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CHILTERNS ATP

Significance Test

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1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

The purpose of a Significance Test is to determine if the project is categorised as 'CSM Significant', as required by EC regulation CSM-REA 402/2013 [1]. This is achieved by using a defined set of criteria to assess the impact of the change. NR will apply the CSM-RA process regardless of the result of the significance test, with the difference being the appointment of an Assessment Body following a decision of a project being deemed significant.

1.2 SCOPE

The Significance Test is performed on the change made to the railway. For this project the change is the replacement of the SELCAB ATP system with an enhanced version of TPWS.

The Significance Test considers the entire system including trackside, train borne and the interface to signallers, maintainers etc.

The primary driver for the need for the change is the obsolescence and decreasing reliability of the train borne SELCAB equipment, resulting in an increase in the number of trains operating in TPWS (rather than ATP). However, this increase in risk to the operating railway is being managed through an exemption being applied for by Chiltern Lines and has no effect on the Significance Test that only considers the final version, that is Enhanced TPWS with SELCAB ATP switched off.

1.3 ACRONYMS & ABBREVIATIONS

Term	Meaning
ATP	Automatic Train Protection
FIU	Failure Indication Unit
SPAD	Signal Passed At Danger
TPWS	Train Protection and Warning System

1.4 REFERENCES

Ref Document Number	Document Title	Issue/Rev/Date
1. CSM RA Regulation 402/2013	Common Safety Method	Commission Regulation (EC) 402/2013
2. 70066459-PSD	Project Preliminary System Definition	30/03/2020

Ref Document Number	Document Title	Issue/Rev/Date
3. NR/L2/RSE/100/02	Level 2 – Application of the Common Safety Method for Risk Evaluation and Assessment	Issue 3 05/12/2015

2 SIGNIFICANCE OF THE PROPOSED CHANGE

2.1 CURRENT SYSTEM

The current system fitted on the Chiltern Lines is the ATP which is installed on the majority of signals. The ATP system provides continuous ATP protection against a possible SPAD and overspeed risk which is achieved by monitoring train speed. The ATP also provides protection against rollback collisions. The existing train borne ATP equipment is now obsolete and suffering from repeated failures (mostly to the speedometer) as a result, long term ATP operation cannot be sustained and requires replacement.

2.2 PROPOSED CHANGE

The proposed change from the current ATP system is to fit the Chiltern Lines with Enhanced TPWS. TPWS is usually only provided at certain signals, e.g. junctions, approaching some speed restrictions and all buffer stops on platform lines, unlike the current ATP system which is fitted at all signal types.

However, the “Enhanced TPWS” does not reflect any change in the technology applied, but to the fact that many more signals are fitted with TPWS, than on a conventional application.

2.3 CHANGES

The replacement of SELCAB ATP with Enhanced TPWS brings several changes to the railway. Whilst ATP provides an enhanced level of protection compared to TPWS as it is installed at all signal types and will stop a train within a defined overlap. TPWS is normally only fitted to main line junction signals and other signals based upon the risk assessment of the layout and use of the line.

To counter the difference between the systems, the proposed change to the Enhanced TPWS system will be fitted to a majority of signals, and thus minimise any effect on safety.

The Significance Test should consider the proposed change in conjunction with previous or planned changes. For this project, there are no other recent changes (past or planned) to consider so the scope of this assessment is limited to the change from SELCAB ATP to Enhanced TPWS.

3 ASSESSING THE UNCERTAINTY OF OUTCOME USING NOVELTY AND COMPLEXITY

3.1 INTRODUCTION

The determination of significance is assessed using 6 prescribed criteria as follows;

1) Complexity	Uncertainty
2) Novelty	
3) Performance	Consequence
4) Safety	
5) Monitoring	Further Criteria
6) Reversibility	

These are applied in a predetermined order as listed in the following calculations.

The uncertainty of a change to the railway infrastructure is calculated as follows:

Uncertainty = Complexity + Novelty (1)

This has been calculated in the following sections.

3.2 COMPLEXITY

The complexity of a Project is assessed using a score from 1 to 5. The score is used to determine the scale of the project or the number of project interfaces. The scores have been defined in Figure 1 below.

Complexity				
1	2	3	4	5
None	Some, e.g. multidiscipline or multi-site	Medium, e.g. as 2 + multi stake-holders	Significant, e.g. multidiscipline & multi-site	High, e.g. Major programme

Figure 1 - Definition of Complexity Scores

Based on Figure 1 the Complexity for the Project is deemed to be Significant so has been given a score of **4**.

The rationale behind this is that, the project is both multidiscipline and multi-site.

