

Independent Reporter

Railway Specific Plant
Review of Case for Investment
(CH/023)

Network Rail and ORR

August 2013

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Independent Reporter Review – Railway Specific Plant

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Executive Summary

Introduction

The railway construction industry is dependent on a fleet of road/rail vehicles (RRVs). RRVs are conventional vehicles and plant converted for use in the railway environment. However, this conversion process results in compromises to the safety and performance of the original machines.

As a consequence, NR has, in its Strategic Business Plan submission, requested significant capital funding (c. £145m) for CP5 to develop and implement a fleet of purpose designed railway construction plant. NR believes that this investment will deliver significant efficiency and safety benefits in CP5 and beyond.

We were mandated as Independent Reporter (IR) by the Office of Rail Regulation (ORR) to review the draft case for investment being developed by NR which identifies potential improvements in the areas of:

- Reduced safety risk
- Increased outputs per shift
- Fleet standardisation
- Cost savings

The Nature of the Proposed Investment

For the purposes of this review, the investment in Railway Specific Plant being proposed by Network Rail (NR) in its draft Strategic Business Plan falls into two distinct categories.

The first category is conventional, commercially available equipment that is converted by specialist vehicle engineering companies to allow it to perform with road/rail capability (road/rail vehicles or RRVs). These types of vehicle are typical of existing road/rail vehicle conversions currently used by NR; but what is being proposed is investment in a new fleet to a more developed specification and configuration that would more satisfactorily meet NR's present and future needs, and to allow life-expired vehicles to be replaced. They comprise:

- Mobile Elevated Working Platforms (MEWPs)
- Modular Lorries
- Iveco Daily 4x4s
- Mitsubishi Canters

This proposal is technically uncontentious and will clearly offer NR operational and safety advantages. NR has already introduced some of these vehicle types on a limited basis. Our analysis considers whether the case of investment in this new fleet has been adequately made.

The second category relates to excavators with both lifting and road/rail capability. In order to address the unsatisfactory safety record and limitations in the capacity for lifting of the existing road /rail excavator fleet, NR proposes a development of these machines to their own specification.

Methodology and our Analysis

We have reviewed NR's draft case for investment by addressing in turn the following questions as set out in the ORR mandate. Due to the less well-developed nature of NR's proposals for the development of the road/rail excavator fleet, the detailed findings in the report relate only to the first category of plant, but a review and view of the proposed development of the road/rail excavator fleet is provided based on the information available at this early development stage .

1) What are the safety benefits attributable to the proposed new fleet and can this be expressed in terms of safety improvement using industry recognised safety performance measures e.g. Fatality Weighted Index (FWI)?

NR estimates that the introduction of the new fleet would result in a 25% reduction in major injuries and a 15% reduction in minor injuries. However, NR has not provided a direct monetary quantification of the safety benefits from injury reductions. The results from our indicative sensitivity analysis show that varying levels of safety benefits achieved by introducing the new fleet does not have a material impact on the business case for any of the asset categories, as the Benefit Cost Ratios vary by less than 1% relative to our reference case scenario.

2) What productivity and output gains are assumed for the proposed fleet and can this be expressed in units of measure for work activities that the relevant machines may be involved in undertaking?

For two asset categories - MEWPs and 26-tonne Lorries - the total expected productivity and output gains per vehicle were identified by NR to be £20.27 and £0.80 million respectively. However, for the other asset categories, NR did not include estimated financial savings from productivity improvements in the relevant business case.

3) Validate estimated costs of each type of machine in proposed new fleet including development costs and accessories

We are content that NR has correctly implemented the calculations derived from its capital cost estimates into the relevant business cases. However, because this is a very limited and specialist market, the price for each machine very much depends on contract conditions, delivery, volume, specification and finish options selected. Therefore, we are unable to validate the NR-quoted costs with any level of precision, but we are content that they are of the right order of magnitude and not excessive.

4) Validate claimed costs of existing fleet including price for donor machine then conversion

We are unable to validate the NR-quoted costs with any level of precision. However, we are content that they are of the right order of magnitude and not excessive.

5) Validate claimed hire costs avoided

The hire rates are largely determined by the specification and hours of its use. We found these hire cost to be marginally lower than the indicative cost across the industry, but not substantially so.

6) Assess impact of proposed operating and maintenance (O&M) arrangements for new fleet on case for investment

NR's stated O&M costs vary considerably by asset as a proportion of capital costs. For the Iveco and Canter plant, the O&M costs represent a very significant proportion of the total Capex and appear relatively high. NR was unable to provide an analysis of whole life costs for any of the plant assets to support their O&M costs estimate; an analysis which we would have expected to be prepared for what is a substantial investment in a new plant fleet.

