Office of Rail Regulation

Mandate AO/011: Network Rail Regulatory Accounts Data Assurance

Final Report

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Glossary

AFC	Anticipated Final Cost
BMIS	Business Management Information System
CAF	Cost Analysis Framework
CEM	Cost Efficiency Measure
CP	Control Period
DPu	Delivery Plan update
DU	Delivery Unit
EEA	Efficient Engineering Access
FRM 702	Reporting of Maintenance Unit Costs - guidance document
FTN	Fixed Telecoms Network
HQ	Headquarters
ISC	Internal Stock Control (materials ordering system)
KPI	Key Performance Indicator
MBR	Monthly Business Review
MDU	Maintenance Delivery Unit
MNT	Maintenance activity code
MUC	Maintenance Unit Cost
NDS	National Delivery Service
NR	Network Rail
NROL	Materials ordering system used by NDS
ORR	Office of Rail Regulation
OTL	Oracle Time and Labour
PR08	Periodic Review 2008
RAB	Regulated Asset Base
REEM	Real Economic Efficiency Measure
RUC	Renewals Unit Cost
RWI	Repeatable Work Item
S&C	Switches and Crossings
SEU	Signalling Equivalent Units
WAIF	Work Arising Identification Form
YTD	Year to Date

0 Executive Summary

0.1 Introduction

In accordance with our Independent Reporter mandate AO/011: Regulatory Accounts Data Assurance, Arup was asked to review key cost and efficiency information presented in (and supporting) Network Rail (NR's) 2010/11 Regulatory Accounts. This report presents the findings of our review.

We note that Network Rail has elected not to comment on the detailed findings of our review. NR has indicated that it is concentrating its efforts on developing an improvement plan, rather than commenting on specific points or the factual accuracy of our report.[1]

0.1.1 Approach

Our approach to this assignment has combined a desk-based review of NR's internal documents, a review of spreadsheets used for the calculation of efficiency metrics and meetings with various teams from both the engineering/asset management and finance functions within NR.

We undertook our review with particular reference to the following areas:

- Renewals expenditure and efficiency.
- Evidence base for renewals efficiencies.
- Unit cost data quality and confidence grading.
- Regulatory accounts statement data review.
- Best practice in cost and efficiency accounting.

After conducting our review of data initially presented to us by NR, Arup wrote to NR on the 7th June 2011 detailing a number of outstanding concerns that we had.[2] Subsequently, we received significant additional information from NR on 24th June 2011.[3] That additional information has been reviewed and integrated into the analysis contained in this report.

The timing and duration of this review has been a cause of considerable concern to all parties (NR, ORR and ourselves). It began at the time when other regulatory and accounting deliverables were being prepared, and has taken longer to complete than any party would have desired. We therefore support current proposals to amend the format and timetable for the next review (see Section 0 below).

[1] We make reference to the letter from Patrick Butcher (Network Rail) to Stefan Sanders (Arup), dated 4th August 2011.
[2] Letter to Network Rail from Arup "Covering letter to accompany Arup's draft opinion regarding Network Rail's regulatory accounts statements 2010/11" dated 7th June 2011.
[3] Letter from Network Rail to Arup "2010/11 regulatory accounts" plus enclosures dated 24th June 2010.

In a number of areas, such as civils asset policy, track and maintenance unit cost processes, NR has set in train changes that are designed to improve management processes and activities. These are anticipated to lead to significant improvements. We also recognise that a forward-looking, recommendation-orientated set of findings is probably of most value to NR and ORR. Inevitably, our work involves a review of 2010/2011 and many of the improvements being made by NR will not have influenced our findings for the year in question.

0.1.2 Overview of renewals expenditure

The primary focus of this report is NR's reporting of its renewals expenditure and associated efficiencies, as specified in the assignment mandate. In broad terms, the reporting in NR's 2010/11 Regulatory Accounts of renewals underspend can be broken down into the following two categories:

- Efficiency: this relates to both the target 9.75% efficiency for the year as set out in the PR08 determination, and additional efficiencies above and beyond ORR determinations.
- Deferrals: expenditure reductions not attributed in terms of efficiency are defined in terms of deferral. The majority of renewals deferrals are treated by NR as intra-Control Period deferrals. Only a small amount of expenditure (£69m) is deferred in the accounts beyond CP4.

0.2 NR's calculation of renewals efficiencies

0.2.1 Volume-based efficiency calculations

- Of the £2.174 bn total renewals expenditure recorded in the 2010/11 Regulatory Accounts for CEM/REEM efficiency calculation purposes, 43.1% (£936m) is captured on a volume and unit cost basis. This relates to proportions of expenditure for track, signalling and civils renewals categories.
- Renewals unit costs (RUCs) utilised for CEM/REEM efficiency calculations are calculated by dividing total expenditure for a given expenditure category by total volume to produce the unit cost value. RUC values are therefore the product of an aggregated calculation using macro-level figures, and cannot be regarded a bottom-up unit cost measure.[4]
- The calculation of volume and unit cost efficiency is undertaken on a "top-down" basis (i.e. using total expenditure and volume figures and applying calculations at a macro level). The derivation of baseline and actual expenditure and volume figures, through which unit cost values and efficiency percentages are calculated, differs between the three volume-based renewals categories (we review the calculations in detail throughout Chapter 3 of this report). We summarise our key findings for the three categories below.

[4] The RUC calculations differ from the CAF (Cost Analysis Framework) renewals unit costs, which are originated at the project level (see Section 3.2.1 for a fuller explanation of the differences between the RUC and the CAF).

0.2.1.1 Track efficiency (volume-based expenditure)

- For calculation of volume efficiency, NR applies a pre-determined efficiency percentage that represents the reduction in CP4 (5-year) volumes in the 2010 Delivery Plan update vs. the PR08 baseline volumes as projected in the budget figures.
- NR's re-baselining of year-end volumes ensures that the pre-determined volume efficiency percentages are still achieved in spite of significantly lower volumes of Plain Line renewals delivered compared to the budget figures.
- NR's unit cost efficiency figures show a significant level of variability when comparing budget projections with the actual year-end figures. This indicates that track renewals activities carried out were significantly different (both in nature and scope) to what was projected in NR's Delivery Plan update 2010. However, lack of granularity within the RUCs utilised for track, e.g. six activity types captured under the single "Plain Line" unit cost measure, restricts visibility of the work-mix (i.e. the precise nature and scope of the work undertaken) and how this influences overall efficiencies.

0.2.1.2 Signalling efficiency (volume-based expenditure)

- The signalling efficiency calculations reviewed in this report are based on figures provided by NR on 24th June 2011. These differ from the figures originally provided to us prior to this date and reviewed in our Initial Draft Report (9th May 2011).
- NR's calculation of volume and unit cost efficiencies for signalling assets follows the same top-down approach applied to track assets. However, the reported volumes feeding into the signalling efficiency calculations are derived on a different basis. For signalling, the baseline CP4 signalling volume appears to be the product of a revised CP4 "post-efficient" volume, prior to application of a scope efficiency of 25 x Signalling Equivalent Units (SEUs). This results in a comparatively small volume efficiency percentage (0.5%) declared by NR at year-end, compared to the 4.7% volume efficiency projected in the budget.
- We have not been able to establish a clear audit trail between the year-end volume figures provided in the revised CEM/REEM efficiency calculation, and published figures that the numbers are supposed to represent.[5] Furthermore, no information has been provided that links the revised baseline CP4 volume to the "pre-efficient" volume set out in the PR08 determination.
- We have not been able to link the 2010/11 in-year reported volume for conventional re-signalling (700 SEUs) with year-by-year volumes for CP4 provided in any other data (including the 2011 Delivery Plan update forecast volume for "Conventional" re-signalling of 963 SEUs). We recommend that this issue is clarified by Network Rail.

[5] NR's revised CEM/REEM efficiency calculation is baed on a total CP4 volume projection which differs both from the published figure with NR's 2011 Delivery Plan, and subsequent data provided by Network Rail containing adjustments to the Delivery Plan figures – see Section 3.4.3 for details.

- Successive versions of NR's Delivery Plan have shown significant fluctuations in the overall volume profile.

0.2.1.3 Civils efficiency (volume-based expenditure)

- For civils volume-based renewals, the efficiency calculations reviewed in this report are also based on revised figures provided by NR on 24th June 2011. These figures differ significantly (both in relation to year-end expenditure and baseline values) from the figures originally provided to us prior to this date, and reviewed in our Initial Draft Report (9th May 2011).
- NR has claimed no volume efficiency in relation to this asset category. As a result, all efficiencies reported for volume-based civils renewal activities are attributed to unit cost efficiency.
- NR's unit cost efficiency is lower than projected in the budget at the start of FY10/11. There have also been significant fluctuations between the activity volumes shown in NR's Delivery Plan, budget and year-end actual figures.
- Historical uncertainty around planning of renewals work (for example in term of scope and volume) and a significant degree of slippage throughout the year may have contributed to the extent of the variance between the projected RUC values in the budget and the year-end actual figures.

0.2.2 Non-volume renewals activities

- NR reported an aggregate efficiency figure of 9.75% for non-volume renewals activities, which was uniformly factored into the efficiency calculation across all non-volume renewals categories.
- Although documentation provided indicated that levels of efficiency vary between the different non-volume assets, Network Rail appears to be unable to provide a breakdown of efficiency on an individual asset category basis.
- NR's non-volume renewals spending for Track, Signalling and Civils have been included as part of the spending items for which the 9.75% aggregate efficiency was reported, as non-volume renewals spending accounts for significant portions of the total renewals spend for these assets.
- For three of the non-volume asset categories - Telecoms, Operational Property and HQ/Other – 'further efficiencies' beyond the 9.75% Delivery Plan assumption were reported, whilst for Electrification a negative adjustment was applied resulting in a reported net inefficiency.
- We consider that at this time it is not possible to validate the declared efficiency levels for non-volume based renewals categories on an asset specific basis, because it appears no specific efficiency figures can be provided to measure efficiency for the individual non-volume based renewals categories.

0.3 Renewals efficiency reporting process review: key findings

We have reviewed the process by which CEM renewals efficiencies are analysed and challenged internally at NR. Various aspects of the CEM renewals efficiency reporting process have been assessed. Our findings in relation to the areas we reviewed are set out in the sections below.

0.3.1 Definition

- The additional information we received from NR on 24th June 2011 represented a considerable improvement on that which we had initially received. We do however believe that NR should put in place a comprehensive systematic guide explaining the basis by which the CEM and REEM metrics are calculated, setting out source data, calculation processes / rationale and outputs, as no such guide appears at present to exist.
- Data analysis was complicated by the use of baseline terminology that was at times difficult to follow and inconsistent from an external review perspective. We consider that documenting these in a more formal and detailed manner is essential.

0.3.2 Source Data

- The CEM metric is derived from a number of separate but interlinked spreadsheets containing cost input data and adjustments. We believe that the CEM calculation process would also benefit from the creation of high level documentation to illustrate how the CEM components map together and where data are derived from. In addition, we think that NR should adopt a financial model approach to the CEM calculation process. This will help to reduce the risk of error and over reliance on a very small number of competent individuals (possibly just one) who know how the spreadsheets work together.

0.3.3 Variability of inputs

- We noted significant levels of variability identified in renewals volumes when comparing Delivery Plan and budget projections with actual volumes.
- This implies instability in the renewals delivery process and volumes delivered.
- Variability has also been identified in the calculation formulae from which the CEM metric is calculated. This includes alterations in baseline approach in calculations provided to Arup since June 24th 2011 compared to earlier calculations that were otherwise understood to be “draft final”.

0.3.4 Process and analysis

NR’s methodology for estimating efficiency gains is in essence a top down *ex post* approach, which involves re-baselining NR expenditure to reflect efficiency gains the business considers it has achieved for the year in question.

Whilst this general approach is adopted for all asset categories, the precise inputs and assumptions feeding into the calculations differ between different asset groups, both in relation to the volume-based categories (track, signalling, civils) where efficiencies are broken down in terms of volume and unit costs and for non-volume categories where efficiency is based on total expenditure. We analyse these calculations in detail in Chapters 3 and 4 of this report. NR has provided us with management estimates of efficiency gained as a result of positive management actions taken to improve efficiency across asset categories. These are particularly relevant (although not exclusively so) in substantiating the unit cost reductions being reported. Examples provided by NR represent the sorts of activities that should result in efficiency gains (such as renegotiation of contracts, reduced headcount, use of new types of on-site equipment and so forth).

We note however that there are significant challenges and uncertainties with the *ex post* method of efficiency gain that has been adopted. This can be seen at a number of individual asset category levels, where estimates of efficiency have moved substantively between the two final draft Statement 12 efficiency schedules that we received on 5th May 2011 and 24th June 2011 respectively. It is clear that this approach relies on management's best efforts to link actions to efficiency gain.

For some asset categories, NR has informed us that the movement in estimates of efficiency was due to errors in the way in which the previous figures had been calculated (particularly in the signalling and civils asset categories). This again perhaps illustrates some of the risks associated with the "bespoke" nature of the approach adopted by the business in compiling and estimating efficiencies in question.

We have however, held a number of meetings with NR staff where we have been able to discuss at some length the management narrative relating to positive management actions. We recognise that in many cases, managers have been able to give specific examples of management actions that are likely to have genuinely improved NR's renewal efficiency. We believe that that there is a degree of uncertainty surrounding the extent to which actions highlighted are actually responsible for efficiencies NR is reporting.

