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Infrastructure Maintenance Planning Handbook – Maintenance Work Planning Introduction and Guidance

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1 Purpose

Effective planning is at the heart of all Maintenance Delivery Unit activities. This manual provides an overview of the processes and systems involved in planning maintenance work activities to deliver all them in a safe, efficient and productive manner that aligns with Network Rail compliance and business requirements.

2 Scope

This Guidance Note provides guidance for all the Infrastructure Maintenance Services and Section Team roles involved in work planning within the Delivery Unit.

This Guidance Note is applicable to Infrastructure Maintenance Delivery Managers, Infrastructure Maintenance Engineers, Maintenance Engineers, Section Managers, Section Supervisors, Section Planners, Section Administrators, Section Planner/Administrators, Programme Managers, Works Delivery Managers and Works Delivery Supervisors.

A glossary of terms relating to work planning is provided as Appendix A. A list of standards relating to work planning is provided as Appendix B.

3 Background

3.1 Work planning

The maintenance work bank is held in Ellipse. It includes routine scheduled activities and other work arising from inspections or other sources. The work items in Ellipse are usually identified and prioritised by Section Managers or Engineers. They are then entered into Ellipse by the Section Planner.

The Section Managers' priority is expressed as an "M" factor. For example, an "M4" work item is required to be completed within four months after being identified. Some work items have a very low priority, but they are entered into Ellipse for monitoring purposes (e.g. single defective sleepers) and provide the opportunity to undertake such works when packaged with other works at the same location. These are entered with a "M99" priority.

The Section Planner's task is to build a coherent & productive work plan which schedules all the work prioritised by the Section Manager and Engineer before it becomes overdue. This plan is owned by the Section Manager, but it is produced on their behalf by the Section Planner.

When work is entered into Ellipse, a unique Work Order is generated. This is used to assign work to teams, and to subsequently record details of the completed work.

3.2 Resource planning

The Section Manager's plan will require resources to carry out the work. Some (such as most direct labour) is within their direct control. Others (such as heavy plant) will need to be ordered for specific activities.

The Section Planner should produce a plan that makes best use of the Section Manager's resources. They will request additional resources via the Resource Planner. These additional resources are planned and smoothed through the Work Plan Co-ordinator who holds the overall DU work plan.

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Engineering Trains and On Track Machines. These are managed as national resources by NDS. The Engineers request their overall annual requirement at TT-65. This enables NDS to secure the most efficient allocation between the Delivery Units, which is then passed on to the Engineers to manage, supported by the IMSM team.

The engineer should confirm OTM worksites to NDS by T-38 for inclusion in the DPPP. This is so that NDS can plan the best stabling points and the associated train movements to and from worksites.

Small Plant, Equipment and Materials. If work requires resources above the Section Manager's in-house allocation, the Section Planner should request them from the Resource Planner. If the resources are available from elsewhere within the Delivery Unit, they will be arranged by the Logistics Co-ordinator and/or Stores Co-ordinator.

Labour. Labour is initially provided using direct employess who are rostered to meet work plan requirements.. If work is planned sufficiently far enough in advance, rosters can be implemented to match the work demand. Additional labour could be available from neighbouring Section Managers. Where necessary and subject to sufficient funding sub-contract labour can be used. This is resource is procured via the Resource Planner team with the appropriate authority from the IME/IMDM.

Track access. There are two types of track access:

- a) *green zone*, where staff are separated from trains, which is safest and is always preferred; and
- b) *red zone*, where staff work amongst trains using warning systems.

NOTE See later in document 3.3.2 & 3.3.3

Track access is no different from any other resource required to carry out an activity. The further in advance that it is requested, the more likely it is that it will be provided, subject to agreement with customers. The cost of track access can be reduced if it is identified and arranged to meet planning timescales..

The railway is a very complex business and there is a prescribed process that needs to be followed by the whole industry to make sure that the TOCs and FOCs can offer the best service to their customers, and that Network Rail can plan safely and efficiently.