7) Assess likely residual value of new fleet at end of CP5 based on reasonable likely estimate of hours worked

NR has prepared estimates of Residual Values (RVs) for all assets which appear to be based on estimates of hours worked. We accept that there are several possible methods for estimating RVs for such assets. Given the estimated asset lives and expected fleet introduction dates, NR's estimates are not unreasonable; recognising again that the actual value will depend on usage of the fleet. In any case, the NR estimates of RVs at the end of CP5 do not directly drive the business case analysis, as the period for the analysis extends into CP6, by the end of which the new assets are assumed to be fully depreciated.

8) Identify any additional costs not accounted for so far by NR in material presented

We have identified several cost headings which should be included in the relevant business case(s) - based on good practice for business case assessment. These include a provision for: GRIP contingency, associated costs such as training, and whole life cycle cost analysis. As this detail is not presently available from NR, we have been unable to take these factors into consideration in our table below. Whether these factors would have a material impact on the business case remains to be seen.

9) Anything else that should form part of the case for investment for such a venture

In our view, NR has not at this stage fully evaluated the potential operational productivity and efficiency benefits arising from the proposed investments. This is a significant piece of work, but essential in our view to make the business cases more robust and compelling.

10) Clarify NR's position with regard to intellectual property rights and any impact on investment case

NR has conceded that the intellectual property rights (IPR) to any unique design of plant developed by manufacturers to meet an NR specification would lie with the manufacturer. As regards any impact on the case for investment, it is in our view, a pre-requisite assumption that manufacturers will wish to retain the IPR to their designs.

Conclusions

Conventional road/rail vehicle fleet

Based upon the available evidence, we have concluded that a positive Case for Investment could be made for the replacement of the following conventional road/rail vehicle fleet:

- Mobile Elevated Working Platforms (MEWPs)
- Modular Lorries
- Iveco Daily 4x4s
- Mitsubishi Canters

Below, our tabular analysis shows that there is a positive business case for each of the four asset categories, as in all cases the Benefit Cost Ratio (BCR) is greater than 1 and the Net Present Value (NPV) is positive. The highest benefit-cost ratio and rate of return is for the Iveco vehicles. The BCR for the four asset categories combined is 1.96, which shows that the overall business case for the four assets is strong.

Table 1

Asset Category	Halcrow BCR	Halcrow IRR	Halcrow NPV £m	NR NPV £ m
MEWPs	2.19	44%	45.9	44.8
Lorries	1.31	19%	6.4	6.2
Iveco	2.50	110%	13.1	12.7
Canters	2.02	65%	5.3	5.1

Purpose designed excavators with lifting capability

After considering NR's proposed development of the fleet of road/rail excavators with lifting capability, we believe that proposal needs a great deal more detailed development before it could be considered a deliverable solution to both the safety and productivity challenges it is seeking to address. Clearly the potential exists to deliver increased productivity and safety improvements through that development and so exploring its development is, in our view, a worthwhile enterprise, but we believe that NR must be satisfied corporately of its technical feasibility and commercial viability before committing to it.

In Generality

We believe that a more compelling case could be made for these investments if greater detail could be presented regarding the extent to which specific, measurable productivity improvements could be attributed directly to it. That case for investment would also have to address the implications for changed working practices and training that would be necessary to maximise the benefits from the investment.

David Simmons
Independent Reporter
Halcrow Group Ltd
(A CH2M HILL Company)
8 August 2013

1 Introduction

1.1 Background

1.1.1 The railway construction industry is dependent on a fleet of road/rail vehicles (RRVs) that are conventional vehicles and plant converted for use in the railway environment. The conversion process, however, results in compromises to the performance of the original machines. Whilst reasonably practicable improvements have been made to the existing fleet to improve performance and safety, Network Rail (NR) consider that there is a need to introduce new innovative machinery to deliver railway maintenance and construction work to the required levels of safety and efficiency.

1.1.2 As a consequence, NR has, in its draft Strategic Business Plan submission, requested significant capital funding (c. £145m) for CP5 to develop and implement a fleet of purpose designed railway construction plant. NR has stated that this will deliver significant efficiency and safety benefits in CP5 and beyond. Whilst the principle is supported by ORR the case for investment needs further justification by NR if funding is to be agreed.

1.2 Timescale

1.2.1 ORR proposes to respond to NR's draft Strategic Business Plan submission in its Draft Determination in June 2013 and is seeking clarification of the Case for Investment for this plant before responding on the matter to NR.

1.3 Remit for Independent Reporter

1.3.1 NR has not to date attempted to fully quantify the level of improvements and benefits in order for ORR to be able to agree to the proposed level of investment and deliverables.

1.3.2 Independent Reporter (IR) has been requested through the mandate to which this report refers¹ to address this with NR by considering the case for investment being developed by NR. NR identifies potential improvements in the areas of:

- Reduced safety risk
- Increased outputs per shift
- Fleet standardisation
- Cost savings

1.3.3 In the form of a short report the IR is requested to give its view on the case for investment together with any recommendations that would strengthen the case.

