



Share with Pain

SWP 017/16

Princes Risborough Swinging
Overlap

Infrastructure Projects



Background

In August 2011, the Princes Risborough area was remodelled as part of the Evergreen 3 project.

In 2015, the SSI for the area was migrated to a Westlock as part of the East West Rail programme.

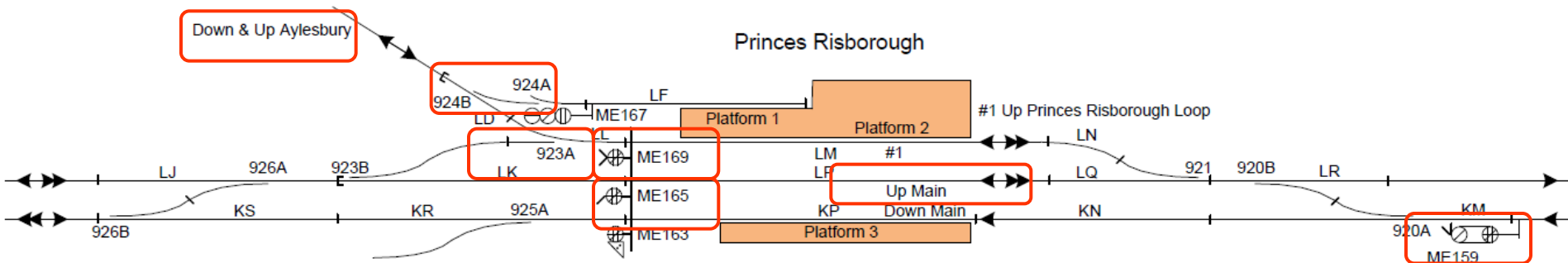
During preparations for the data migration, a potential Wrong Side Failure condition was identified during an examination of the existing data.



Site Configuration

The layout is shown below. Key infrastructure is as follows:

- ME159 signal
- ME169 signal
- ME165 signal
- 923A points
- 924A/B points
- Up Main line
- Aylesbury line



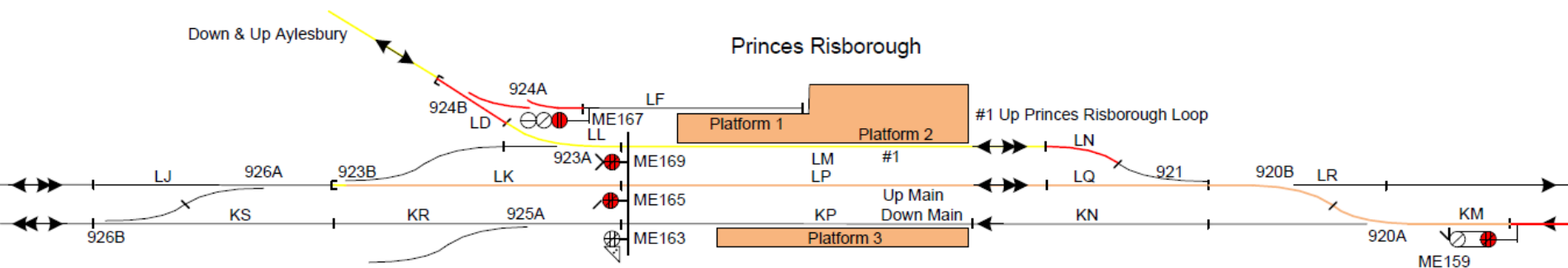
Only equipment relevant to the investigation is shown

Princes Risborough Incident

A route could be set from ME159 to ME169 with the overlap set out to the Up Main line (to allow the bay platform to be used for another service to/from the Aylesbury line).

Once the train had passed through the route clear of LQ track circuit, point locking in the route was released.

If the route from ME159 to the parallel signal ME165 was set, the swinging overlap could be moved, hinge points 923A could swing and 924 points would move, even with the dead locking track occupied.



Immediate Cause

When the SSI data was written for the Evergreen 3 project, a recursive data construct was found by the independent checker, caused by cross checking of free to move tests between 923 and 924 points.

In order to resolve the recursive data issue, the advice in SSI 8003-65B was followed – the points free to move test had to be moved from the PFM file to the PRR file with the points free test being undertaken in EVERY route request which might swing the overlap.

In this instance the test that 924 points were free to move was missed from the data for ME159(B) route up to ME165.

SSI 8003-65B highlights the risk that an application of the points free to move test could be missed and recommends “defensive measures” are added to the PFM file which would lead to a right side failure rather than a wrong side failure.

It is not clear why these defensive measures were not included in this case but it is possible that the complexity of the example in SSI8003-65B was considered to be much greater than existed in the layout at Princes Risborough.

Principles Testing failed to identify the missing data.

Actions Taken

Measures were immediately taken to protect the operational railway by barring certain routes out of use.

The data was corrected and tested before the new Westlock interlocking was commissioned.

The design organisation which undertook the Evergreen 3 design initiated desk checks of other data they were responsible for where recursive data had been encountered.

A detailed and thorough two stage investigation has been completed.

Immediate Lessons Learnt (1)

1. Even in this relatively simple layout, the presence of a swinging overlap made data complex. This is considered to be the root cause of this incident.
As NB125 highlights, with mechanical signalling of this layout, a swinging overlap would not have been provided.

2. Solving recursive data required controls to be moved from a single entry in the PFM file to multiple entries in the PRR file.
Designers & Testers should be very wary when this occurs & communicate the change.

Immediate Lessons Learnt (2)

3. Legacy control table formats in use at Princes Risborough provide less information about where PFM tests are exercised than modern formats.
*Use of the modern CT format **may** have reduced the likelihood of the PRR data being missed in the relevant route.*

4. Difference lists produced as a result of making the change to data to eliminate the recursive data could have effectively led the tester in the scope of change to the data.
The difference list did not show the missing data because it was not there.....

Recommendations

- 1. Projects & scheme designers should refer to NB125 'Simple is Effective' and challenge the need for complex signalling controls requested in the interest of operational flexibility.*
- 2. In accordance with NR/L2/SIG/11201 Mod A18, projects & scheme designers should consider whether the scale of change makes it worth while re-writing Control Tables in modern form taking into consideration the scale of testing required. This decision should be documented in the Design Specification.*
- 3. Designers & testers should follow the requirements of SSI8003-65B and maintain a mind set of "have all the required changes been made?"*

Further Information...

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