3.3 Track access planning

3.3.1 Green zone working

Access to the track should be planned using the following hierarchy of safe systems of work (most preferred being at the top).

- a) *Safeguarded green zone.* All train movements stopped on all lines except planned engineering trains or OTM.
- b) *Fenced green zone.* Protective fence erected 2m (>100 mph) or 1.25 m (<100 mph) away from open lines.
- c) *Separated green zone.* Provision of site wardens to monitor workers remain two metres from open line.

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These top three safety systems are referred to as “green zones”. This is where the line is blocked for a pre-arranged period of time so that staff can work safely separated from trains. There are three different methods of providing green zones, commonly referred to by the section of the Rule Book that governs their use.

- a) *Absolute Possession* (“T3”). These are green zone possessions where lengths between signals or junctions are totally blocked to the passage of trains and controlled by a PICOP who has ownership of the line until it is handed back. They are commonly divided into a number of worksites, or can be used to allow bigger items of work to be carried out.
- b) *Protected Possessions* (“T2”). These are usually short-duration possessions that are ideally taken between trains in quieter times of the day. T2 possession arrangements prevent train movements to protect a worksite using a number of protection arrangements.

There are different types of T2 possession, depending on how the possession is protected on site, are shown in Table 1.

Protection procedure	Description of protection
T2 –A	Using one or more track circuit operating devices
T2-D	Disconnecting Signals or signal routes
T2-H	Using hand signallers or detonator protection
T2T	On an absolute block line – by the signaller placing the block indicator to train on line On a single line worked by token by the COSS keeping the token On a token-less block line – by the signaller at each end placing the acceptance switch to normal
T2-X	For emergency use only – using signals placed to danger
T2-LODS	T2 with Lockout Device

Table 1 – T2 possessions

- c) *Protecting personnel* (“T12”), Other than T2 access, there is are also T12 access arrangements. These are specifically to protect Maintenance personnel walking to site or carrying out short work items on the line that does not affect the safety of the line.

Specific conditions apply to T12 access. The line is required to be blocked to all train movements if it is necessary to carry out a work activity on or near the line. The work is required to have:

1. not more than six people involved;
2. only one group involved in the activity;
3. the activity will not affect the safety of trains or activate any level crossing;
4. none of the T2 methods of protection are available;
5. no activity longer than 60 minutes as of December 2009 Rule Book Change;
6. the portion of line under protection will be as short as possible;
7. the signal boxes will stay open while the T12 is in operation.

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3.3.2 Planning T2 and T12 green zone working

The Planning Assistant (Delivery) within NDS is responsible for arranging any green zone working arrangements that involve the Signaller granting a blockage of the line, or lines, using a non-disruptive T2 or T12 access arrangements. These non-disruptive T2 and T12 arrangements should be, where possible, applied for in advance through the GZAM process (SSWOPS Tool) and notified to the Signallers via the "Daily list".

T2 and T12 can be used prior to a T3 possession to cut down time used to access the site and prepare for work. This is especially beneficial where only short T3 possessions are available.

3.3.3 Red zone working

Red zone working is where the line is not blocked and is open to traffic with Maintenance activities undertaken between trains. All red zone working requires look-outs or other warning system to provide protection to the work gang. They should only be used for work activities that can easily be completed or safely interrupted to allow trains to run with no disruption to the tie table. There are several types of red-zone working arrangements:

Safe systems of work in order of highest form of red zone protection are as follows:

1. Red Zone with Automatic Train warning System;
2. Red Zone with train operating system TOWS;
3. Red Zone with Lookout Operated Warning System (LOWS);
4. Red Zone with Pee Wee activated by Lookout;
5. Red Zone working with Unassisted Lockout or by COSS/IWA working alone and looking out for him/herself.

Method 1 is the highest form of protection and, if available, should always be selected first.

Red zone access for work planned as day-work by the Section Planners does not need reporting to the IMSM Team.