1.4 Acknowledgements

1.4.1 The IR would like to thank the NR Plant team for their collective assistance in compiling this report.

¹ Review of Case for Investment in Railway Specific Plant/Equipment/Transport (CH/023)

2 The Nature of the Investment Proposal

2.1 Plant Types

2.1.1 For the purposes of this review, the investment in Railway Specific Plant being proposed by NR in its draft Strategic Business Plan falls into two distinct categories.

2.1.2 The **first category** is conventional, commercially available equipment that is converted by specialist vehicle engineering companies to allow it to perform with road/rail capability (road/rail vehicles or RRVs). These types of vehicle are typical of existing road/rail vehicle conversions currently used by NR; but what is being proposed is investment in a new a fleet to a more developed specification and configuration that would more satisfactorily meet NR's present and future needs, and allow life-expired vehicles to be replaced. They comprise:

- Mobile Elevated Working Platforms (MEWPs)
- Modular Lorries
- Iveco Daily 4x4s
- Mitsubishi Canters

2.1.3 This proposal is technically uncontentious and will clearly offer NR some operational advantages. NR has already introduced some of these vehicle types on a limited basis in the past. Our analysis in the next section of this report considers whether the case of investment in this new fleet has been adequately made.

2.1.4 The **second category** relates to excavators with both lifting and road/rail capability. Due to the unsatisfactory safety record and limitations in the capacity for lifting of the existing road /rail excavator fleet, NR propose to procure a specifically designed and manufactured fleet of machines to their own specification to replace the existing. These machines (termed "Liftex") would potentially address the inadequacies of existing plant.

2.2 The "Liftex" Proposal

2.2.1 Configuration

Road/rail excavators are conventional wheeled construction plant excavators which hydraulically deploy rail wheels for on-track use. This results in the machine and its centre of gravity being raised when in rail mode. This reduces the machine's stability and hence it's lifting capability, and overturning has occurred as a consequence. Also, depending on the method of drive, its braking performance can be poor; and as a consequence machines have run away.

2.2.2 Through the intervention of the safety inspectorate, NR has initiated, on a progressive basis, reasonably practicable safety-related improvements to the existing excavator fleet to improve their performance and safety. This is, however, an incremental process as the machines themselves are the property of plant hire companies and only hired out to NR. It is recognised, however, that even having implemented the safety modifications, the converted machines are still a compromise. Moreover, they do not enable fail-safe operation in situations of Adjacent Line Operation (ALO) or operation beneath live OLE.

2.2.3 NR recognises that there is a need to introduce new purpose-built machinery to deliver railway maintenance and construction work to required levels of safety and efficiency. Their innovative Liftex proposal is clearly a key element of that, as no satisfactory designs are currently available in the market.

2.2.4 Procurement

Unfortunately, in 2009 NR already experienced a failed procurement exercise for a Liftex-type machine. The procurement terms differed from that currently being envisaged, in that manufacturers were being required to fund the design and development themselves, whilst NR were seeking to own the Intellectual Property Rights (IPR) to the design. These concepts were rejected by potential manufacturers at that time, as they did not wish to take the financial risk of product development for an uncertain and very narrow potential market, and did not wish to undertake the product development process without owning the IPR of the finalised design.

2.2.5 Instead, NR was only offered similar products to that already available. Unfortunately there then arose a substantial disruption to the supply base as a result of this failed procurement exercise, as providers ceased investment in their fleet for fear that it would be abortive.

2.2.6 The proposed revised procurement strategy for Liftex is unconventional, but mirrors that successfully adopted for the Stoneblower on-track equipment, in that:

- NR would develop the output specification for the machine, which would be materially different from the current Rail Industry Standard (RIS-1530-PLT) but incorporate all recent safety improvements.
- NR would procure a recognised manufacturer to design and develop the machine, with NR funding the development costs.
- The manufacturer would retain the IPR of the developed design.
- Subject to NR accepting the developed machine, a production order of 250 units in CP5 would be placed with the manufacturer by NR
- Production machines would be “free issued” to plant hire companies with whom NR had an established relationship.
- NR would hire the Liftex machines from the plant hire companies who would maintain and operate the machines.

2.2.7 Whilst NR have an existing model for that procurement, the IR is concerned that a full risk analysis for this procurement model has not been undertaken, and market testing of the revised procurement strategy has also not been undertaken. The IR recognises, however, that this strategy is still in conceptual form and may develop in another direction altogether. The IR also recognises the potential downside that might arise from premature market testing, with providers of existing RRV plant again ceasing investment.