Multidiscipline: the project involves signallers, drivers, maintainers, installers and testers.

Multi-site: the project will cover many different sites across the Chiltern Lines where replacement will occur.

3.3 NOVELTY

The Novelty of the Project is assessed using a score from 1 to 5. The novelty is used to determine the number of elements of the project that are newly being introduced into the existing railway infrastructure. The scores have been defined in Figure 2 below.

Novelty				
1	2	3	4	5
None	Minor novel elements, e.g. standards deviations	Discrete elements of novelty, e.g. new applications of existing products	Significant novel systems, e.g. new products or discrete systems	Majority of project is novel solution, outside of current suite of standards

Figure 2 - Definition of Novelty Scores

From Figure 2, the Novelty of the project scores a **2**. The Project has a minor element of novelty. This is justified by:

- Chiltern Lines will be changing from an ATP system to TPWS Enhanced and all signals shall be fitted. Minor novelty lies in the fact that ALL signals shall be fitted with TPWS.
- TPWS is already fitted to main line junction signals and is an existing technology that is recognised and is already in use on most of the railway infrastructure therefore it is not seen as a novel.

3.4 UNCERTAINTY

Using (1) the overall Uncertainty score for the project is therefore Complexity (**4**) + Novelty (**2**) = **6**.

Uncertainty =6

4 ASSESSING THE FAILURE CONSEQUENCE USING PERFORMANCE AND SAFETY

4.1 INTRODUCTION

The consequence of a change to the railway infrastructure is calculated as follows:

Consequence = Performance Impact + Safety Impact (2)

This has been calculated in the following sections.

4.2 PERFORMACE

The performance impact of a project is assessed against the impact the proposed change poses to the operational railway. This impact is assessed based on a score from 1 to 5. These scores have been defined in Figure 3 below.

Performance				
1	2	3	4	5
Planned disruption for up to a day on any one route Project <1yr = <=1 week schedule delays Project >1yr = <=2 weeks <52hrs Possession; overrun <=15mins 52hrs – week Possession; overrun <=1hr 1-4week Possession; overrun <= 4hrs	Unplanned disruption (for up to a day) on any one route Project <1yr = 1-2 weeks schedule delays Project >1yr = 2-4 weeks <52hrs possession; overrun 15 - 30 minute 52hrs – week Possession; overrun 1-2hrs 1-4week Possession; overrun 4-7hrs	Unplanned disruption (for up to a week) on any one route or Up to a day on multiple routes Project <1yr = 2-4weeks schedule delays Project >1yr = 4-8 weeks <52hrs possession; overrun 30 minute to 1hrs 52hrs – week Possession; overrun 2-4hrs 1-4week Possession; overrun 7-14hrs	Unplanned disruption for over a week on multiple routes and limited access to station facilities Project <1yr = 4-6 weeks schedule delays Project >1yr = 8-12 weeks <52hrs possession; overrun 1 – 2hrs 52hrs – week Possession; overrun 4-7hrs 1-4week Possession; overrun 14-26hrs	All users experience prolonged and unplanned disruption to key routes. Access to major station facilities likely to be severely restricted Project <1yr = >6 weeks schedule delays Project >1yr = >12 weeks <52hrs possession; overrun >24 hour 52hrs – week Possession; overrun >7hrs 1-4week Possession; overrun >26hrs

Figure 3 - Definition of Performance Impact Scores

Based on Figure 3, the Performance score for this project is deemed to be **1**.

The changes proposed are minor and proven. The potential disruptions to the service are only planned for one route, thus as the changes are minor it is unlikely that the schedule is delayed for a prolonged period.

4.3 SAFETY

The Safety impact of a project is based on the introduction of risk to an individual or a set of individuals, as well as considering the impact on the environment. This impact is assessed again using a score from 1 to 5. These scores have been defined in Figure 4 below.

Safety				
1	2	3	4	5
Event with the potential for less than 20 minor injuries or a single major injury (less than .1 FWI) Small environmental incidents that can either be addressed by internal control procedures or readily cleaned up	Significant event with the potential of a single major injury to five major injuries (between .1 - .5 FWI) Adverse environmental impacts that can be addressed by internal controls but requires follow up investigation	Significant event with the potential of between five major injuries and two fatalities (between .5 and 2 FWI) Significant damage to the natural environment such that the relevant regulator requires a proposal to achieve restoration	Catastrophic event with the potential of between two and 10 fatalities (between 2-10 FWI) Major damage to the natural environment such that the relevant regulator imposes a recovery work plan and timeline. Forces a Licence Condition Review	Catastrophic event with the potential of over 10 fatalities (10 FWI) Catastrophic and long term environmental damage resulting in protests / lobbying. Forces a Licence Condition Review

Figure 4 - Definition of Safety Impact Scores

Based on Figure 4 the Safety impact has been judged to be **4**. When considering the changes proposed, it is important to also consider the potential for a SPAD. TPWS is not designed to prevent SPADs but to mitigate against the consequences of a SPAD, therefore there is still a possibility a SPAD could occur. As a SPAD has the possibility to lead to multiple fatalities the safety score for this change is a 4.