This uncertainty is in our opinion, driven largely by the lack of a bottom-up, 'auditable' trail of information that relates planned activities to their impact on outcomes. We would maintain that a more systematic, forward-looking, embedded approach to delivering efficiency, in line, for example, with practice observed in the UK water sector, would do much to address this uncertainty.

0.3.5 Coverage

- We are satisfied that the CEM measure encompasses the full scope of renewals activities undertaken by NR.
- We consider the present level of unit cost coverage for CEM purposes of 43.1% total renewals expenditure could be significantly increased.

0.4 CEM efficiency key dependencies and risks

We have assessed the extent to which an audit trail in the form of substantive, quantifiable evidence forms is in place, and set out what we consider areas of key uncertainty and risk in the present efficiency reporting process.

0.4.1 Evidence to justify efficiencies

We note that conceptually, it can be difficult to justify efficiency solely on the basis of movements in key cost or volume indicators. It is possible for NR (or indeed any business) to deliver efficiency in a number of ways which by their very nature can cause key cost or volume indicators to move in opposite directions.[6]

We therefore consider it essential that evidence of procedures and analysis to show compliance with asset policies or evidence of positive management actions is be "hard wired" into efficiency calculations. Whilst we were able to follow a number of positive management actions detailed in the material sent to Arup on 24th June 2011, this appears to have been an *ex post* analysis based on management's best judgement (and our request for further information) rather than the product of a systematic forward-looking management practice. We note that NR does not fully agree with our view on this matter. We also note that there is a risk that it may now be too late for such a process to help shape the periodic review process for CP5.

Notwithstanding the above, we do consider that the engineering functions within NR should be providing the finance function with stronger evidence for efficiency gains compared with non-adjusted baselines. If this is not the case, efficiencies being claimed as a result of baseline adjustments risk not being delivered.

0.4.2 Asset policies

We consider that an important part of the evidence to justify the efficiencies noted above relates to compliance with NR's asset policies, in line with the *sustainability* and *robustness* "tests" that ORR and to a certain extent the Regulatory Accounting Guidelines provide when assessing efficiency.

ORR's assessment of efficiency requires that NR's renewals activities are compliant with NR asset policies (and that these in turn are considered by ORR to be sustainable and robust)[7] . We note that the civils asset policy is presently being revised, and is yet to be formally endorsed by the ORR; we also understand the ORR is considering further review and assessment of Network Rail's other asset policies.

Our initial assessment of asset policy compliance focused on higher-level information provided by NR (such as Route Asset Management Plans (RAMPs) and policy documents, current and forward-looking asset condition measures / forecasts, and delivered & programmed volumes / outputs), that are designed to

[6] See, for instance, ***Table 22*** (Section 6.1) where we illustrate how movements in volume or unit cost indicators may indicate either greater or lesser efficiency depending on the nature of the underlying driver.
[7] Note: the definitions of robustness and sustainability set out in the letter from Michael Lee (ORR) to Paul Plummer (NR), 1 June 2010.

evidence NR's opinion that efficient levels of asset expenditure encompassed within the accounts are sustainable.

The latter part of our review has provided us with an opportunity to explore information provided on sustainability with NR's asset managers. They have provided us with rationales and analytical evidence to demonstrate this point. The evidence and narrative made available to us by NR represents a considerable advance on the information previously provided . What we have not been able to undertake is an assessment of supporting evidence. We note that the ORR previously tested asset policies through an extensive programme of "challenge" workshops to assess their "sustainability". Such a detailed process has not formed part of the scope of our review.

As we have found with positive management actions, there is, as such, no "auditable" trail of analysis, decision making, work undertaken or modelled results which provide a "look through" from one end of asset decision making to the other. There is therefore some uncertainty as to whether NR's renewals activities in 2010/11 are efficient when measured in this way. Our opinion details specific areas where believe material uncertainty may exist (as guided by the ORR as to what constitutes material uncertainty).

As we noted before, there is clearly an opportunity and some momentum in NR and ORR to review asset policies and how they influence and shape work banks. These may well have help to reduce the level of uncertainty associated with asset policy compliance.

0.4.3 Volume deferrals/efficiencies

Declared volume efficiencies within the Control Period are normalized through a re-baselining process. With revised future renewal volumes higher than stated in previous versions of NR's Delivery Plans, there is the risk that it will not be possible to know whether the full "efficient" volume in the original Delivery Plan can actually be delivered until the end of the Control Period.

There is a related risk around a "bow-wave" of expenditure/activity building up for the latter years of the Control Period. This risk is takes the form of a deferral amount for CP5.

We consider that there is a need for a stronger evidence base that can provide a robust and "auditable" trail of analysis and decision-making. This is in order to underpin volume efficiencies being reported in the early years of the Control Period through the re-baselining process as well as supporting management opinion that renewal expenditure in the remaining years of CP4 will still be achievable.

0.4.4 Unit costs

The information provided to us on 24th June 2011 provided some important evidence of NR's specific drivers responsible for reducing unit costs. We consider unit cost analysis should be more transparent to review than at present and would benefit from the proposed systemic improvements we have highlighted above.

0.5 Evidence base for renewals efficiencies – key findings

0.5.1 Volume uncertainty –across asset types

We note that in a separate report, which formed an audit of NR's renewals volume data (AO/013), the accuracy ratings vary from '1' to '3'. With regard to those renewals activities presently reported in volume and unit cost terms within the CEM, for track volumes a '1' rating has been assigned, indicating that the measure is expected to be accurate to within +/-1% whilst signalling and civils renewal volumes are assigned a rating of '2', which represents an expected accuracy level of +/-5%. On this basis, there is a risk that the unit cost efficiencies included in the Regulatory Accounts may be subject to a material degree of uncertainty. We have reflected this uncertainty in our opinion. It forms one of the items that we consider is an area of "material" uncertainty depending on the threshold that is used. We discuss this issue further in Section 0.8.2 below.

0.5.1.1 Track

For track renewals efficiencies:

- Unit cost efficiencies declared have been supported by information relating to positive management actions implemented. Notwithstanding our observations about future volume uncertainty, the types of efficiencies identified appear reasonable.
- The sustainability of the track renewals programme has been supported by evidence of key track condition metrics. We consider this to be a reasonable evidence base (subject to the robustness of the modelling methodology from which the given forward-looking track condition metrics are derived). A technical review of this evidence is beyond the scope of this mandate.
- Notwithstanding the two points noted above, we consider there to be a "bow wave risk" in light of the requirement for significantly higher levels of output to achieve required renewals volumes over the remainder of the Control Period. This applies in particular to significantly higher volumes of "Category 1" track to be renewed for the remainder of the Control Period (out of an overall 20% increase in total plain line renewal volume that is required to compensate for volume slippage to date). This category of track, by its nature (and location) is likely to carry a higher level of delivery risk than other categories of track renewal delivered to date. Given the value of plain line efficiency being stated (some £66m at the REEM level), we have identified this as an outstanding item in our opinion. In order to address this area of uncertainty, we would need evidence of a bottom-up work bank and a credible management narrative around risks and mitigations with respect to its deliverability.

0.5.1.2 Signalling

For signalling renewals efficiencies:

- The sustainability of the signalling renewals programme has been supported by NR's evidence of condition and performance metrics across the rail network to date. Given the nature of signalling asset performance, and the scope of the renewals programme going forward, we consider the evidence of sustainability of signalling renewals is reasonable.
- The robustness of the signalling renewals programme has been supported by NR's project-specific evidence of planned and outturn delivery volumes to date, and programmed delivery volumes going forward. We consider that this represents a reasonable evidence base for the deliverability of the signalling renewals programme. However, we note that it has not been possible to link the volume information presented in various documents on a CP4 (5-year) basis, with the 2010/11 in-year reported volumes utilised for the CEM/REEM volume efficiency calculations (this is explained in more detail in Section 3.4.3).
- Unit cost efficiencies declared have been supported by information provided by NR relating to positive management actions implemented and project-specific information relating delivered volume and cost versus baseline. Given the variability (in both positive and negative terms) relating to RUC levels across the different projects, we consider there may be some risk to the sustainability of the unit cost efficiencies declared. However we consider this risk to be relatively modest and the impact not material when measured against the measure suggested by the ORR.

0.5.1.3 Civils

For civils renewals efficiencies:

- There is a risk relating to the sustainability of the civils efficiencies declared. Whilst no volume efficiency is being reported, we consider due to the asset policy "being in flux" there is some risk that unit cost efficiencies may not have been achieved on the basis of delivery of civils asset renewals on a sustainable basis. Specifically, NR may need to deliver a larger or more costly volume of work in the Control Period. Given the value of civils unit cost efficiencies being reported (at the REEM level) - some £35m – this has been identified as a material issue in our opinion letter to NR on 22nd July 2011 (a copy of which is reproduced in Section 9.10).

0.6 CAF Confidence Grading Analysis

0.6.1 Results of previous confidence grading analysis

Arup completed a previous data quality and confidence grading analysis of CAF unit costs in September 2010.[8] This resulted in a Reliability Grading of "C3"[9].

0.6.2 Approach to our gradings

Our approach to the development of an updated reliability grading for CAF unit costs is based on our existing knowledge of the CAF process and our findings regarding the developments made in the intervening period. Measures taken to address our previous recommendations are also taken into account.

The accuracy of CAF unit costs has been analysed on the basis of a sample of high value (e.g. significant in audit terms) projects. 6-10 projects have been sampled for each of the five main asset categories through which unit costs are reported via CAF returns process – buildings, civils, signalling, telecoms and electrification.

Our approach combines quantitative checks of the consistency of figures in the CAF returns with financial data in the Oracle Projects (OP) reporting system, as well as qualitative checks in order to ensure completeness of information and to identify gaps and discrepancies.

Track renewals unit costs are not directly reported through the CAF returns process, therefore our review of track data is based on spreadsheets containing cost and volume data reported though the Primavera system, from which CAF values for track are derived. These have been checked for consistency against the CAF unit cost values reported in the Regulatory Accounts.

0.6.3 Results of Confidence Grading - assets reporting through CAF returns process

Through our assessment of the CAF process, we have identified that improvements have been made since our last audit in particular with regard to the level of CAF coverage, process changes to improve data integrity and the increased utilisation of Unit Cost Modelling. We consider these measures have increased the level of unit cost reliability.

With regard to accuracy, based on the analysis of CAF returns from a sample of buildings, civils, signalling, telecoms and electrification projects, material inaccuracies representing a value of 6% of total expenditure value for the given selection of projects were identified.

With the dataset available it is not possible to determine a confidence grading explicitly for the CAF costs presented for track renewals. To achieve this, further information would be required to identify the finalised Period 13 costs on a disaggregated basis, which would show any adjustments made by the central

[8] Arup Independent Reporter (part A) mandate AO/003: NR Annual Return Audit 2009/10
[9] Reliability grading "C": significant shortcomings in the system; Accuracy grading "3": accuracy level outside +/-5%, but within +/-10%.

Finance Team prior to presentation in the Regulatory Accounts. However, we consider that the processes and procedures in place for recording track volumes and costs have not changed significantly since our 2010 Annual Return Audit.

Based on the information provided, an overall Confidence Grading of B3 has been assigned for CAF unit costs based on the sample data provided.[10]

0.7 MUC (Maintenance Unit Cost) Confidence Grading Analysis

0.7.1 Results of previous confidence grading analysis

Arup completed a previous data quality and confidence grading analysis of MUC unit costs in September 2010. This resulted in a Reliability Grading of "C4"[11]: some significant shortcomings in the process which require urgent attention; and an Accuracy Grading of "4": accuracy level outside +/-10%, but within +/-25%.

0.7.2 Approach to our gradings

Our approach to the development of a reliability grading for the MUC figures is built upon our existing knowledge and analysis of the MUC process gained through our previous Confidence Grading review, combined with an analysis of improvements and developments implemented by NR since that time, including specifically activities that relate to Arup's recommendations.

Our accuracy grading approach involves a comparison between figures within NR's MUC Macro output and our calculation of Unit Cost combining source data from NR's internal systems. We have also performed an analysis of all of the MUC Macro Output files produced during week 1 and week 3 of each period during FY 2010/11, using YTD variance, period variance, and costs with no units etc. as indicators of the accuracy level of the MUC data for each respective MNT code.

0.7.3 Results for Reliability grading

We have found that many of the measures already introduced or being introduced to improve MUCs during the last year have not progressed sufficiently enough to impact significantly on unit cost process reliability.

A major improvement from last year has been the development of the MUC Process/Handbook. However, this process is very user focused and does not contain enough detail on the design, configuration and change control/documentation of the MUC system. This is of particular concern for next year given the amount of development currently underway and the need to assess the impact on the MUCs of such development.

[10] Reliability grading "B": minor shortcomings in the system; Accuracy grading "3": accuracy level outside +/-5%, but within +/-10%.
[11] Reliability grading "C": significant shortcomings in the system; Accuracy grading "4": accuracy level outside +/-10%, but within +/-25%.

We believe however, the concerns previously identified which have not yet been adequately addressed, along with the lack of design documentation amount to a significant shortcoming in process.

Overall, our review of the current MUC system and process results in a Reliability grading of C: some significant shortcomings in the process, which need urgent attention.

0.7.4 Result of Accuracy grading

Our analysis of the current MUC data results in a Reliability grading of 2 – accurate to within 5%.