2.2.8 Specification

Concept sketches of the proposed Liftex machine exist, and a draft specification has been drawn up by NR. The IR has undertaken a comparison between stated ORR rail inspectorate recommendations and the proposed Network Rail Procurement specification as follows:

ORR concern regarding existing RRVs	NR solution in response to ORR concern	How issue addressed within Proposed procurement specification	Comments /recommendations for specification
On/Off tracking runaway risk	Interlocking of rail gear Direct rail wheel braking	Clause 3.10 Direct traction and braking via rail wheels (type 9A) Clause 4.20.4 The vehicle shall have independent direct braked rail wheels. Clause 4.20.6 Capable of preventing the vehicle from running away and hold the vehicle on a 1 in 25 gradient. Improved stopping distance to those specified in RIS clause 4.20.10.	None
Failure to stop	Fitting of brakes to rail wheels	Specification clearly specifies type 9A so risk minimized.	None
Overturn risk	None	Vehicle fitted with RCI as per RIS	Specification needs to add Proof of Stability proved by both calculation and testing
Injury to personnel in the area	Built in radio communication Visibility aids, camera, mirrors Proximity warning systems (trialled)	Recommendations of RIS re communications, camera, mirrors incorporated in specification (clause 4.7.2)	Consider the additional requirement of proximity warning systems
RRVs operating under OLE	None	Vehicle is to be bonded in accordance with BS EN 15746 – 2:2010 and GM/RT2514. Specification calls for failsafe Height limiters (clause 3.11.3)	None
RRVs and Adjacent Line Open	None	Specification calls for safe exit from cab without stepping into open traffic (clause 3.11.4)	None

2.2.9 In addition, the IR makes a number of recommendations regarding the development of the draft procurement specification and these can be found in Appendix A.

2.2.10 Potential Benefits

The draft Liftex Investment paper states that the primary reason for the design and procurement of the plant is to significantly improve workforce safety. Reference is however made in the NR Strategic Business Plan to efficiency savings from mechanisation in track maintenance, of which the RRV excavator improvements are implied (but not specifically identified) as a contributor.

2.2.11 NR has yet to develop the specific RRV-related productivity savings but we are advised that the productivity gains are likely to include:

- Improved reliability (from more efficient reliable machines) in the form of timely possession hand backs
- Reduction in the length of possessions necessary to deliver a required given programme of works
- Reduction in RRV excavator transportation costs for those machines replaced by the lorry based RRV. NR Maintenance currently spends c£2m per quarter on low loaders
- Ability to deliver safer ALO working
- Potential to reduce RRV excavator replacement costs for the plant hire sector. NR estimates that Liftex machines will be c£50k cheaper than a current RRV excavator. Network Rail suggests that by introducing 100 new Liftex machines over CP5 it could leading to an industry saving of c£5m.

2.2.12 The IR acknowledges that the above potential productivity improvements represent worthwhile ambitions, but we caution that they cannot, in our view, be delivered solely by re-equipping. They require a whole-process approach which includes changes to working and management practices to align with the use of the new plant, which in turn has operative competence, and so training, implications. The NR proposal does not address these matters in any way.

3 Response to Questions Posed to the IR

For the purposes of analysing the business case for investment in the proposed new fleet, we have constructed a Halcrow “reference case”, using Network Rail’s estimates of costs and benefits with appropriate adjustments as explained below. For this reference case, the costs and benefits for each asset category are analysed over a 14-year appraisal period – as this period represents the maximum expected life for these assets. In order to assess the business case, we have carried out discounted cash flow analysis, using a discount factor of 4.75% (based on NR’s regulated cost of capital), based on our assessment of costs and benefits for the new fleet.

3.1 What are the safety benefits attributable to the proposed new fleet and can this be expressed in terms of safety improvement using industry recognised safety performance measures e.g. Fatality Weighted Index (FWI)?

3.1.1 Network Rail has provided information on the estimated safety benefits resulting from the implementation of the proposed new fleet. The table below shows NR’s expected improvement across all elements:

KPI	Iveco, Canter etc.	LiftEx	On-Track machines	Total
Major Injuries	10%	10%	5%	25%
Plant Overturns	5%	25%	10%	30%
Plant Derailments	20%	20%	10%	5%
Plant Collisions	10%	25%	5%	40%
Plant Runaways	25%	35%	0%	60%

3.1.2 In this table, Network Rail has estimated reductions in major injuries on a moving annual average (MAA) basis, which comprise one element of the FWI. These reductions appear to be measured relative to current levels of major injuries relating to on-track plant (an MAA of 0.31), which Network Rail has provided in a separate paper. Estimates of current levels of major injuries are necessarily based on a small sample size – as NR notes in its paper. Network Rail has not provided further details of the assumptions that drive these improvements. We understand these estimates are based on professional judgement. While we have no reason to believe that NR’s professional judgement is unreasonable at this stage, NR has not linked its judgement clearly to other evidence.

3.1.3 The table provided by Network Rail only shows changes in Major Injuries. We would expect that outputs for other categories (Minor Injuries and Fatalities) would also change as a result of introducing the new fleet, and understand that Network Rail expects improvements in other categories. On 1 May 2013 NR provided a further estimate of a 15% reduction in Minor Injuries due to the introduction of the new fleet, which we have included in our business case analysis. This further reduction, again based on professional judgement alone, has a negligible impact on the business cases for each element of the proposed new fleet. We assume that Fatalities are not expected to change as a result of introducing the new fleet.