Any red zone working should have a Safe System of Work pack produced by the Section Planner except for emergencies planned by a COSS.

3.4 Track access terminology

Maintenance is delivered through three levels of access:

- a) *Possession*. This is a length of track, usually between junctions or controlling signals, that is blocked by the signaller to prevent train movements to enable works to be completed. A Person In Charge of Possession (PICOP) has responsibility for taking and managing the possession in co-ordination with Customers and Operations employees.

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The PICOP is responsible for setting up a safe system of work and then giving permission to works delivery teams to commence work. Throughout the possession the PICOP checks that the works are being delivered to the plan and that the possession will be given back (to allow normal train movements to resume) on time. The PICOP will time and control the movement of on track plant and engineering trains through the possession to where they are required. Following completion of works the PICOP is then responsible for checking the possession to be clear and safe before handing back the track into operational use at the agreed time.

If an electrical isolation is required in conjunction with the possession in order to undertake the work, this will be taken in accordance with the appropriate electrification standards:

- NR/WI/ELP/3091, *DC Electrified Lines Working Instructions*
 - NR/SP/ELP/29987, *Working on or about 25 kV A.C. Electrified Lines*
- b) *Work Site*. A Possession can have several different work sites within it to enable different disciplines to undertake their particular works. Equally there can be a single Work Site within a possession – either taking the full length of the possession or within a smaller section than the whole Possession. The commencement of work within worksites needs to be co-ordinated by the Engineering Supervisor to allow the movements of engineering trains and other constraints created by adjacent worksites.
- c) *Sites of Work*. These are the smallest defined item of work identified and planned into a worksite, and are usually different activities. Each Site of Work will have a Controller of Site Safety (COSS) to control and manage the safety of the operatives doing the work.

3.5 Measuring time on the railway

Four methods are used to locate work activity and associated planning and reporting processes in time, as follows.

- a) *“TT”*. This stands for “Time Table”. It is the number of weeks before the beginning of the timetable year that an activity takes place. Timetable years start in mid-December each year with the production of the Working Time Table (WTT). This is the base line time table based on the previous years model
- Therefore, February 15th 2010 is “TT-44”, or 44 weeks away from the start of the new 2011 timetable (on December 15th); by November 15th 2010 it will be “TT-4”.
- b) *“T”*. This stands for “Time”. It is the number of weeks before work is carried out that an activity should take place.

Therefore, “T-39” relates to something that should be done 39 weeks before the work is carried out; “T-5” activities should be done 5 weeks before work is carried out.

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- c) *Rail Industry Period and Week numbers.* This is the measurement of time used by the rail industry for financial and reporting processes. A Period is a unit of 4 weeks, thus there are 13 in a year. Period 1 starts at 00:01 hrs on April 1st and ends at 23:59 on the Saturday approximately four weeks afterwards. Periods 2 to 13 start at 00:01 every fourth Sunday. Period 13 ends at 23:59 on March 31st.
- d) *Planning Period and Week numbers.* This is the measurement of time used for track access planning publications. Again a Period is a unit of 4 weeks, but in this case it runs from 00:01 Saturday to 23:59 Friday throughout the year. Because a year is not exactly 52 weeks long, every four years there is an extra week. Note that Rail Industry and Planning periods do not align exactly.

3.6 Network Code

All parties involved in planning any activities on the rail infrastructure are bound by the Network Code.

The Network Code is a set of five agreements between Infrastructure Maintenance, Operations and Customer Services, Infrastructure Projects and National Delivery Service within Network Rail. These agreements also extend to our customers, the Train Operating Companies and Freight Operating Companies and their customers, the paying public. These five agreements are in place to provide and share precise information at specific timescales to enable the production of accurate timetables as the end product for all our customers. The Network Code is a live document that is changing and evolving as it involves all parties producing and selling a timetable. They are agreements to submit information as and when it is required.