Our accuracy analysis placed NR close to the boundary between a score of 2 and 3. This takes into account the work that NR has carried out over the last year, the strong proven link between source data and MUC figures and that the analysis above gives an indication of accuracy, not a definitive figure.

Our analysis of the MUC macro data suggests that an accuracy score of 3 could be considered appropriate. However, we believe that there is sufficient evidence to suggest that NR is taking appropriate mitigation measures to identify and correct errors; has a process which does not rely upon manual input into calculations; and has put significant effort into reducing data errors at source.

0.8 Conclusions and opinion

0.8.1 Opinion

Based on our review of information and evidence provided in respect of the following statements within the Regulatory Accounts, we confirm that in our opinion the statements (listed here) have been prepared in accordance with the Regulatory Accounting Guidelines and are consistent with the underlying financial statements, subject to the areas of uncertainty detailed below.

- Statement 8b (parts (1) and (2) – Analysis of maintenance expenditure by MDU
- Statement 9b – Detailed analysis of renewals expenditure
- Statement 12 – Analysis of efficiency (year on year efficiency measure)
- Statement 13 – Volume Incentives
- Statement 14 – Unit Costs
- Statement 15 – Renewals unit costs and coverage
- Statement 16 – Renewals - track unit costs and volumes
- Statement 17 – Other

0.8.2 Areas of uncertainty

Based on the information provided during this review, the following specific areas of uncertainty relating to the REEM efficiency figures reported in the 2010/11 Regulatory Accounts have been identified[12]:

- **Year-end reported volumes**. Based on Arup's assessment of renewals volume reporting by NR (mandate AO/013), there are uncertainties around the reported year-end volume values. These feed into the track, civils and signalling volume efficiency calculations covered by the statements Arup has reviewed under this mandate. A review of the accuracy of the renewals volume reporting process has indicated that there is a risk that the renewal volumes may be up to one per cent over or understated for track renewals, and up to five per cent over or understated for signalling and civils renewals. As a result of this uncertainty, renewals efficiency savings may be up to £26m higher or lower.[13]
- With respect to **plain line track renewals**, NR has recognised volume efficiency in 2010/11. There has however, been a lower level of delivered track activity than planned and NR will therefore need to deliver a larger volume of work in the remaining years of the Control Period, particularly "Category 1" plain line track, in order to fulfil PR08 requirements. We consider there to be a risk of a shortfall in delivery of increased volumes . The fact that this risk arises as a consequence of underdelivery in FY10/11, means that in our opinion some of the efficiency relating to the FY10/11 delivery may be invalid. We therefore consider that a value equivalent to the potential volume shortfall should be discounted from the current volume efficiency calculation. On this basis, we have estimated that there is a risk that track renewals efficiency may have been overstated by up to £4.5m on an annualized basis, based on a 25% shortfall in delivering volume deferred from the 2010/11 Delivery Plan.
- **With respect to civils assets**, we consider that there is a degree of uncertainty with regard to the precise nature and scope of renewals activities required for the remainder of CP4. Given the level of instability in both cost and volume terms between successive delivery plans to date, and the fact that civils policies are still to be fully agreed and endorsed by ORR,[14] we consider there is a risk that NR will need to

[12] The first three areas of uncertainty listed were included in Arup's quantified assessment of the potential impact of uncertainty, contained within our opinion letter of 22nd July 2011 (reproduced in Section 9.10).
[13] Note that our assessment of the impact of uncertainty relating to year-end reported volumes has been revised since we produced our opinion letter on 22nd July 2011. Our original analysis indicated an uncertainty of up to £50m. However, further analysis carried out under Arup's mandate AO/013 has identified factors that have led to the revision of the accuracy grading assigned to track volume reporting from "2" to "1", indicating a higher level of accuracy than previously identified. As a result, our revised calculation now reflects a lesser degree of uncertainty in relation to track volumes, resulting in a revised uncertainty value to £26m. See Appendix P for full details of our calculations.
[14] See also Arup's mandate AO/007 review of NR asset policy, stewardship and management of structures, March 2011.

deliver a larger or more costly volume of work in the Control Period. Until the policy is finalised by NR, and evidence presented of a definitive understanding of asset condition, we estimate a degree of uncertainty relating to 20% of the declared efficiency, in order to reflect the fact that part of the declared unit cost efficiency may not be fully sustainable.

- **Non- volume based renewals**. We consider that there is uncertainty with regard to the amount of capitalised renewals expenditure relating to non-volume based renewals categories, following deferral of a significant amount of expenditure under these categories during 2010/11. We consider there to be a risk of underdelivery of the deferred 2010/11 expenditure amount for the remainder of the Control Period, which could result in underperformance against PR08 requirements for renewal and overhaul of the rail infrastructure.[15] (We also consider that the same risk applies to outstanding expenditure deferral amounts from 2009/10, although, Arup was not provided with a similar breakdown of expenditure deferral for 2009/10.)

The process by which the quantified estimations of the impact of the uncertainties outlined above have been calculated is set out in Appendix P to this report.

We also consider there to be a level of "background uncertainty" surrounding the validity of cost efficiency calculations presented. This is due to the lack of a systematic process through which Network Rail's efficiency calculations are substantiated with tangible, bottom-up evidence. However, due to the limitations in the level of information provided we have not been able to define further areas of uncertainty in quantified terms.

Chapters 3 to 6 of this report provide further detail of our concerns in relation to the efficiency reporting process. We have provided recommendations to help mitigate the areas of uncertainty identified, and revisited a number of recommendations from previous Arup reviews during 2010 which we understand are yet to be implemented.

0.8.3 Proposed improvements in the efficiency reporting and review process

NR and ORR have agreed an improved process of efficiency reporting and review is needed for future years. ORR has summarised the key points agreed as follows:

- "The ORR should to be clearer about its requirements of Network Rail's reporting of efficiencies;
- The ORR should clarify how it considers that the concept of materiality should be applied to the reporting of efficiencies;
- Network Rail should improve its documentation of its policies, processes and controls relating to the calculation and recognising of efficiencies;

[15] A range of CP4 output requirements across the different asset categories are set out in Chapter 5 of the PR08 document.

- Network Rail's evidence base supporting reported efficiencies should be made more easily auditable; and
- Arup should commence its assessment of efficiencies earlier in the year to enable any issues to be identified and resolved ahead of the year-end reporting cycle."[16]

We support the proposed changes, and consider them to be an important first step in moving towards a more transparent, evidence-based approach to efficiency reporting. We are currently reviewing Network Rail's proposals to effect immediate improvements for efficiency reporting for the current financial year (FY11/12) and beyond, as well as discussing changes to the scope and timescales of our review process on this basis.

Implementation of a comprehensive bottom-up approach to efficiency assessment will require substantial change to internal reporting structures and accountabilities with Network Rail. Implementation of the changes required in time to inform the periodic review process for CP5 is likely to represent a significant challenge for NR. This is not least because of the scale of changes that might be required and competing demands on NR's management team. Furthermore, the prospect of NR's reorganisation presents may mean that making like with like comparisons between assets and years during CP4 becomes more difficult. We also note that an interpretation of "material uncertainty" is still to be formally agreed and finalised. However, we understand that the parties have agreed in principle to the following definitions:

- for opex and maintenance efficiencies, materiality should be set at around 1% of cumulative efficiency; and
- for renewals efficiency, materiality should be set at around 5% of reported cumulative efficiency.[17]

The formal agreement and implementation of the above definitions within the finalisation of the Regulatory Accounting Guidelines (RAGS) should help support and guide the review and audit of NR's efficiency metrics in future years.

0.9 Summary of recommendations

The sections below set out the recommendations made in our report under the following four headings:

- Regulatory Accounts – Process Assurance
- Regulatory Accounts – Evidence Base
- MUC (Maintenance Unit Costs)
- CAF (Cost Analysis Framework)

[16] Points as set out in draft letter from ORR (Paul McMahon) to Network Rail (Patrick Butcher), subject "The assessment of Network Rail's efficiency in financial year 2011-12", 30th August 2011

[17] Proposed materiality values set out in the draft letter from ORR (Paul McMahon) to Network Rail (Patrick Butcher), subject "The assessment of Network Rail's efficiency in financial year 2011-12", 30th August 2011

These recommendations for the four areas summarised below are set out in full in Sections 5.2, 6.9.2, 7.5.4 and 8.8 respectively.

We highlight Section 6.9.1 a number of key recommendations made previous Arup Independent Reporter reviews during 2010, relating to Network Rail's efficiency reporting through the unit cost framework, which we consider to be of continuing relevance. We have included in this section both the response received from Network Rail in relation to the original recommendation and our updated comments in relation to the given recommendation in light of work completed as part of this mandate (AO/011).

0.9.1 Regulatory Accounts – Process Assurance

In relation to the process followed in NR's preparation of the Regulatory Accounts and supporting analysis, we recommend:

- Development of a guide setting out source data for the CEM and REEM calculation processes. This should cover issues such as the rationale for key assumptions, the connection between the various spreadsheets used, how baseline cost data are derived and adjusted, and internal controls in place to ensure data quality.
- Simplification of the spreadsheets used to calculate the CEM efficiency measure.
- Disaggregation of the renewals efficiency calculation by asset category for "non-reportable volume based" (i.e. non-volume) [18] renewal activities.
- Increasing the present level of unit cost coverage utilized for CEM purposes, through incorporation of additional asset categories.
- Improvements in the level of granularity of efficiency reporting for non-unit cost based asset categories, (i.e. categories that cannot be captured in terms of defined RUCs).

0.9.2 Regulatory Accounts – Evidence Base

In relation to the evidence base supporting NR's preparation of the Regulatory Accounts, we recommend:

- The implementation of a robust, documented procedure for the monitoring and analysis of both unit cost and volume-based efficiencies through which targets are embedded into the reporting process.
- Development of specific tests / criteria setting out minimum requirements for the provision of "bottom-up", asset specific evidence through which declared efficiencies for each asset type / RUC category are substantiated.
- Development / review of options for changing the methodology by which volume efficiency is calculated in the CEM, to enable any uncertainties

[18] Renewals activities for which volume and unit costs are not reported for efficiency calculations (as reviewed in Chapter 4 of this report).

in relation to forward-looking / CP4 volumes, associated with deferral and deviation/slippage vs. plan to be taken into account.

- Review by NR and ORR of asset policies and how they influence and shape work banks. This should help to reduce the level of uncertainty associated with the sustainability test on NR's asset policies.

0.9.3 MUC (Maintenance Unit Costs)

In relation to NR's MUCs, we recommend the following:

- Documentation should be developed to define clearly the design of the MUC source data systems and the mechanisms of how these feed the MUC calculations.
- NR should increase the proportion of maintenance expenditure captured on a unit cost basis in the CEM calculation, to encompass the full range of activities captured under the MUC unit cost framework.
- Documentation should be developed setting out in full the process through which maintenance efficiency is calculated for the purposes of the CEM / REEM.

0.9.4 CAF (Cost Analysis framework)

In relation to NR's CAF unit costs, we recommend:

- Implementation of additional checks to audit the data reported in the CAF returns. This should occur at the territory level before submission to the Central Estimating Team.
- Implementation of a process to cross check CAF returns against OP (Oracle Projects), and material variances explained to the Central Estimating Team.
- Investigation by NR of the potential use of alternative IT platforms for the CAF process to replace the current Excel system, in order to accommodate the volume of data anticipated in future years and Control Periods.

Ove Arup & Partners Ltd
27th September 2011

1 Introduction

1.1 Background and Objectives

This report presents the findings of Arup's review of key cost and efficiency information presented in Network Rail's 2010/11 Regulatory Accounts[19], in accordance with the Independent Reporter mandate AO/011: Regulatory Accounts Data Assurance. A copy of the mandate is included as Appendix G of this document.

The results of our work are presented on the basis of the three principal areas below. We present our recommendations for each area at the end of the respective report areas. As well as specifying new recommendations, we also make reference to the recommendations from our previous Independent Reporter reviews[20], taking into account progress made and key developments since the recommendations were originally presented.

Please note:

- Expenditure figures and monetary values presented in this report are in 2010-11 prices unless noted otherwise.[21]
- Unless otherwise stated, all sections of the report referring to expenditure, and all cost-related figures shown, relate to the costs incurred (and efficiency measures applied to / derived from them) during the financial year 2010/11 (1st April 2010 – 31st March 2011) only. Whilst frequent reference is made to year 2010/11 expenditure in the context of the overall Control Period, the expenditure and efficiency metrics are not analysed as a cumulative sum (i.e. taking into account 2009/10) and Arup has not had visibility of 2009/10 accounts.

Renewals Underspend and Efficiency (Chapters 2 - 6)

The first part of our report focuses on Network Rail's renewals expenditure and the calculation of associated efficiency measures.[22] These include the relevant elements of the CEM (Cost Efficiency Measure) and REEM (Real Economic Efficiency Measure) metrics.[23]

We thereby seek to address the following specific objectives, as set out in the assignment mandate:

[19] A copy of the final draft accounts is shown at Appendix A.
[20] As detailed in Arup's reports: Mandate AO/005 Audit of the Robustness of the Network Rail Unit Cost Framework, May 2010 and Mandate AO/003: Network Rail's Annual Return MUC and CAF audit 2009/10, November 2010.
[21] Please note that
[22] Please note that our audit of Renewals Underspend and Efficiency was also covered by Arup's Initial Report (covering sections of the assignment mandate for which it was indicated that an initial report was required), the latest iteration of which (v.1.1) was submitted on 8th May.
[23] The REEM was introduced in FY2010/11 by Network Rail. It is an efficiency measure based on the CEM that is intended to provide the ORR with a more helpful measure of efficiency. Efficiency inputs used to calculate the CEM are also used for the REEM. Our review/audit of the CEM in Chapters 2-6 is therefore aligned with a review of the REEM unless otherwise stated. (The specific adjustments applied to the CEM figures in order to derive the REEM figures presented in Statement 12 of the Regulatory Accounts are reviewed separately in the Chapter 9, Section 9.4 of this report).