3.1.4 For the purposes of business case analysis, Network Rail has not provided a direct monetary quantification of the safety benefits from major injury reductions. However, we have undertaken analysis based on standard DfT-recommended values to quantify the estimated improvements in safety within the business case analysis. The values used are shown in the table below.

Values of safety benefits, based on DfT guidance (WEBTAG)

Injury category	Description	Average value, 2013
Fatality	Fatality within one year of the causal accident	£1,860,586
Major injury	An injury as defined in schedule 1 of RIDDOR 1995, or where the injury resulted in hospital attendance for more than 24 hours	£ 186,059
Reportable minor injury	For workforce, any injury resulting in more than 3 days off work, which is not a major injury. For passengers and members of the public, any injury that leads to a person being taken from the site of the accident to hospital for treatment, which is not a major injury	£ 9,303

Source: DfT WEBTAG guidance on appraisal & Halcrow analysis – see http://www.dft.gov.uk/webtag/documents/expert/pdf/u3_4_1-accidents-120817.pdf

As suggested by ORR, we have carried out some indicative sensitivity analysis to assess the impacts of varying levels of safety benefits achieved by introducing the new fleet: the results (in terms of benefit-cost ratios, or BCRs) are presented below, relative to the reference case – which is based on NR’s estimates of benefits. We have considered two alternative scenarios:

- Scenario 1- doubling the NR estimates of safety benefits (a 100% increase in major injuries);
- Scenario 2- halving the NR estimates of safety benefits (a 50% reduction in major injuries)

Sensitivity test results, showing the impact of varying benefit levels

Sensitivity Analysis			
Asset Category	Halcrow BCR ref	Halcrow BCR (Scenario 1)	Halcrow BCR (Scenario 2)
MEWPs	2.18	2.19	2.18
Lorries	1.31	1.31	1.31
Iveco	2.50	2.51	2.50
Canters	2.01	2.02	2.00

The results from the indicative sensitivity analysis show that varying levels of safety benefits achieved by introducing the new fleet does not have a material impact on the business case for any of the asset categories, as the BCRs vary by less than 1% relative to the reference case.

3.1.5 The IR notes that NR provided a paper (dated 12 April 2013), setting out in qualitative terms some of the factors that impact on the level of safety benefits. However, NR has provided only verbal evidence to support any quantified link between reductions in safety incidents such as plant derailments and safety outputs (such as major injuries).

3.2 What productivity and output gains are assumed for the proposed fleet and can this be expressed in units of measure for work activities that the relevant machines may be involved in undertaking

3.2.1 For two asset categories (MEWPs and 26-tonne Lorries), NR has identified the expected productivity and output gains per vehicle and included the corresponding benefits in its business case analyses. These benefits are summarised in the table below, for the entire appraisal period – in both discounted and undiscounted terms. However, for the other asset categories (Canters and Iveco vehicles), NR did not include estimated financial savings from productivity improvements in the relevant business case. NR provided some useful background on the process for estimating these benefits at the meeting on 10 April. However, the material that NR subsequently provided did not provide a clear explanation for its estimation approach. In particular, NR has not adequately explained the basis for the assumptions used in its business case analyses, which drive estimated benefits.

Estimated productivity and output gains over the appraisal period

Asset category	Improved Productivity (£ m)	Improved Productivity (£ m NPV)
MEWPs	20.27	14.58
Lorries	0.80	0.75
Iveco	0.00	0.00
Canters	0.00	0.00

3.2.2 NR has also provided some analysis by routes of the potential productivity and output gains from introducing the new fleet. However, there is no clear quantified link between these route-level estimates and the benefits included in the business cases. NR has not provided clear narrative to explain the link between the two sets of analysis, although NR has informed us that it is currently carrying out further analysis which should enable it to reconcile the route-level estimates with its business case analysis.

3.2.3 The route-level analysis of route benefits for Canters, Iveco vehicles and 26-tonne Lorries does present potential productivity and output gains expressed in units of measure for work activities. However, as noted above, these estimates do not clearly feed through to the business case analysis. For example, in the business case for the 26-tonne lorries, the total route returns benefits received are estimated as £130k per vehicle per year; but in the business case analysis the estimated benefit is shown to be £110k per annum per vehicle.

3.2.4 For some asset categories, such as MEWPs, Network Rail has assumed benefit realisation estimates (for MEWPs the figure is 50%). We believe that this parameter represents NR's estimate of the proportion of the benefits that would be realised in practice. NR has provided some high-level explanation and evidence in support of these figures. However, the IR does not believe that these benefit realisation estimates are necessarily appropriate, as NR's estimates of benefits should assume that 100% of benefits can be realised, given efficient utilisation of the fleet. The IR has therefore carried out a sensitivity test, assuming that 100% of benefits are realised. The results of this sensitivity test relative to the reference case are shown in the table below.