The component agreements of the Network Code are:

a) *Rules of the Route (RotR)*

RotR is produced by the National Access Unit and made available to Infrastructure Maintenance through the National Delivery Service. It is an annual plan of T3 possessions that generally remains the same from year to year. There is an annual opportunity for each DU to review this framework agreement.

RotR establishes the frequency, amount and type of access required on a particular section of route through the year. It is the high-level agreement that identifies the possession requirements for maintenance. These possessions range from cyclic routine maintenance the longer week-end and mid-week blocks required for more complex maintenance or other activities.

These maintenance possession requirements become a set of rules between Network Rail and the TOCs and FOCs. RotR identifies general location, duration and frequency, but not specific dates or times. These are identified later in the planning process.

RotR identifies three types of possession opportunities. These are included in the following sections of the Rules:

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- Section 4 contains details of standard possession opportunities within the timetable. The times of the access opportunity vary according to the period. The frequency and duration of these can change across different periods identified in RotR.
- Section 5 contains details of mid-week night time possessions. The frequency and duration of these can change across different periods identified in RotR
- Section 7 contains details of disruptive access requirements. For maintenance possessions, these are requested by the Access Co-ordinator. These items are longer possessions and blockades than those contained in Section 4.

NOTE The above relates to the different sorts of possessions identified in RoTR. White space relates to access opportunities left after publication of CPPP at T-26. It is the times when there are no trains running nor any maintenance of project works being done.

RotR is a live document and is subject to continuous revision. It is updated and published onto Connect at the beginning of each RotR period. Therefore it should not be printed and should be consulted live on Connect.

It can be accessed on Connect by clicking on “Links” at the top of the home page, and then scrolling down the following page and clicking on “Rules of the Route/Rules of the Plan”.

RotR is reviewed between TT-95 and TT-65. Request for alterations (such as longer or changed possession patterns) is required to be submitted by the IMSM team to NDS prior to TT-65.

NDS co-ordinate all the delivery unit RotR submissions into Route plans. These are passed to the National Access Unit (NAU) who align them to the draft Working Time Table (WTT). These documents are then negotiated with the TOC's and FOC's to lock down a finite version of both of these document. The agreed RotR are then published at TT-44.

b) *Draft Period Possession Plan (DPPP)*

This is the document in which the T3 possession opportunities originally agreed in RotR are firmed up and specific locations, dates and durations are applied. It is also the final opportunity for DUs to request any additional disruptive possessions they require. The DPPP contains both the agreed RotR possessions and the requests for additional disruptive possessions. It is submitted to NDS at T-38. This is done every four weeks.

A meeting is held each period to review and agree the requests to be made in the DPPP prior to submission to NDS. All requests for additional non-disruptive possessions should be entered into PPS at least one week ahead of the DPPP meeting.

NDS liaise with the DUs to produce an efficient and co-ordinated request for track access to the NAU. This plan is then negotiated with the TOCs and FOCs resulting in the publication of the Confirmed Period Possession Plan (CPPP) at T-26.

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c) *Confirmed Period Possession Plan (CPPP)*

This is the final agreed track access plan. By this stage it has been confirmed by all parties, including the TOCs and FOCs.

This is the most important part of the Network Code. At this stage all parties have committed to deliver their planned works within the agreed access. The CPPP is issued every four weeks at T-26 and is not permitted to be changed unless agreed by the TOC/FOC. All changes after T-26 incur a penalty charge to the party instigating the change.

d) *Informed Traveller*

The TOCs and FOCs publish their timetables twelve weeks in advance of the day of travel (T-12). This enables the public to book and buy discounted tickets.

After T-12 any further requests for track access could attract considerable compensation cost for disrupting the timetable.

3.7 National Delivery Service (NDS)

National Delivery Service provides the single point of contact for requesting track access. They also coordinate supply of engineering haulage trains and On-Track Machines (OTMs). This service includes the provision of transit routes to and from possession limits.

Contact with NDS should always be via the IMSM team. They interface with the following two posts in NDS.