- "review whether Network Rail's breakdown of the renewals underspend, when compared to the 2010-11 budget and CP4 delivery plan, between deferral and efficiency is reasonable, particularly given that Network Rail's asset policies have been in a state of flux";
- "identify whether Network Rail's breakdown of efficiencies between scope and unit cost is reasonable";
- "verify whether the reporting and data collection systems, procedures and processes are now set up so that the CEM[24] estimate of renewals efficiency is sufficiently accurate and reliable;"
- "verify whether the internal analysis, challenge and reporting of its renewals efficiency measure ensures that the breakdown of efficiencies between scope and unit cost is sufficiently accurate, e.g. Network Rail can adequately explain movements from the previous year."

We also take into account key findings and recommendations from Arup's previous worker reviews, in particular our previous review of the CEM measure as a means of efficiency reporting.

Chapters 2-5 focus on the information and evidence provided to us with regard to the formulation and calculation of the CEM renewals efficiency metric, including detailed analysis of volume and unit-cost based efficiency for track, signalling and civils assets, as well as the calculation of efficiencies for other asset groups.

Chapter 6 provides a review of additional information provided by Network Rail from 24th June onwards to support the reported efficiency levels on an asset-specific basis, taking into account both positive management actions driving efficiencies, and underlying sustainability from an asset management perspective of the underlying renewals activity and expenditure levels.

Unit Cost Data Quality and Confidence Grading (Chapters 7&8)

The next part of our report entails an assessment of the accuracy and reliability/integrity of CAF and MUC unit costs in accordance with the Confidence Grading system, taking into account underlying source data and systems from which the unit costs are derived. This section draws upon Arup's previous analysis and findings, taking into account progress and developments since previous reviews were carried out.

Regulatory Accounts Statement Data Review (Chapter 9)

We have undertaken a review of the figures and supporting data feeding into a number of Regulatory Accounts Statements relating to maintenance and renewals expenditure, unit cost measures, efficiency measures and volume incentives, as set out in the assignment mandate.[25]

[24] CEM = Cost Efficiency Measure: a metric used to measure efficiency by comparing year-end outturn operations, maintenance and renewals expenditure against a baseline value representative of the "pre-efficient" expenditure level.

[25] These Regulatory Accounts statements comprise the following:
- Statement 8b (parts (1) and (2) – Analysis of maintenance expenditure by MDU
- Statement 9b – Detailed analysis of renewals expenditure
- Statement 12 – Analysis of efficiency (year-on-year economic efficiency measure)

Over the course of this assignment, Arup has also been required to provide a separate letter setting out our opinion with regard to the Regulatory Accounts statements we have reviewed, which accompanies Network Rail's Regulatory Accounts submission. A copy of our opinion letter of 22nd July 2011 has been included in this chapter.

1.2 Our Approach

As per our methodology (reproduced in Appendix J) our approach to this review combines a desk-based review of Network Rail's internal documents a review of spreadsheets used for the calculation of efficiency metrics and meetings with various teams within Network Rail[26]. Findings from these exercises underpin our opinions presented in this report.

Review of Network Rail's Internal Documents

We have reviewed Network Rail's internal guidance notes and policy statements to understand Network Rail's internal planning and efficiency calculation processes. This forms the basis of our assessment as to whether Network Rail's reporting and collation of data conforms to its own established processes and allow us to form an opinion on the quality of data and metrics reported. To assess whether decisions and assumptions made in calculating the efficiency measures are reasonable, we have also requested and received internal records and documentation that Network Rail uses throughout these processes.

Review of Spreadsheet Data

We have performed detailed reviews of the spreadsheets that Network Rail uses for collating data and calculating various metrics in the Regulatory Accounts.[27] Sources of data have been traced to ensure the consistency and suitability of the source figures and formulae have been examined to allow us to form an opinion as to the reasonableness of the methodologies used. Substantiation and evidence to support figures and raw source data have been provided by Network Rail and reviewed. Relevant data and calculations provided by Network Rail are reproduced and explained throughout sections of this report.

Meetings with Network Rail

A number of meetings have been held with Network Rail's Financial Control and Asset Management teams[28], with a particular focus on renewals cost efficiencies. By meeting both the Financial Control and Asset Management teams, we are able to gain a holistic view of the interactions between the efficiency reporting process and the implementation of renewals projects in

- Statement 13 – Volume Incentives
- Statement 14 – Unit Costs
- Statement 15 – Renewals unit costs and coverage
- Statement 16 – Renewals - track unit costs and volumes
- Statement 17 – Other

[26] Appendix B provides details of meetings held to date. Appendix F provides a schedule of documents received at the time of writing.
[27] See Appendix I.
[28] See Appendix B.

different asset types. We are also able to gain insights into how checks and balances are achieved within Network Rail's organisation with regard to efficiency reporting and how well Network Rail's established processes are implemented in practice. Network Rail has been asked to evidence statements made in meetings by providing records and documentation where appropriate.

Acknowledgements

We are grateful to Network Rail staff for making themselves available to assist us with our work and their continuing co-operation in providing us with material, arranging meetings and other assistance.

1.3 Report Structure

We set out our findings in this report as follows:

- Chapters 2 – 6 present our findings resulting from our review of renewals underspend and efficiency, which entails the following:
    - Chapter 2 provides an overview of renewals underspend in the context of expenditure during CP4;
    - Chapter 3 sets out the results of our review of volume and unit cost efficiencies calculated in the CEM for track, signalling and civils assets.
    - Chapter 4 sets out the results of our review of efficiencies calculated in the CEM for "non-volume" (i.e. non-unit cost based) renewals categories.
    - Chapter 5 sets out our key findings and recommendations relating to Network Rail's reporting of renewals efficiency.
    - Chapter 6 details our review of the underlying evidence base for renewal efficiencies, based on information provided by Network Rail since 24th June.
- Chapters 7 and 8 present the results of our data quality and Confidence Grading analysis of MUC and CAF unit costs respectively.
- Chapter 9 provides our review of the relevant sections of the Regulatory Accounts Statements.
- Appendices A to P then follow (as detailed in the table of contents).

2 Overview of renewals expenditure

2.1 Comparison of renewals expenditure levels over CP4

This chapter of our report provides an overview of renewals underspend. Underspend refers to the materially lower levels of renewals expenditure incurred during FY 2010/11 compared to the expenditure levels set out in the PR08 determination.

The total year-end renewals expenditure figure presented in the 2010/11 Regulatory Accounts is £2.174 bn. This is 16.2% below the original expenditure level of £2.595 bn projected in the ORR's PR08 determination for the year, and is also lower than projected expenditure levels both in Network Rail's own 2009 Delivery Plan, and in its subsequent 2010 Delivery Plan update.

To gain a full understanding of how the renewals underspend relates to both efficiency and deferral of expenditure (explored in further detail later in this report), it is important to gain an overview of both planned and actual renewals expenditure levels for the full 5-years of the Control Period (CP4). We set out in the figure overleaf the following CP4 expenditure profiles:

- PR08 determination: target "efficient" expenditure set out by the ORR for the Control Period, together with the "pre-efficient" baseline expenditure.
- 2009 Delivery Plan: Network Rail's renewals expenditure projections, presented in response to the PR08 determination prior to the beginning of CP4.
- 2010 Delivery Plan update: Network Rail's updated projections of renewals expenditure, presented in Q1 2010 (prior to commencement of FY 2010/11).
- Actual 2010/11 and 2009/10 year-end expenditure levels: this presents the figures after year-end – as presented in the Regulatory Accounts – together with the expenditure level currently projected for 2011/12
- 2011 Delivery Plan update: we also compare further alterations to the renewals expenditure profile in Network Rail's 2011 update (produced in Q1 2011, shortly before the end of FY 2010/11).

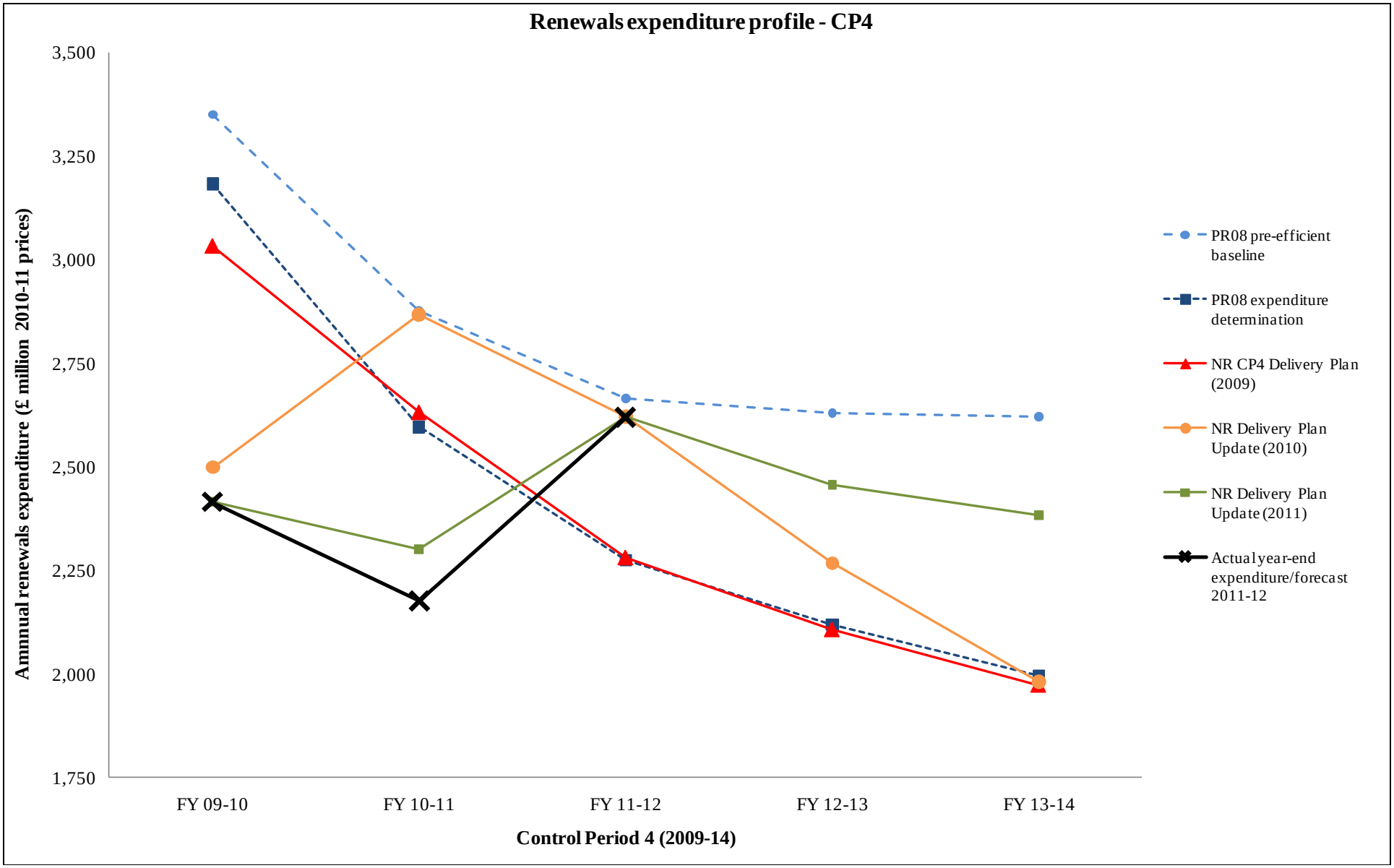

Figure 1: variations CP4 renewals expenditure profile vs. FY10/11 year-end expenditure

2.2 PR08 determination of efficient expenditure

The PR08 sets out the ORR's determination of Network Rail's total funding requirements and associated delivery of outputs for the full 5 years of CP4. The PR08 determination is based on a calculation comprising the following:

- Specified levels of renewals outputs (e.g. km of track, quantities of signalling units, etc.) to be achieved during CP4.[29] These volumes are multiplied by unit rates representative of expenditure at the end of the previous Control Period (CP3), in order to provide a total cost figure that represents the original expenditure level required for delivery of the given outputs.[30] The resulting figure (in 2010/11 prices) of £14.137 bn is seen to represent the original "pre-efficient" baseline expenditure level.
- Application of year-on-year efficiency to the pre-efficient expenditure of 5.0% for the first two years of CP4, and 5.5% for the three years thereafter. The cumulative impact of these efficiencies is a reduction by the final year end of the Control Period of 23.8% vs. baseline.[31]

We illustrate in the top row of the table below the original pre-efficient baseline, distributed across the 5-year Control Period.[32] Following application of the year-on-year efficiency percentage, the bottom row of the table shows the PR08 determination of "efficient" expenditure.