Sensitivity test results, showing the impact of varying benefit realisation level

Asset category	Halcrow BCR ref	Halcrow BCR-100% realisation
MEWPs	2.18	2.56
Lorries	1.31	1.31
Iveco	2.50	2.50
Canterers	2.01	2.01

The results from the indicative sensitivity analysis show that varying levels of benefit realisation achieved by introducing the new fleet does not have a material impact on the overall business case for the four asset categories, noting that this assumption is only applied to MEWPs. For the MEWPs, the BCR varies by 17% relative to the reference case when 100% benefit realisation is applied

3.3 Validate estimated costs of each type of machine in proposed new fleet including development costs and accessories

3.3.1 We are content that Network Rail has correctly implemented the calculations derived from its capital cost estimates into the relevant business cases. The analytical structure and calculations based on these inputs are consistent with previous NR business cases, which follow good practice. For example, estimates of capital cost are included in overall cost-benefit calculations in a reasonable, consistent manner.

3.3.2 We have enquired through industry as to indicative costs for road/rail conversion of typical vehicles. As expected, this is a very limited and specialist market, and price very much depends on contract conditions, delivery, volume, specification and finish options selected. As a consequence we are unable to validate the NR-quoted costs with any level of preciseness, but we are content however that they are of the right order of magnitude and not excessive. We would expect that NR would be able to lever volume and price advantage through its aggressive procurement arrangements.

3.4 Validate claimed costs of existing fleet including price for donor machine then conversion

3.4.1 Our comments in paragraph 3.3.2 apply equally here.

3.5 Validate claimed hire costs avoided

3.5.1 We have enquired through industry as to indicative costs for hire costs of typical vehicles. The hire rates depended on time of the week and specification, but were generally higher than the NR-quoted rates, but not substantially so. Again we would expect that NR will have been able to lever volume and price advantage through its aggressive procurement arrangements.

3.6 Assess impact of proposed operating and maintenance arrangements for new fleet on case for investment

3.6.1 We are content that Network Rail has correctly implemented the calculations derived from its operating & maintenance cost estimates into the relevant business cases. The analytical structure and calculations based on these inputs are consistent with previous NR business cases, which follow good practice. For example, estimates of incremental maintenance cost are included in overall cost-benefit calculations in a reasonable, consistent manner.

3.6.2 The table below shows the proportion of the estimated incremental O & M costs over the appraisal period relative to the capex.

	MEWPs (£m)	Lorries (£m)	Iveco (£m)	Canter (£m)
Capex	-39.4	-21.9	-6.9	-4.4
Additional Maintenance Costs	-7.4	-2.3	-3.3	-1.7
O & M Percentage	18.7%	10.6%	47.8%	38.5%

The table shows that incremental O&M costs vary considerably by asset as a proportion of capital costs, from 10.6 % for Lorries to 47.8% for Iveco vehicles. Given that these estimates are incremental cost (i.e. relative to existing O&M costs for the existing fleet), these costs appear to be relatively high. NR has not provided evidence to support its estimates of these O&M costs. Importantly, it has also not provided any analysis of whole-life costs for these assets. At the GRIP 4 stage of project development, we would expect NR to carry out a whole-life cost analysis: we are concerned that NR seems unable to provide any such analysis for these assets, noting the very significant investment in new fleet that NR is proposing.

3.6.3 NR has identified some other related opex costs such as project management costs - which are estimated as 3.9% of capex for all asset categories. Whilst this is a standard cost item, usually included in business case analysis, NR has not provided evidence to back up its estimate. However, we consider that NR's estimate of 3.9% of capex is not unreasonable, given our experience of actual project management costs for other rail projects of a similar scale.

3.7 Assess likely residual value of new fleet at end of CP5 based on reasonable likely estimate of hours worked

3.7.1 Network Rail has prepared estimates of Residual Values (RVs) for all assets, which appear to be based on estimates of hours worked. The estimates of RVs at the end of CP5 do not directly drive the business case analysis, as the analysis extends into CP6; by the end of which the new assets are assumed to be fully depreciated and hence

have no RV. Therefore, the IR has not relied on NR's analysis of the potential RVs for these assets in the IR's assessment of the business case for these assets. Given this we have carried out a deliberately high-level analysis of NR's estimates of RV, and provided some summary comments on NR's estimates.

We expect that NR's estimates of residual value will be consistent with its regulatory accounting policies, as well as with relevant statutory accounting policies. However, given the discussion above and the scope of our mandate, the IR has not carried out an assessment of consistency with accounting policies. The IR also notes (in response to ORR's comments) that there are several methods for estimating RVs for such assets, which in turn depend on asset usage and residual condition, and relevant asset valuation policies.

- 3.7.2 NR has provided further clarification on its estimates of the RV for all assets at the end of CP5. Given the estimated asset lives and expected fleet introduction dates, NR's estimates are not unreasonable; recognising again that the actual value will depend on usage of the fleet.