- a) *The Planning Specialist (Development)*. They assist with developing the access plan from TT-95, the start of Annual Planning, up to publication of the CPPP at T-26.
- b) *The Planning Specialist (Delivery)*. They phase into the process at T-37, and work with the Planning Specialist (Development) to agree the CPPP. They are then responsible for delivering the access plan.

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3.8 Access timescales and continuous planning process

Access timescales are shown in Table 2.

Time Table/Time	Description
TT-95 – TT-80	Maintenance informs NDS of requirements for access, OTMs and engineering trains. NDS commences integration of access requirements and initiates negotiations with NAU.
TT-80 – TT-65	NDS co-ordinates and optimises maintenance requirements. This includes allocating follow-up possessions to track recording trains. The outputs of this are the draft versions of RotR and WTT.
TT-65	“PPS freeze date”. Further requests for changes to Rules of the Route are no longer accepted.
TT-60 – TT-45	NAU negotiates RotR and WTT with TOCs & FOCs. NDS publishes RotR at TT-44.
T-38	Last opportunity to request low cost track access (input to the DPPP).
T-38 – T-26	NAU negotiates and confirms Period Possession Plan with TOCs & FOCs.
T-26	NDS publishes CPPP.
T-12	NDS confirms provision of additional (high cost) track access requested after publication of CPPP.
T-7	“PPS lock-down” – further changes to work site information are no longer accepted.
T-5	NDS / Maintenance “T-5 review meeting” held.
T-8 days	Draft WON is published.

Table 2 – Access timescales

4 Delivery Unit process

4.1 Creating the plan

An annual business plan is created by each delivery unit and is consolidated and approved at route level. It identifies the volume and type of work to be carried out in order to maintain, refurbish or renew the infrastructure in compliance with Network Rail standards known as the Annual Planned Volumes.

The Annual Planned Volumes (APV) is loaded into Ellipse once a year, separate from the scheduled work items already held there. It is the output of a series of meetings, led by the IMDM and the Business Support manager, held between TT-95 and TT-65.

The APV is created by:

- reviewing the volumes of work delivered during the previous year and rolling over into subsequent years, where appropriate (particularly for Maintenance Scheduled Tasks (MSTs)) taking into account the level of work required to remain compliant to company standards;
- reviewing the current work-bank and re-prioritising where appropriate;
- estimating volumes of work arising from measurement trains;
- adding known additional specific items of work.

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4.2 Annual Maintenance Plan – DU Maintenance Annual Strategy

Once the APV has been approved, it is divided into the elements managed by the different local managers within the delivery unit. This is done by the IME and the DU Engineers, with the support of the IMSM team. The local managers then schedule the agreed volumes into appropriate periods, from which four Quarterly Plans are produced. When consolidated, these plans reconcile the work volumes, track access and budgetary provision for the delivery unit.

The Quarterly Plans at this stage should contain the following types of activities. They will be scheduled by period (or with actual dates if they require to be carried out in specific possessions):

- a) OTMs particularly function tamping;
- b) Grinding Trains;
- c) Seasonal works:
 - 1) Plate oiling;
 - 2) Stressing;
 - 3) Verse testing;
 - 4) Ballast replenishment;
 - 5) Rail adjusting;
 - 6) Point heater maintenance;
- d) Major works:
 - 1) Bulk timber replacement;
 - 2) S&C renewals;
 - 3) Relaying items;
 - 4) Other Capex items;
- e) Compliance inspections:
 - 1) Patrolling (Basic visual inspection);
 - 2) SM inspections;
 - 3) Engineers' inspections;
- f) S&T Cyclical works, 12 or 13 week plan;
- g) E&P Cyclical works and inspections;
- h) OLE inspections and cyclic maintenance;
- i) Off-track:
 - 1) Litter clearance plan;
 - 2) Fencing inspections;
 - 3) Level crossing inspections;
 - 4) Drainage inspections.