CP4 expenditure profile (2010/11 prices)	FY 09-10	FY 10-11	FY 11-12	FY 12-13	FY 13-14	CP4 Total
PR08 pre-efficient baseline	3,350	**2,875**	2,665	2,628	2,619	14,137
Year-on-year efficiency (% per year)	5.00%	**5.00%**	5.50%	5.50%	5.50%	
Year-on-year efficiency (% cumulative)	5.00%	**9.75%**	14.71%	19.40%	23.84%	
PR08 expenditure determination	3,182	**2,595**	2,273	2,118	1,995	12,163

Table 1: PR08 renewals expenditure and efficiency determination[33]

As indicated above, for FY2010/11 - the second year of the 5-year Control Period – the cumulative efficiency level of 9.75% results in a reduction from the "pre-efficient" baseline of £2.875 bn to the determination figure of £2.595 bn.

2.3 Delivery Plan expenditure projections

Network Rail's proposals for renewals outputs and associated expenditure levels, in response to the requirements set out in the PR08 determination, are set out in its Delivery

[29] Note that for some asset categories such as civils, the ORR did not explicitly set out delivery volumes in the PR08 document, only target efficient total expenditure levels.
[30] See ORR Periodic Review 2008: Chapter 5.
[31] See ORR Periodic Review 2008: Table 8.3 (p.171)
[32] The distribution of the ORR determination over the 5 years of CP4 shown in Table reflects Network Rail's phasing of expenditure, as set out in the "RFS template FY09/10" (source calculation spreadsheet: "PR08 vs dp10 for arup.xls")
[33] Source: calculation spreadsheet: "PR08 vs dp10 for arup.xls")

Plan / annual Delivery Plan Update. This forms the basis upon which renewals budgets are set each year.

Figure 1 previously illustrated variances in the CP4 expenditure profile between respective Delivery Plan. Detailed figures are presented in Table 2 below.

CP4 expenditure profile (2010/11 prices)	FY 09-10	FY 10-11	FY 11-12	FY 12-13	FY 13-14	CP4 Total
NR CP4 Delivery Plan (2009)	3,032	2,630	2,280	2,106	1,972	12,020
NR Delivery Plan Update (2010)	2,498	2,866	2,620	2,266	1,979	12,229
NR Delivery Plan Update (2011)	2,414	2,299	2,619	2,456	2,382	12,170
Actual year-end expenditure	**2,414**	**2,174**				

Table 2: Network Rail Delivery Plan and actual CP4 renewals expenditure profiles[34]

The Delivery Plan projections and subsequent year-end expenditure figures can be summarised as follows:

- **2009 Delivery Plan:** Network Rail's first Delivery Plan for CP4, produced prior to commencement of the Control Period, projected an initially higher level of expenditure steadily declining over the course of CP4.

  → **2009/10 year-end:** renewals expenditure reported at FY 09/10 year-end of £2.41 bn was more than 20% below the level projected in the 2009 Delivery Plan.

- **2010 Delivery Plan Update:** Reflecting the lower than projected expenditure level for FY 09/10, Network Rail's 2010 Delivery Plan Update contains an amended profile with increased renewals expenditure levels for FY 10/11 and FY 11/12. The FY 10/11 figure of £2.87 bn formed the basis upon which the 2010-11 budget was set.

  → **2010/11 year-end:** Year-end expenditure of £2.17 bn is once again significantly lower than the level projected in the delivery plan, by more than 24%. The difference in the 2010/11 figures between budget and year-end is explored in detail later in this report.

- **2011 Delivery Plan Update:** Reflecting the lower than projected expenditure levels for both FY 09/10 and FY 10/11, Network Rail's 2011 Delivery Plan update contains a further re-profiling of CP4 renewals expenditure, with an increase in projected expenditure levels this time for the final two years of CP4 (FY 12/13 and FY 13/14).

2.4 Reported efficiency vs. deferral

In broad terms, the reporting in the Network Rail's 2010/11 Regulatory Accounts of renewals underspend can be broken down into the following two categories:

- Efficiency: this relates to both the target 9.75% efficiency for the year as set out in the PR08 determination and additional efficiencies above and beyond ORR

[34] Source: calculation spreadsheets: "PR08 vs dp10 for arup.xls", "DP11 vs DP10.xls"

determinations. We analyse Network Rail's breakdown of efficiencies – including the proportion of expenditure for which a breakdown between volume and unit cost efficiency is provided – in Chapters 3 and 4 of this report.

- Deferrals: expenditure reductions not attributed in terms of efficiency are defined in terms of deferral. The majority of renewals deferrals are treated by Network Rail as intra-Control Period deferrals, i.e. expenditure incurred later within the Control Period (up to 2014), as reflected in the alterations to the Delivery Plan expenditure profiles. Only a small amount of expenditure (£69m) is deferred in the accounts beyond CP4. A review of renewals deferrals is included in Sections 3.3.4, 3.4.4, 3.5.4 and 4.4.

3 Renewals volume and unit cost efficiency review (track, signalling & civils assets)

3.1 Introduction and overview of CEM efficiency measure

This section of the report contains our detailed review of the breakdown of renewals volume and unit cost efficiency feeding into the CEM efficiency measure.

The CEM compares outturn expenditure for renewals (as well as operations and maintenance activities) against a baseline value representative of the "pre-efficient" expenditure level for the individual year. Although the CEM itself is not presented in the Regulatory Accounts, it forms the basis upon which the REEM efficiency metric presented in Statement 12 of the Regulatory Accounts is calculated.[35]

The CEM also entails a measurement of unit cost and volume efficiency presented in the CEM "Heat Map"[36], which is utilised by Network Rail both for internal reporting purposes, and for the reporting of efficiency within its Quarterly Monitoring submissions to the ORR.

We set out in the table below the 2009/10 CEM renewals expenditure figures for each asset category, which result in a total calculated renewals efficiency of 15.9%.

Renewals category	CEM year-end renewals costs (£k) (FY10/11)	CEM baseline renewals cost (£k)	% efficiency
Track - volume-based	553,759	717,372	22.8%
Signalling - volume-based	134,855	170,266	20.8%
Civils - volume-based	247,112	276,589	10.7%
Non volume based	1,237,679	1,418,896	12.8%
Total	**2,173,405**	**2,583,122**	**15.9%**

Table 3: FY10/11 year-end vs. baseline renewals expenditure (CEM)[37]

As shown above, the CEM efficiency calculation is a simple comparison of year-end versus baseline expenditure. The numbers presented mean that Network Rail is declaring that its renewals activities for 2010/11 were 15.9% more efficient when compared to a range of baselines.

The baseline figures constitute "pre-efficient" expenditure levels, representing the final year of the previous Control Period (CP3) prior to the application of year-on-year efficiency percentages specified in the PR08 (see Section 2.2).

[35] A number of baseline adjustments are applied to the CEM in order to derive the REEM efficiency measure reported in Statement 12 of the Regulatory Accounts.
[36] See Appendix D.
[37] Source: calculation spreadsheets: "MasterTemplateRenP11 BP P13 1011 REEM.xls" (track, signalling, civils costs), "MasterTemplateRenP13.xls" (other cost categories)

The levels of efficiencies vary between asset categories. We review the underlying efficiency calculations, including the method by which baseline figures are calculated and vary, in further detail, differentiating between the asset categories on the following basis:

- Track, Signalling and Civils renewals costs are partially captured as renewals unit costs (RUCs); this enables a significant proportion of overall efficiency savings to be broken down and attributed to volume and unit cost efficiencies. We review efficiency calculations for these asset groups in detail in this Chapter.
- For other remaining renewals categories efficiency is simply the percentage variance in year-end costs versus baseline. We review the efficiency calculations for these asset categories in Chapter 4 of this report.

3.2 CEM volume and unit cost efficiency calculation

3.2.1 Definition of renewals unit costs (RUCs) utilised for CEM efficiency calculation

It is important at this point to differentiate between the RUCs (Renewals Unit Costs) utilised for CEM/REEM efficiency calculations, and renewals-based unit costs recorded for cost estimating purposes through the CAF reporting process.

The following illustration shows at a very high level the difference between RUCs which support the calculation of the CEM / REEM efficiency measures presented in the Regulatory Accounts, and CAF unit costs.

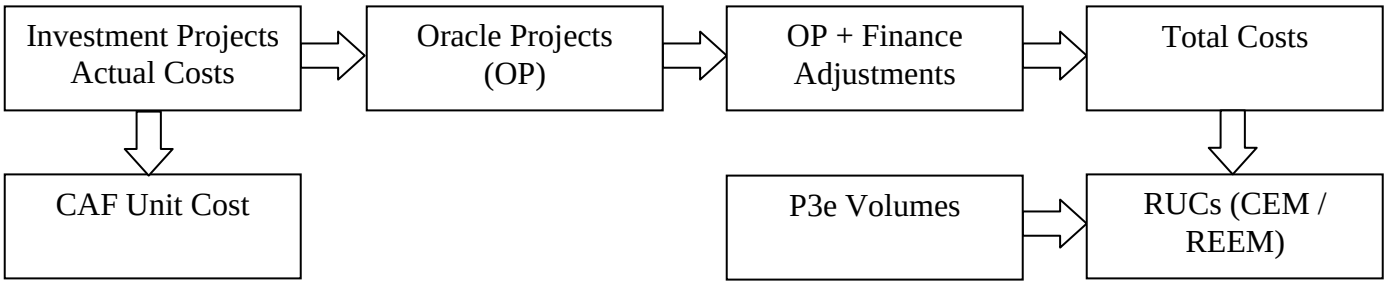

Figure 2: RUC and CAF renewals unit cost process

CAF unit costs are calculated at an individual project level, and are used to inform the future benchmarking and modelling of unit costs for similar activities in Network Rail. The CAF unit costs for a given project are generated at GRIP Stage 7 by the project team using the records of actual costs (managed using Oracle Projects) and the volume delivered.

In contrast, the RUC values utilised for CEM/REEM efficiency calculations are calculated centrally on a top-down basis. Total costs derived from Oracle Projects by

asset category are divided by the volumes recorded in P3e in order to obtain the RUC for each of the RWIs utilised in the CEM/REEM volume and unit cost basis.

The RUC therefore represents the full cost of the work undertaken taking into account costs that may not be accounted for at project level.[38] However, the RUC is the product of an aggregated calculation based on total values taken at the macro-level, and therefore cannot be considered a bottom-up unit cost in the same way as the CAF, which is originated at the project level.

Variations between RUC and CAF values for a given Repeatable Work Item (RWI) may be positive or negative, depending on differences between the RUC figures based on total expenditure and volume for a given year, and the CAF figures based on projects spanning a number of years.[39]

We detail our findings with respect to the RUCs and Network Rail's reported efficiency levels in the remainder of this chapter. Our findings with regard to the reliability and accuracy of CAF unit costs are set out in Chapter 8.

3.2.2 RUC unit cost coverage for efficiency calculation

The proportions of expenditure within the respective asset categories captured on a unit cost basis through the RUC calculations are set out in Table ***4*** below.

Renewals category	CEM year-end renewals costs (£k) (FY10/11)	Volume-based expenditure – total value (£k)	RUC coverage (%total expenditure)
Track	604,628	553,759	91.6%
Signalling	373,135	134,855	36.1%
Civils	355,916	247,112	69.4%
Other renewals categories	839,726	-	0.0%
Total	**2,173,405**	**935,725**	**43.1%**

Table 4 : Unit cost coverage as proportion of total renewals expenditure (CEM)[40]

As indicated above, in terms of total renewals expenditure across all asset categories, the RUC unit cost-based calculations represent 43.1% of costs.

We note that unit costs have also been defined for a number of other areas of renewals expenditure under the CAF unit cost framework(see Chapter 8) that are not presently

[38] In our previous audits a typical item not included in the CAF unit cost but captured in the REEM unit cost would include "depot threshold payments" or other indirect costs attributable to the asset and work undertaken – see for example Mandate AO/005 Audit of the Robustness of the Network Rail Unit Cost Framework, May 2010.
[39] We note the total expenditure and volume values, from which RUCs are derived, vary between asset categories in terms of both year-end and baseline figures. This is explored further in the remainder of this chapter. (We note that for civils renewals the baseline RUC unit cost values are equal to the CAF unit cost values; due to both sets of figures being derived from the same 2008/09 total expenditure and volume figures from 2008/09 – see Section 3.5.5).
[40] Source: calculation spreadsheets: "MasterTemplateRenP11 BP P13 1011 REEM.xls"

included in the RUC calculations utilised for the CEM. This includes the following CAF unit costs that are included in Statement 15 of the Regulatory Accounts:

- Signalling unit costs: a total of 5 × Repeatable Work Items are listed in Statement 15, accounting for a total of £219.5m of expenditure – 60% of total signalling renewals cost. However, as indicated in Table 4, RUC unit costs feeding into the CEM account for only £134.9m (36.1%) of signalling costs.
- Telecoms unit costs: CAF unit costs listed in Statement 15 account for £11.8m (36.4% of total telecoms expenditure). These unit costs are not included as RUCs within the CEM volume and unit cost efficiency calculations.

3.2.3 Total unit cost and volume efficiency calculations

We set out in the table below the volume and unit cost efficiencies derived from track, signalling and civils categories as presented in the CEM "Heat Map"[41], and compare these to the overall CEM efficiency across all asset categories.