3.8 Identify any additional costs not accounted for so far by NR in material presented

- 3.8.1 We have identified several cost headings which should be included in the relevant business case(s) - based on good practice for business case assessment.

For all capital investments, we would expect Network Rail to apply a GRIP contingency, which for these assets at this development stage could be up to 30%. Despite this, NR has applied a contingency of 0% to its capital cost estimates, although we recognise that costs included in the SBP submission are required to be presented without contingency. We have analysed the impact of varying levels of cost contingency in terms of key business case outputs: the results from this sensitivity analysis are shown in the next section.

- 3.8.2 The table below shows the key economic business case outputs for the reference case, which assumes that no contingency is applied to the costs.

Asset Category	Halcrow BCR ref	Halcrow IRR	Halcrow NPV £ m	NR NPV £ m
MEWPs	2.18	44%	45.9	44.8
Lorries	1.31	19%	6.4	6.2
Iveco	2.50	106%	13.1	12.7
Canters	2.01	65%	5.3	5.1

The table shows that there is a positive business case for each of the four asset categories, as in all cases the BCR is greater than 1 and the NPV is positive. The highest benefit-cost ratio and rate of return is for the Iveco vehicles. The BCR for the four asset categories combined is 1.96, which shows that the overall business case for the four assets is strong.

The table also shows that the IR's estimates of NPV are very similar to NR's estimates of NPV (once the issues noted below have been corrected).

- 3.8.3 We note that Network Rail have not made any provisions for associated costs for these fleet investments - such as training - when conducting its business case analysis. We recommend that Network Rail should make provision for it.

- 3.8.4 When investing in these types of fleet, it is essential that whole life cycle cost analysis should be carried out to represent trade-offs between various interventions (Renewal v. Maintenance, for example). Therefore we recommend that NR conducts this analysis and includes it in the business case in accordance with generally-accepted best practice.
- 3.8.5 In discounting nominal values to present values, NR has used an in-year factor of 0.5. NR provided further clarification on its use of this factor on 1 May 2013. Although we note that NR's use of this factor is not fully consistent with best practice, we are content that this factor has negligible impact on its business case analysis.
- 3.8.6 We identified a repeated error in each of the extracts of the Network Rail business cases provided to us. NR estimates of costs provided were miscalculated for the years 2015/16 and 2016/17, where the values for project costs in the detailed calculations of BCRs are hardcoded with incorrect values. NR subsequently acknowledged this, which was due to a transcription error. The table below shows the significant impact on the NR estimates of BCRs as a result of their miscalculation. We have corrected the error in our calculations.

Asset Category	Halcrow BCR Reference Case	NR BCR (Original)
MEWPs	2.18	3.99
Lorries	1.31	5.80
Iveco	2.50	-11.06
Canterers	2.01	-1.24

3.9 Anything else that should form part of the case for investment for such a venture

- 3.9.1 In our view Network Rail has not, to date, fully evaluated the potential operational productivity and efficiency benefits arising from the proposed investments and related these in a transparent manner to the infrastructure maintenance activity efficiencies projected elsewhere in the Strategic Business Plan, and to new working practices associated with those. This is a significant piece of work, but essential in our view to make the business cases more robust and compelling and in any case necessary to satisfy NR's Investment Panel process.

3.10 Clarify NR's position with regard to intellectual property rights and any impact on investment case

- 3.10.1 As referred to in Paragraph 2.2.6, NR has conceded that the intellectual property rights (IPR) to any unique design of plant developed by manufacturers to meet an NR specification would lie with the manufacturer. As regards any impact on the case for investment, it is, in our view a pre-requisite assumption that manufacturers will wish retain the IPR to their designs.

4 Economic Analysis - Tables

4.1.1 The tables below show key results from our economic analysis, presented in 2012/13 prices, using a discount factor of 4.75% (based on NR's regulated cost of capital). With the exception of the project cost issue noted above, we are content with Network Rail's calculations of net present value, internal rate of return (IRR) and benefit-cost ratio (BCR).

We have presented the results table with and without additional cost contingencies of 15% and 30%, to show the impact if this contingency is included. The table below shows the Benefit to Cost Ratio for three scenarios, which represent varying levels of accuracy in cost estimation, consistent with the GRIP guidance:

1. 0% contingency (reference case)
2. 15% contingency
3. 30% contingency

Asset Class	BCR 0% Contingency (Reference Case)	BCR 15% Contingency	BCR 30% Contingency
MEWPs	2.18	1.93	1.73
Lorries	1.31	1.15	1.03
Iveco	2.50	2.26	2.06
Canterers	2.01	1.81	1.64
Total (all assets)	1.96	1.75	1.58

The business case for all assets is positive, even with the additional 30% contingency – although the business case for the 26 tonne Lorries is marginal once the contingency is included. The combined business case shows a BCR of above 1.5 even with an additional 30% cost contingency added, which suggests the business case for investment in the proposed new fleet is strong under a range of alternative scenarios. Once NR provides more information on the business case for the Liftex investment, it would be possible to carry out a quantified assessment for Liftex, using similar analysis to that outlined in this report for the other plant categories.