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These four local Quarterly Plans are then reviewed by the IMSM team. They may adjust planned dates to make best use of resources and track access subject to agreement with the relevant Section Manager via their Section Planner. The resulting plan is the delivery unit's annual plan. The activities within the annual plan that require T3 track access are extracted and form the "Visible T3 Plan".

4.3 Continuous planning and Stage Gate reviews

Historically, planning meetings have been used as the main mechanism for planning, with day-long meetings used to plan work that should have been planned during the week. This often resulted in issues, problems and opportunities all saved up to be discussed at the planning meetings.

Such meetings create pressures to deal with a lot of information and make important decisions within a short time scale. They also create the need for people to attend just to check that their inputs are correct or to get approval for a change. This process is wasteful of peoples' time, and means that the plan is rarely up to date.

This discontinuous planning process has been replaced by Continuous Planning. Continuous Planning is the process of sharing information about our work with all interested parties. This should be done as and when it becomes available, so the plan always remains accurate, robust and viable. This in turn gives the opportunity for shorter, less challenging and more effective reviews where all information is reviewed by exception and any issues given the right consideration and resolve. These are known as Planning Reviews.

Continuous Planning is about spreading what would be achieved in a planning meeting across the working week. Everybody who would normally attend a planning meeting is available on the phone, via email or face to face during the week. Discussing and actioning requests and changes as they occur, allows everybody to plan together in a continuous process. Therefore the plan is always current, viable and robust and does not require line by line checking or verification.

Where issues and problems emerge, solutions can be developed and scenario tested for performance and cost impact. Thus at the weekly Stage Gate Review the team has well scoped options to choose from. The review can therefore focus on managing risks to the plan, rather than creating the plan.

4.4 Quarterly Visible T3 Plan

Each Quarterly Visible T3 plan is a 13 week cut of the Annual Plan of Volumes. It is produced by the IMSM team and identifies all T3 possessions, major work items, measurement train runs, cyclical and all annual planned activities. Two Quarter Visible T3 plans, the current quarter plan and the plan for the forthcoming quarter, are always available to the Section Planner who continues to populate Worksites with defects and other works arising.

The Quarterly Visible T3 Plan is reviewed at T-13 weeks ahead of its start. It is updated to incorporate work from previous quarters that was not completed and still requires to be planned. Current progress with delivery of planned annual volumes is also taken into consideration, and volumes in future plans adjusted as necessary.

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The Quarterly Visible T3 Plans for the next two quarters are made available to the section teams (usually by publication to a shared drive). The section teams use them to plan T3 worksites for reactive maintenance work using the Section Planning process.

The Quarterly Visible T3 Plan shows should also be used to match staff rosters to planned work.

4.5 Period Plan

The section teams manage a continuous rolling plan that covers the forthcoming four weeks (T-4 – T-0). As one week's work is delivered, another "week 4" is added.

Reactive maintenance works are work items other than those included in the Quarterly Visible T3 Plans. All reactive works are notified to the section through the Section Manager and are planned by the Section Planner (see Section Planning Process).

Where reactive maintenance works require changes to the Quarterly Visible T3 Plan, the Work Plan Co-ordinator assists the Section Planner to re-assign and re-plan any displaced work items. This maintains the integrity of the quarterly and annual plans.

Where reactive maintenance works do not require changes to the Quarterly Visible T3 Plan, Section Planners can work independently to schedule work into T2, T12 or red zones to maximise workforce safety and efficiency.

Note that effective planning only works when the Section Managers assign correct priorities to reactive maintenance works.

4.6 Daily plan

The daily plan for all maintenance staff is generated by the Ellipse scheduling system. Staff are advised of their planned activities a week in advance of the planned date, updated as necessary at the daily roll call meetings.

4.7 Delivery Unit Planning Review

The Delivery Unit Planning Review is held weekly, ahead of, and in preparation for, the NDS Weekly Access Planning Meeting ("T-5 meeting").

It is attended by:

- a) IMSM;
- b) Work Plan Coordinator;
- c) Resource Coordinator;
- d) Access Coordinator;
- e) Section Planner (as required).