Renewals category	Volume efficiency (% volume-based cost)	Unit cost efficiency (% volume-based cost)	Total efficiency (% total cost)
Track, signalling & civils volume-based efficiencies			
Track volume-based	16.0%	6.8%	22.8%
Signalling volume-based	0.5%	20.3%	20.8%
Civils volume-based	0.0%	10.7%	10.7%
Sub-total: volume-based	**9.9%**	**9.7%**	**19.6%**
Other categories (non-volume)			12.8%
Total variance (all categories) (% CAF-able)			**15.9%**

Table 5: renewals unit cost and volume efficiencies in CEM[42]

As shown in the table, the CEM efficiency calculation presents total volume and unit cost efficiencies of 12.7% and 8.6% respectively. However, these percentages are calculated only on the basis of the 43.1% of total expenditure captured in unit cost terms through the RUC calculations, whereas the total efficiency percentage of 15.9% is based on expenditure across for all asset categories. Therefore they cannot be compared or counted on the same basis.[43]

[41] See Appendix D.
[42] Source: calculation spreadsheet: "MasterTemplateRenP11 BP P13 1011 REEM.xls"
[43] The focus of this audit volume and unit cost efficiency measure but a review of the CEM was undertaken by Arup and was the subject of a previous report: Audit of the Robustness of the Network Rail Unit Cost Framework, May 2010.

3.3 Track assets

3.3.1 Volume based renewals efficiency calculation

Track renewals costs represent a significant proportion of costs feeding into Network Rail's efficiency calculations, with FY10/11 costs of £604.6m accounting for 27.8% of total renewals expenditure.

To enable track renewals costs to be analysed through on a unit cost basis, unit cost and volume data are periodically rolled up and recorded in RUC terms under the following two RWIs:

- Plain-line renewal (unit of measurement: composite km)
- Switches and crossings (S&C) renewal (unit of measurement: no. of units)

Of the £604.6m of total track renewals expenditure, 92% (£553.8m) is captured in these two RWIs.

We summarise in Table 6 below the breakdown of volume-based track renewals costs and the associated efficiency calculations.

Track renewals - year-end cost	CEM baseline 10/11 (£m)	Year-end FY10/11 (£m)	Attributed variance (£m)	% Attributed variance
Plain Line renewal	484.6	405.9	-78.7	-16.2%
S&C Renewal	232.7	147.9	-84.8	-36.5%
Sub-total – RUC-based costs	717.3	553.8	-163.6	**-22.8%**

Table 6: Track volume-based renewals efficiencies[44]

As shown in the table above, overall track renewals efficiency for the FY10/11 CEM was calculated at 21.0%, with a cost saving of 22.8% (£163.6 m) for plain line and S&C renewals captured as unit costs.

3.3.2 Breakdown of efficiency into volume and unit cost

We set out in the table overleaf a breakdown of the volume and unit cost efficiency calculation for the two unit cost categories (Plain Line, S&C).

[44] Source: calculation spreadsheet "Details of CEM calcs.xls"

2010/11 Regulatory Accounts	A: Volume	B: Unit cost	C: Total	Remarks
Plain Line				
1: Baseline	1,804 km	£ 268.6 k/km	£ 484.7 m	C = A × B
2: Year-end	1,557 km	£ 260.7 k/km	£ 405.9 m	C = A × B
3: Efficiency amount (allocated)	£ 66.38 m[1)]	£ 12.41 m[2)]	£ 78.80 m	C = A + B
4: Efficiency percentage	**13.7%[3)]**	**2.6%[4)]**	**16.3%**	C = A + B
S&C				
1: Baseline	438 units	£ 530.8 k/unit	£ 232.7 m	C = A × B
2: Year-end	347 units	£ 425.9 k/unit	£ 147.9 m	C = A × B
3: Efficiency amount (allocated)	£ 48.4 m[1)]	£ 36.4 m[2)]	£ 84.8 m	C = A + B
4: Efficiency percentage	**20.8%[3)]**	**15.6%[3)]**	**36.5%**	C = A + B

Table 7: breakdown of volume and unit cost efficiency: track assets[45]

Notes:
1) Volume efficiency amount (allocated) = (A1 – A2) × B1
2) Unit cost efficiency amount (allocated) = (B1 – B2) × A2
3) Volume efficiency percentage = A3/C1 × 100%
4) Unit cost efficiency percentage = B3/C1 × 100%

The results set out above indicate that volume and unit cost efficiencies have been achieved for both Plain Line and S&C renewals.

To gain an overview of the process by which volume and unit cost efficiencies for track assets are calculated for the CEM, it is also necessary to compare the above year-end efficiency calculations to the original efficiency levels projected in the budget (prior to commencement of the Financial Year). We set out these figures in Table 8 below.

2010/11 Budget	A: Volume	B: Unit cost	C: Total	Remarks
Plain Line				
1: Baseline	2,181 km	£ 268.6 k/km	£ 586.0 m	C = A × B
2: Year-end	1,883 km	£ 251.9 k/km	£ 474.4 m	C = A × B
3: Efficiency amount	£ 80.2 m[1)]	£ 31.5 m[2)]	£ 111.6 m	C = A + B
4: Efficiency percentage	**13.7%[3)]**	**5.4%[4)]**	**19.0%**	C = A + B
S&C				
1: Baseline	433 units	£ 530.8 k/unit	£ 230.0 m	C = A × B
2: Year-end	343 units	£ 503.8 k/unit	£ 172.8 m	C = A × B
3: Efficiency amount	£ 48.0 m[1)]	£ 9.2 m[2)]	£ 57.2 m	C = A + B
4: Efficiency percentage	**20.8%[3)]**	**4.0%[4)]**	**24.9%**	C = A + B

Table 8: budget projection of volume and unit cost efficiency: track assets

[45] We note that the track unit cost figures presented in Statement 17 of the Regulatory Accounts are based on the same calculation, but have been rounded down to the nearest thousand, resulting in slightly lower indicative unit cost figures for Plain Line (£260/km) and S&C (£425/item) compared to those shown .

Notes:
1) Volume efficiency amount (allocated) = (A1 – A2) × B1
2) Unit cost efficiency amount (allocated) = (B1 – B2) × A2
3) Volume efficiency percentage = A3/C1 × 100%
4) Unit cost efficiency percentage = B3/C1 × 100%

When comparing year-end figures to the budget figures set out above, it can be seen that total year-end expenditure is significantly lower than the budget expenditure for both RUC categories. This follows the general pattern across all renewals activities.

Lower volumes of activity have been reported at year-end for both categories. The year-end volume efficiency percentages of 13.7% for plain line and 20.8% for S&C are exactly the same as the budget figures. We explore the volume efficiency calculation in further detail below.

3.3.3 Calculation of volume efficiency

The 2010/11 track renewal volumes reported at year-end are based on total volumes delivered by NR's IMT teams recorded through the Primavera P3e system, plus volumes of track renewal delivered by NR's maintenance division which are recorded separately.

As set out in Table 7 above, the determination of the volume efficiency figure is based on the volume saving (units of activity) vs. a baseline value, multiplied by unit cost. The resulting percentage cost variance is measured in percentage terms against the total baseline expenditure, and factored into the volume efficiency figure displayed on the CEM "heat map". The 2010/11 baseline volume is calculated on the basis of the relative value in percentage terms of the 5-year delivery volume within Network Rail's 2010 Delivery Plan Update against the 5-year assessed volume published on the PR08 Determination. The calculation applied to track renewals is set out in Table 9 below.

Track renewals – establishing volume baseline	PR08 CP4 Assessed volume (5Y)	Delivery Plan update 2010 (5Y)	% Delivery Plan reduction vs. PR08
Plain Line renewal volume (km)	10,956	9,456	**-13.7%**
S&C Renewal volume (units)	2,249	1,781	**-20.8%**

Table 9: Baseline volumes for track renewals[46]

The percentage volume reductions indicated in Table 9 are set for individual business planning year (FY10/11) in order that deviations in year-end delivered volumes compared to Delivery Plan update 2010 do not alter the pre-determined volume efficiency percentage. This means that, set against the 2010/11 year-end volumes, the 2010/11 baseline volumes are "fixed" on the following basis:

- **Plain Line:** year-end post-efficient volume 1,557km, post application the 13.7% volume efficiency, results in a baseline volume of 1,804km.

[46] Sources: ORR Periodic Review 2008, NR 2010 Delivery Plan Update.

- **S&C:** year-end post-efficient volume 347 units, post application the 20.8% volume efficiency, results in a baseline volume of 438 units.

The above volume efficiencies account for the majority of cost savings calculated for both of the track unit cost categories (see Table 8). Although actual year-end Plain Line volumes are 17.3% below Delivery Plan update 2010 level, and S&C volumes 1.2% above at year-end, the baseline amount has been reduced / increased by exactly the same proportion for both categories. This means in-year volume alterations are 'adjusted out' of the CEM efficiency calculation. In effect, the Delivery Plan update 2010 volume efficiency remains valid at year-end irrespective of changes in year-end volumes delivered over the course of the year.

3.3.4 Deferral of track renewals expenditure

For Plain Line track renewals, the significantly lower delivery volume at year-end compared to budget has resulted in the deferral of volumes into future years. Network Rail is however projecting that the shortfall will be fully recovered prior to the end of the Control Period. We illustrate the alterations in the overall Plain Line volume profile between the respective Delivery Plans (as well as the actual year-end volumes) in overleaf.

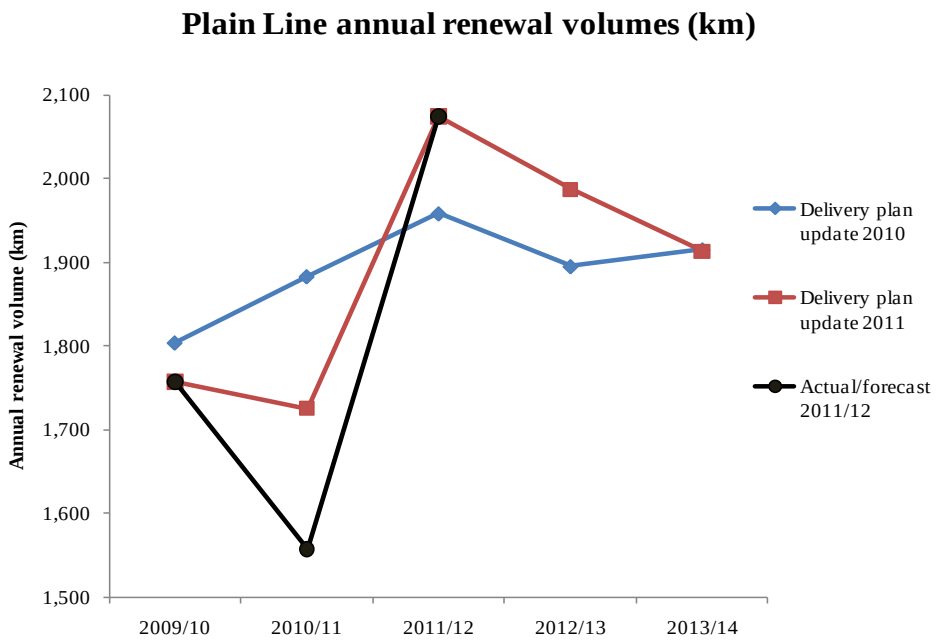

Figure 3: plain line annual renewal volumes (km)

As shown above, significantly higher levels of activity will be required in order that the full CP4 volume of 9,456km is still delivered. Plain Line volumes for FY11/12 projected in the updated Delivery Plan total 2,074km - 33% higher than the FY10/11 volume of 1,557km.

In contrast, the delivery volume projections for S&C (not shown) show very minor variations between the figures in the respective Delivery Plan updates. Furthermore, there is a lower level of variability in the S&C renewal profile between the respective years of the Control Period.

3.3.5 Calculation of unit cost efficiency

The calculation of unit cost efficiency for track renewals which feeds into the CEM efficiency "heat map" is based on the RUC differential (year-end vs. baseline) multiplied by the year-end renewals volume.

Unlike the volume efficiency calculation, the baseline value for year-end RUC calculation is unchanged compared to the figure projected in the budget prior to FY10/11 commencement.

The baseline RUC value is calculated by dividing baseline total expenditure by baseline volume.

The year-end RUC value is simply the total year-end expenditure for the given cost category divided by the total volume.[47]

As previously shown in Table ***5***, overall unit cost efficiency across the two RUC categories is calculated at 6.8%. This compares favourably to the budgeted efficiency of 5.0%, although the levels of unit cost efficiency vary between the two categories. For plain line track, the year-end efficiency of 2.6% is smaller than the budget projection of 5.4%, whilst for S&C the year-end unit cost efficiency of 15.6% is about four times more than the budgeted figure of 4%.

Network Rail has indicated that there is likely to be significant variability in track renewals unit cost levels over the course of a given year, due to variations in "work mix" (the combination of activities of different scope and breath that are captured under the two unit cost categories). –For example, six different types of track renewal activity are rolled-up into the single RUC category "Plain Line" renewals[48]. Aggregation of unit costs on this basis means there is a lack of visibility of how the underlying collection of activities and associated costs is driving movements in the high-level unit cost measure.

Notwithstanding the extent to which unit cost levels may show variability, the extent of variation between year-end and projected unit cost levels – alongside the significantly lower volumes discussed earlier – indicate that track renewals activities actually carried out during FY10/11 were significantly different both in nature and scope to what was projected in Delivery Plan update 2010.

