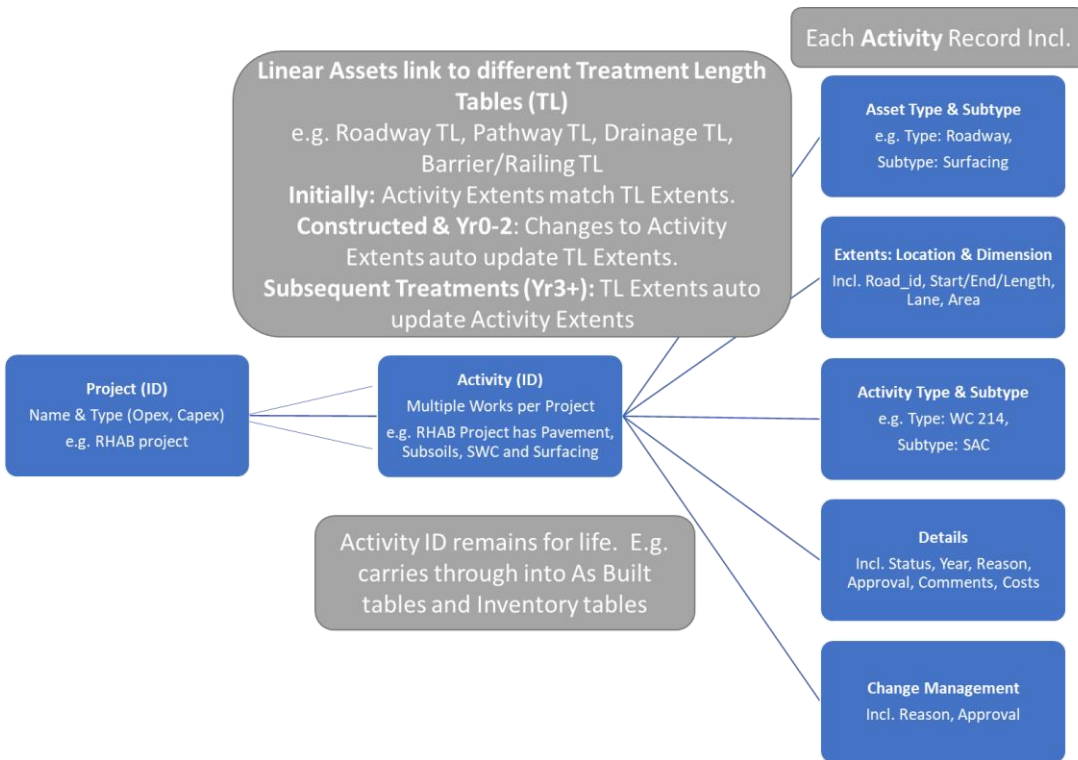- Point asset Activities have a spatial point location rather than link to TL segments.

Figure 5: Project and Renewal Activity components