4.4 CONSEQUENCE

Using (2) the overall Consequence score for the project is therefore Performance Impact (**1**) + Safety Impact (**4**) = **5**.

Consequence = 5

5 SIGNIFICANCE TEST

5.1 SCORE

From the Uncertainty and Consequence scores calculated in sections 3 and 4 respectively it is now possible to determine the overall Significance score of the project using the following formula:

Significance = Consequence + Uncertainty (3)

The scores have been summarised in Table 1 below

Consequence Score		**Uncertainty Score**		**Significance**
Assessment	**Score**	**Assessment**	**Score**	**Significance Score**
Performance impact	1	Complexity	4	**11**
Safety Impact	4	Novelty	2	
Consequence	**5**	**Uncertainty**	**6**	

Table 1 – Summary of Scores

Based on these scores it is now possible to determine if the project is deemed significant or not using the Significance Matrix shown in Figure 5 below.

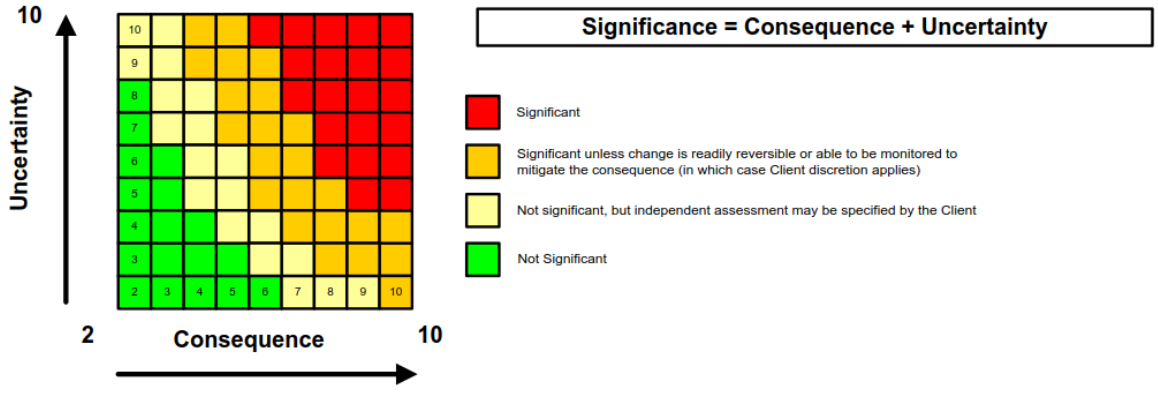

Figure 5 - Significance Matrix

The project significance risk score places the project in the “Not significant, but independent assessment may be specified by the Client” category. This could be

classed as “Not Decided”, therefore “Monitoring” and “Reversibility” must be considered.

5.2 MONITORING AND REVERSABILITY

Monitoring and Reversibility are additional criteria required to determine the significance of a project if the decision as to whether a project is deemed “Significant” or “Not Significant” cannot directly be made by using the Uncertainty and Consequence failure test. This is the case for this project.

5.3 MONITORING

Monitoring is the ability to determine the status of the equipment.

The following points summarise monitoring of the proposed change:

- All TPWS installations have faults reported to the signaller. Train borne faults are reported to the driver. Every time the cab is opened, the TPWS is “self-tested”;
- In the signal box a test on the Failure Indication Unit (FIU) is performed at least every 12 hours;
- If a TPWS installation fails, the signal in rear is held at danger.

5.4 REVERSABILITY

Reversibly refers to the ability to revert to a safe state following the event of a failure.

The following points summarise the reversibility of the proposed change:

- The installation on TPWS once commissioned is NOT reversible to SELCAB;
- Failures of the TPWS are quickly identified to the driver and thus alternate action can be taken;
- If a TPWS installation fails, the signal in rear is held at danger.

5.5 CONCLUSION

When taking into account the robust monitoring that takes place as well as the ability to revert to a safe state in a short timescale, project is considered to be **Not Significant** and thus the services of an AsBo are **NOT** required.

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