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[47] Note: unit costs and volumes for track assets are recorded on a bottom-up basis through the Monthly Business Report (MBR) process, based on the track renewals programme planning through the Primavera system; however, the unit cost definitions used are different from the CAF, with 5 x specific cost categories for plain line renewal (which for the purposes of the CAF measure are rolled-up into the single "Plain Line" RWI). The full list of unit cost sub-categories feeding into the track CAF figures are reported in Part C of Statement 16 of the Regulatory Accounts.

[48] The six sub-categories of plain line renewal activity types are:
Cat 2 – Rerail both rails, Cat 4 – Rerail, resleeper (steel), Cat 10 – Rerail, resleeper, reballast (ABS method), Cat 11 – Rerail, resleeper, reballast (Traxcavate method), Cat 14 – Rerail, resleeper, reballast formation (traxcavate) and Other.

3.3.6 Arup assessment

Of the £604.6m of total track renewals expenditure, 92% (£553.8m) is captured in RUC terms for CEM efficiency reporting purposes, under the following two CAF RWIs:

- Plain-line renewal (unit of measurement: composite km)
- S&C renewal (unit of measurement: no. of units)

A total cost efficiency of 22.8% (£163.6 m) has been calculated for plain line and S&C renewals. This is split down into a volume efficiency of 16.0% and a unit cost efficiency of 6.8%.

Volume efficiency calculations for Plain Line and S&C renewals of 13.7% and 20.8% respectively (16.0% overall) are based on the following:

- Application of a pre-determined efficiency percentage that represents the reduction in CP4 (5-year) volumes in the 2010 Delivery Plan update vs. the PR08 baseline volumes, as projected in the budget figures.
- Re-baselining of year-end volumes ensures that the pre-determined volume efficiency percentages (i.e. the 13.7% / 20.8% figures for the two categories) are still achieved; this is in spite of significantly lower volumes of Plain Line renewals delivered compared to the budget figures (whilst S&C volumes are slightly higher).
- The rebaselining process means in-year volume alterations are adjusted out of the CEM efficiency calculation. In effect, the Delivery Plan update 2010 volume efficiency remains valid at year end irrespective of changes in year-end volumes delivered over the course of the year.
- Virtually all (99%) of budgeted Plain Line volume that was not delivered during FY10/11 is deferred until later in CP4 (up to FY13/14) – leaving overall projected Plain Line volumes for the full 5-year Control period unchanged. This will require significantly higher volumes to be delivered for the next three years. This includes almost doubling the track renewal volume of high criticality "Category 1" track.

The unit cost efficiency figures show a significant level of variability when comparing budget projections with the actual year-end figures. Plain line unit cost efficiency of 2.6% at year end was less than half the efficiency level projected in the budget, whilst the S&C unit cost efficiency of 15.2% was almost four times greater. This indicates that track renewals activities actually carried out during FY10/11 were significantly different both in nature and scope to what was projected in Delivery Plan update 2010.

The top-down calculations of unit cost and volume efficiency described above entail a number of inherent assumptions about the "efficient" nature of expenditure incurred – in particular, that the pre-determined level of volume efficiency has necessarily been complied with, in spite of the deferral of a significant volume of Plain Line renewals. We consider that the efficiency assumptions require further analysis from a "bottom-up" basis, to assess the extent to which an underlying evidence base is in place to support the efficiency declarations being made. The nature of the efficiency assumptions are explored further in Chapter 5, and the "bottom-up" supporting evidence is reviewed in Chapter 6.

3.4 Renewals efficiency review – Signalling Assets

3.4.1 Total signalling renewals efficiency calculation

Total FY10/11 cost for signalling renewals has been calculated at £373.1m at year-end, which represents 17.2% of overall renewals expenditure across all asset groups.

36.1% (£134.9m) of signalling renewals costs was recorded in RUC terms, using the single defined RWI "101 – Re-Signalling", for which the unit of measure is a Signalling Equivalent Unit (SEU). This RUC relates to conventional re-signalling projects only (accounting for 36.1% of total signalling renewals expenditure) and excludes ERTMS.[49]

Although a number of other RWIs have been defined under the CAF framework for activities that included in Statement 15 of the Regulatory Accounts, these are not included within the CEM efficiency calculation.[50] Network Rail has indicated that this is due to significant changes in the nature of projects and associated definitions for the respective activities between the baseline year and FY 2010/11 year-end, limiting the meaningfulness of unit-cost based comparisons for such activities.

We reviewed the signalling renewals efficiency calculation in our Initial Draft Report (completed on 9th May 2011). Network Rail has since provided an amended signalling volume and unit cost efficiency calculation, based on different baseline and year-end volume values (see Section 3.4.3 below).

We summarise in Table 10 below the revised total efficiency calculation for volume-based signalling renewals.

Signalling renewals - year-end reportable volume cost	CEM Baseline (£m)	Year-end (FY 10/11) (£m)	Attributed variance (£m)	% Attributed variance
Conventional re-signalling	170.3	134.9	35.4	**-20.8**%

Table 10: Signalling volume renewals cost efficiency calculation[51]

3.4.2 Breakdown of efficiency into volume and unit cost

The breakdown of 20.8% (£35.4m) efficiency for re-signalling into volume and unit cost efficiencies follows a similar process as for track renewals. As shown in Table 11 below, 2010/11 figures for conventional re-signalling indicate that both volume and unit cost efficiencies have been achieved.

[49] This differs from the CAF unit cost definition "101 Re-Signalling", as reviewed in Chapter 8 of this report, which uses a wider definition that includes ERTMS (see Statement 16 of the Reg Accounts).
[50] CAF unit costs relating to signalling renewals, set out in Statement 15 of the Regulatory Accounts, account for £209.7m (56.2% of total CEM resignalling expenditure), captured under six unit cost categories (see Section 9.7).. This compares to the singe RUC unit cost calculation utilised for CEM/REEM which accounts for only £134.9m
[51] Source: calculation spreadsheet "Details of CEM calcs.xls"

2010/11 Regulatory Accounts	A: Volume	B: Unit cost	C: Total	Remarks
Conventional re-signalling				
1: Baseline	703 SEUs	£ 242.1 k/SEU	**£ 170.3 m**	C = A × B
2: Year-end	700 SEUs	£ 192.7 k/SEU	**£ 134.9 m**	C = A × B
3: Efficiency amount (allocated)	£ 0.8 m	£ 34.6 m	**£ 35.4 m**	C = A + B
4: Efficiency percentage	0.5%	20.3%	**20.8%**	C = A + B

Table 11: breakdown of volume and unit cost efficiency: signalling assets[52]

Notes:
1) Volume efficiency amount (allocated) = (A1 – A2) × B1
2) Unit cost efficiency amount (allocated) = (B1 – B2) × A2
3) Volume efficiency percentage = A3/C1 × 100%
4) Unit cost efficiency percentage = B3/C1 × 100%

As a means of comparison, we set out the projected volume and unit cost efficiency levels projected in the budget (prior to commencement of the Financial Year) in Table 12 overleaf.

2010/11 Budget	A: Volume	B: Unit cost	C: Total	Remarks
Conventional re-signalling				
1: Baseline	851.7 SEUs	£ 242.1 k/SEU	£ 206.2 m	C = A × B
2: Year-end	812.0 SEUs	£ 210.2 k/SEU	£ 170.7 m	C = A × B
3: Efficiency amount (allocated)	£ 9.6 m[1)]	£ 25.9 m[2)]	£ 35.5 m	C = A + B
4: Efficiency percentage	**4.7%**[3)]	**12.6%**[4)]	**17.2%**	C = A + B

Table 12: budget projection of volume and unit cost efficiency: signalling assets[53]

Notes:
1) Volume efficiency amount (allocated) = (A1 – A2) × B1
2) Unit cost efficiency amount (allocated) = (B1 – B2) × A2
3) Volume efficiency percentage = A3/C1 × 100%
4) Unit cost efficiency percentage = B3/C1 × 100%

When comparing year-end actuals in Table 11 vs. the budget figures set out in Table 12 it can be seen that year-end actual volumes are significantly lower than projected in the budget (which also contributes to significantly lower total year-end expenditure).

However, the year-end volume efficiency of 0.5% is different to the 4.7% efficiency level projected in the budget. We explore this breakdown further in the next section.

3.4.3 Calculation of volume efficiency

2010/11 reported volume

The 2010/11 year-end reported volume for conventional re-signalling 700 SEUs. Network Rail has indicated that the 700 SEUs are representative of the spread of CP4 activity (including work in progress), rather than a count of SEUs undertaken at project completion. However, these figures do not reconcile with volumes provided in any other dataset provided by Network Rail. The figure of 700 SEUs differs significantly both from

[52] Source: calculation spreadsheets "Details of CEM calcs.xls", "P13-11 CEM Signalling.xls"
[53] Source: calculation spreadsheet "P13-11 CEM Signalling.xls"

the 2011 Delivery Plan update forecast volume for "Conventional" re-signalling of 963 SEUs, as well as the 812 SEUs that were projected in the budget prior to commencement of FY10/11 (see Table 12).

CP4 pre-efficient vs. post-efficiency volumes

The volume efficiency amount for signalling equals the volume reduction (year-end vs. baseline), multiplied by unit cost. As indicated in Table 11, £0.8 m of cost savings are attributed to volume efficiency on this basis (0.5% of conventional re-signalling expenditure).

Calculation of the 2010/11 baseline volume is based on the principle of applying a pre-determined efficiency percentage, representing an efficient reduction in forecast CP4 (5-year) volumes. However, the derivation of volume figures for re-signalling differs from the track volume efficiency calculation – both in relation to the year-end reported volume and the baseline value.

CEM numbers provided to us for our initial report (9th May 2011) entailed a signalling volume efficiency calculation based on the post-efficient CP4 projection in the DPU10 (5,328 SEUs) vs. the 2008 SBPu volume (5,578 SEUs) as the baseline. This resulted in an original volume efficiency calculation of 4.7% (see our Initial Report, Section 4.1.2);

On 24th June 2011 Network Rail provided an updated volume efficiency calculation with revised baseline and year-end values. The revised "post-efficient" CP4 volume projection is now 5,384 SEUs. NR explained to us that this figure relates to the revised CP4 projection set out in the 2011 Delivery Plan update (which indicates a total CP4 conventional re-signalling volume of 6,522 SEUs), but with a quantity of activity relating to "accelerated renewals" discounted from the SEU count, as this is considered to represent activities not comparable with the remaining scope of conventional re-signalling, to which the volume efficiency calculation relates.[54] We were however unable to reconcile the "discounted" CP4 volume of 4,994 presented in the spreadsheet with the reported figure of 5,384.

The revised CP4 projection of 5,384 SEUs is compared to a baseline volume of 5,409 SEUs, which represents the revised year-end volume prior to application of a volume efficiency of 25 SEUs.

We set out the revised CP4 signalling volume efficiency calculation in Table 13 below.

Signalling renewals - establishing volume baseline	Revised pre-efficient CP4 volume baseline (5Y)	Revised CP4 volume projection (DPU 2011) (5Y)	Efficiency figure (DP 2011 vs. revised volume baseline)
Conventional re-signalling (SEUs)	5,409	5,384	**0.5%**

Table 13: Signalling renewals volume efficiency calculation[55]

[54] The amended CP4 re-signalling volume of 4,994 SEUs, with "accelerated renewals" discounted from the total, was presented in the spreadsheet "Revised signalling volumes April 2011.xlsx"
[55] Calculation spreadsheet "Signalling vols cp4 summaryv2.xls"

To support this calculation, NR provided a spreadsheet illustrating scope efficiencies relating to three re-signalling projects – from which the total volume reduction of 25 SEUs (equalling 0.5% total volume) is derived.

For the 2010/11 CEM calculation, an efficiency of 0.5% is applied to the 2010/11 year-end volume figure. As illustrated in Table 11 in the previous section, applying this to the in-year reported volume of 700 x SEUs, results in a volume baseline of 703 SEUs, yielding a reported volume efficiency of £0.8m.

3.4.4 Deferral of signalling renewals expenditure

The signalling renewal volume not delivered at FY10/11 year-end has been deferred in its entirety until later in the Control Period.

In terms of deferral beyond the end of the Control Period, the £54m of signalling expenditure projected in the 2010 Delivery Plan for deferral into CP5 remains unchanged in the updated 2011 Delivery Plan. We understand that the ORR has mandated Network Rail to deliver the full CP4 conventional re-signalling volume set out in the 2010 Delivery Plan by the end of CP4. Based on the information provided, is not clear what the projected deferral amount beyond CP4 (£54m) relates to.

When comparing conventional re-signalling volumes over the full 5-year Control Period between successive Delivery Plans, the volume profile shows some fluctuation. As illustrated in below, higher overall delivery volumes are projected in the latest Delivery Plan update for the remainder of the Control Period, compensating for lower volumes in earlier years of CP4.