The table below presents our detailed results by asset for the reference case, noting that the discounted values are used to assess the business case for the fleet:

Undiscounted	MEWPs	Lorries	Iveco	Canter
	£ m	£ m	£ m	£ m
Total Economic cost	-46.81	-24.19	-10.14	-6.04
Capex	-39.43	-21.87	-6.86	-4.36
Opex	0.00	0.00	0.00	0.00
Additional Maintenance Costs	-7.38	-2.32	-3.28	-1.68
GRIP contingency	0.00	0.00	0.00	0.00
Total Economic Benefits	119.14	35.26	27.68	13.21
Efficiency Savings	0.00	0.00	0.00	0.00
Avoided cost of Accident - (H & S benefits)	0.02	0.02	0.02	0.02
Improved Productivity	20.27	0.80	0.00	0.00
RRV and ancillary equipment hire	91.14	30.16	26.57	12.26
Residual Value	7.59	4.21	1.00	0.84
Total Net Impact: Benefits - Costs	72.3	11.1	17.5	7.2
NPV - Discounted				
Total Economic cost	-38.79	-20.92	-8.71	-5.25
Capex	-33.50	-19.09	-6.11	-3.89
Opex	0.00	0.00	0.00	0.00
Additional Maintenance Costs	-5.30	-1.84	-2.60	-1.36
GRIP contingency	0.00	0.00	0.00	0.00
Total Economic Benefits	84.73	27.35	21.78	10.55
Efficiency Savings	0.00	0.00	0.00	0.00
Avoided cost of Accident - (H & S benefits)	0.01	0.01	0.01	0.01
Improved Productivity	14.58	0.75	0.00	0.00
RRV and ancillary equipment hire	65.40	23.88	21.08	9.94
Residual Value	4.66	2.65	0.63	0.54
Total Net Impact: Benefits - Costs	45.9	6.4	13.1	5.3

Reference Case: detailed results of our Business Case Analysis

5 Conclusions

5.1.1 The IR is satisfied that a positive Case for Investment could be made for the replacement conventional road/rail vehicle fleet:

- Mobile Elevated Working Platforms (MEWPs)
- Modular Lorries
- Iveco Daily 4x4s
- Mitsubishi Canters

That view is supported by our analysis.

5.1.2 It is the IR's view that a more compelling case could be made for this investment if greater detail could be presented regarding the extent to which specific, measurable productivity improvements could be attributed directly to it. That case for investment would also have to address the implications for changed working practices and training that would be necessary to maximise its value; matters which are not addressed in NR's current proposals in any way.

5.1.3 It is the IR's firm view that the Liftex proposal needs a great deal more detailed development before it could be considered a deliverable solution to both the safety and productivity challenges it is seeking to address. Clearly the potential exists for Liftex to deliver increased productivity and safety improvements and so its development is, in our view, a worthwhile enterprise. NR could consider how development of the design of the Liftex machine might be accelerated, in order that it may be satisfied corporately of its technical feasibility and viability before committing to its design, manufacture and introduction into service.

6 Recommendations

Ref	Key Issue
1	Attributable Productivity and Efficiency Benefits
	Recommendation
	For both the conventional road/rail fleet replacement proposal and the Liftex proposal greater detail is required of the extent to which specific productivity improvements could be directly attributed to this investment, and quantified, taking into account necessary changes to working practices and training requirements.

Ref	Key Issue
2	Attributable Safety Benefits
	Recommendation
	For the Liftex proposal, greater detail is required of the extent to which safety benefits could be attributed to this investment, and quantified.

Ref	Key Issue
3	Whole Life Cycle Cost Analysis
	Recommendation
	For both the conventional road/rail fleet replacement proposal and the Liftex proposal, whole life cycle cost analysis should be undertaken in accordance with recognised best practice.

Ref	Key Issue
4	Monetary Quantification of Safety Benefits
	Recommendation
	For both the conventional road/rail fleet replacement proposal and the Liftex proposal objective assessments of the monetary benefits from major injury reduction in accordance with established practice.

Ref	Key Issue
6	Specification Development
	Recommendation
	For the Liftex proposal the specification should be refined and proposed features explicitly linked to addressing the expressed concerns of the safety inspectorate. Technical feasibility and deliverability of service outcomes should be proven before manufacture is contemplated.

Ref	Key Issue
7	Procurement Strategy
	Recommendation
	For the Liftex proposal, the procurement strategy should be developed in detail and informed by targeted consultation with relevant potential manufacturers.

Ref	Key Issue
8	Contingency Provision
	Recommendation
	For both the conventional road/rail fleet replacement proposal and the Liftex proposal contingency provision should be made in the investment proposal in accordance with established practice.

David Simmons
Independent Reporter
Halcrow Group Ltd
(A CH2M HILL Company)

August 2013.