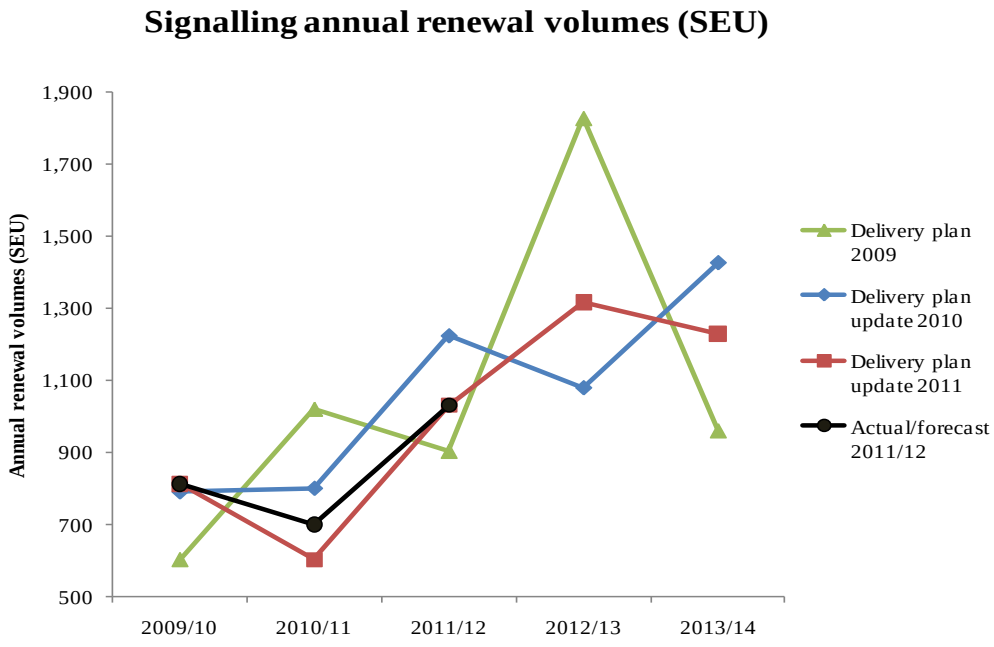

Figure 4: annual conventional re-signalling renewal volumes over CP4

3.4.5 Calculation of unit cost efficiency

The calculation of unit cost efficiency for signalling renewals follows exactly the same process as for track renewals. Both the budget and the year-end RUC value are calculated by dividing the budget or year-end expenditure totals by the respective volume figures in order to derive the unit cost value.

The efficiency is then based on the unit cost differential (year-end vs. baseline) multiplied by the year-end renewals volume. Unlike the volume efficiency calculation, the baseline RUC value set out in the budget – £242k per SEU – has not been subject to re-baselining / alteration at year-end.

As indicated in Table 11, for conventional re-signalling a unit cost efficiency of 20.3% (c. £49,400 per SEU) was achieved - significantly higher than the 12.6% projected in the budget.

3.4.6 Arup assessment

Of the £373.1m of total signalling renewals expenditure, 36% (£134.9m) is captured in RUC terms for CEM efficiency reporting purposes, under the defined RWI "101 – Re-Signalling", for which the unit of measure is a Signalling Equivalent Unit (SEU).

The process by which unit cost efficiency is calculated for signalling assets follows the same top-down approach applied to track assets. Volume efficiency calculation is once again based on a pre-determined efficiency percentage, although this has been altered in the figures provided to Arup on 24th June 2011 from the calculation previously provided and reviewed. The basis on which the baseline amount is adjusted for conventional re-signalling volume efficiency calculations is not consistent to that for the plain line and S&C track assets volume efficiency calculations. The final volume efficiency percentage for conventional re-signalling has been calculated at 0.5% (compared to 4.7% as calculated by NR previously).

Given the uncertainties outlined above, we consider that further clarification is required from NR in regard to the revised baseline volumes.

The total year-end conventional re-signalling volume of 700 SEUs is significantly below the 812 SEUs forecast in the budget figures. Once again, the re-baselining of the year-end volume means that although 112 (13.8%) fewer SEUs were delivered than projected in the budgeted, the 0.5% volume efficiency mentioned above is still achieved. It is assumed that all 112 SEUs will be delivered later in the Control Period (i.e. the £54m of expenditure already deferred until CP5 has not been affected by this variation).

Unit cost efficiencies show a 20.3% efficiency – which equates to c. £49,400 per SEU. This is significantly higher than the 12.6% efficiency projected in the budget.

The top-down calculations of unit cost and volume efficiency for signalling renewals described above entail assumptions similar to those for track renewals about the efficient nature of expenditure incurred. We note, in particular, that year-end unit cost efficiencies were at a significantly higher level than projected in the budget, and that successive versions of the Delivery Plan have shown significant fluctuations in the overall volume profile. This is in spite of the long-term and relatively stable nature of the signalling renewals workbank. Therefore we consider once again further analysis from a "bottom-

up" basis is required, to assess the extent to which an underlying evidence base is in place to support the efficiency declarations being made. We explore this further in Chapters 5 and 6.

3.5 Renewals efficiency review – Civils assets

3.5.1 Civils volume based renewals efficiency calculation

Civils volume based renewals costs accounted for £247.1m of expenditure at FY10/11 year end, which represents 69% of total civils renewals costs and 11% of total renewals costs.

We set out in Table 14 below the updated breakdown of civils expenditure for each RUC category provided by Network Rail on 24th June 2011[56], together with the associated calculation of percentage efficiency. We note that these figures (both baseline and year-end) have been altered since our initial draft report (8th May 2011) was completed.

We understand that year-end expenditure figures below are based on total costs (captured through the general ledger) plus a 4% provision for project management costs. The baseline expenditure values are based on total year-end expenditure levels for 2008-09 (also adjusted upwards by 4% to account for project management costs).

As indicated below, when measured against the baseline value, total year-end efficiency for RUC items is now calculated at 10.7%.

Civils Renewals – Year end	Baseline (£m)	Year-end actual (£m)	Variance (£m)	% variance
Overbridges	22.8	20.1	-2.7	-11.97%
Underbridges	138.9	115.2	-23.7	-17.08%
Overbridges - bridguard 3	23.2	17.1	-6.1	-26.34%
Footbridges	4.6	5.3	0.7	15.39%
Tunnels	9.3	13.1	3.8	40.90%
Culverts	4.2	5.6	1.3	31.28%
Retaining walls	3.7	1.8	-1.8	-49.88%
Earthworks	69.8	68.9	-0.9	-1.27%
Total – volume based	**276.6**	**247.1**	**-29.5**	**-10.66%**

Table 14: Civils renewals year-end efficiency figures[57]

[56] In the original civils CEM efficiency figures provided by Network Rail prior to June 24th 2011, and analysed in Arup's initial draft report (8th May 2011), total efficiency for civils volume costs was calculated at 14.41%. Network Rail has stated that this original calculation was undertaken in error, and that the basis for this calculation has since been altered, as set out in this version of our report .

[57] Source: calculation spreadsheet "CEM REEM Summary by Assetv3.xls"

3.5.2 Comparison of year-end with budget expenditure

By means of comparison, we set out in Table 15 overleaf the budget figures for baseline and projected civils expenditure prior to commencement of the financial year.

Civils renewals – Delivery Plan cost (£m)	Budget baseline CP4 (£m)	Budget FY10/11 (£m)	Variance (£m)	% Variance
Overbridges	27.6	18.9	-8.7	-31.40%
Underbridges	128.7	120.4	-8.3	-6.43%
Overbridges - Bridguard 3	36.0	25.8	-10.2	-28.24%
Footbridges	5.2	5.8	0.6	11.27%
Tunnels	30.4	17.9	-12.6	-41.27%
Culverts	3.1	6.7	3.5	113.54%
Retaining walls	8.6	6.8	-1.8	-21.00%
Earthworks	80.0	71.3	-8.7	-10.88%
Total - CAF costs	**319.7**	**273.6**	**-46.1**	**-14.41%**

Table 15: Civils renewals costs in FY10/11 budget[58]

As indicated in Table 15 above, the budget figures indicate both significantly different levels of total budgeted expenditure per RUC category compared to year-end figures and varying levels of efficiency against baseline.

Although total year-end costs for RUC categories are 10.7% (£29.5m) below the budget costs, the level of variation differs between categories – with expenditure on underbridges as the highest spend category 4% below budget, whilst retaining walls expenditure is almost 74% lower. Although the variation in budget vs. year-end costs for the two categories "Overbridges" and "Overbridges – Bridguard 3" is mainly attributable to re-allocation of cost between them, when combining expenditure figures of the two overbridge categories this results in an overall reduction of 16.8% between budget and year-end expenditure.

3.5.3 Discounting of volume efficiency

Year-end volumes for civils renewals activities are taken from the volumes recorded through the Primavera P3e system, which are captured at an individual project level. We understand that the 2010/11 figures are total volumes recorded for projects completed during the year, although we understand that the reporting of civils activities through the P3e system was only implemented during the first quarter of FY10/11.

The reporting policy at present for civils renewals is for no volume efficiencies to be reported at year end. Network Rail has indicated the reason for this is the asset management policy relating to civils assets is presently being revised and is yet to be fully endorsed by ORR. [59] Consequently, the volume baseline values have been adjusted so that these are exactly the same as the year-end volumes. As a result, reductions in

[58] Source: ibid
[59] Letter from Michael Lee, Director, Railway Planning and Performance, ORR to Paul Plummer, Director Planning and Development, Network Rail, dated 1 June 2010, page 5.

volumes against the PR08 baseline have been factored out of the efficiency calculation and the declared volume efficiency for all civils CAF categories is 0%.

3.5.4 Deferral of civils renewals expenditure

Information provided by Network Rail's Central Finance function indicated that no civils expenditure is to be deferred into CP5 – which means that any deferral amount will be incurred later within Control Period 4. [60]

However, this appears to be contradicted by documentation provided by Network Rail since 24th June, which includes an extract from the civils renewals Change Log that indicates that at least £332k of renewals works are to be deferred into CP5. We therefore consider that the level of civils expenditure deferral both within CP4 and into CP5 requires further clarification from Network Rail.

3.5.5 Unit cost efficiency

Given that no volume efficiency is being declared for Civils CAF costs, efficiency is calculated solely on the basis of unit costs. As a result, the unit cost efficiency both for the individual asset categories and in total exactly matches the overall efficiency figures.

The revised baseline RUC values utilised for the updated civils renewals efficiency calculation are representative of "pre-efficient" 2008/09 civils unit rates.[61] The baseline unit cost value has been calculated by dividing total expenditure recorded at FY08/09 year-end by reported volume.

We set out the civils unit cost efficiency calculation in full in Table 16 below.

Civils	Year-end total expenditure (£m)	Year-end volume	Year-end unit cost (£k)	Year-end baseline unit cost (£k)	% variance
Overbridges (m2)	20.1	11,866	1.69	1.92	-11.97%
Underbridges (m2)	115.2	87,914	1.31	1.58	-17.08%
Overbridges bg3(m2)	17.1	6,276	2.73	3.70	-26.34%
Footbridges (m2)	5.3	1,224	4.35	3.77	15.39%
Tunnels (m2)	13.1	17,636	0.74	0.53	40.90%
Culverts (m2)	5.6	2,340	2.38	1.81	31.28%
Retaining walls (m2)	1.8	2,609	0.71	1.41	-49.88%
Earthworks (m2)	68.9	386,749	0.18	0.18	-1.27%

[60] "CP5 rollover.xls" spreadsheet

[61] The source civils cost data from FY2008/09, and the calculations applied to extract the unit cost values for the respective civils asset categories, was demonstrated to Arup at an audit meeting held on 20th July 2011. Arup was also provided with supporting spreadsheets (CP3 0809 Volume Report v1.xls, 0809 baseline calculation.xls, CP3 0809 Volume Report v2.xls). This source data had not previously been provided due to the earlier civils unit cost calculation (as documented in Arup's initial report) being based on a different set of assumptions (see our Initial Report (9th May 2011) and calculations presented in Appendix O).

Table 16: Civils renewals unit cost efficiency calculation[62]

As indicated above, due to the static volume figures, the variability in overall cost terms is reflected 100% in RUC rates:

- All three overbridge / underbridge categories – which represent over 60% of civils CAF cost expenditure – indicate RUC rate savings, ranging from 12% to over 26%.
- In contrast, RUC rates for culverts and tunnels show significant increases of 31% and 41% respectively; this is particularly notable for tunnels, given that in terms of total expenditure, 74% less was actually spent for tunnels renewals compared to what was projected in the 2010/11 budget (see Table 15).
- The greatest unit cost reduction (-50%) was for retaining walls – which is likely to account for a significant proportion of the 73% total expenditure against budget for this category.
- In contrast, unit cost rates for earthworks show only a very small reduction against the baseline of just over 1%.

As a means of comparison, we set out in Table 17 below the original civils unit cost efficiency calculation as well as volume and total expenditure set out in the 2010/11 budget.

Civils – Budget	Budget total expenditure (£m)	Budget volume	Budget unit cost (£k)	Budget baseline unit cost (£k)	% variance
Overbridges	18.9	14,755	1.28	1.87	-31.40%
Underbridges	120.4	97,065	1.24	1.33	-6.43%
Overbridges - bridguard 3	25.8	7,617	3.39	4.72	-28.24%
Footbridges	5.8	1,370	4.23	3.81	11.27%
Tunnels	17.9	19,851	0.90	1.53	-41.27%
Culverts	6.7	1,599	4.16	1.95	113.54%
Retaining walls	6.8	3,626	1.88	2.38	-21.00%
Earthworks	71.3	440,638	0.16	0.18	-10.88%

Table 17: Civils renewals volume and unit cost efficiency: original budget projection

As can be seen, civils unit cost figures that were projected in the budget differ substantively from unit costs reported at year-end – both in terms of actual / projected year-end unit costs, and in terms of baseline unit cost values. In only one of the eight categories – footbridges – do baseline and year-end figures show similar levels between budget and year-end.

For underbridges (the highest spend item), total year-end expenditure is 4.3% (£5.2m) below budgeted level. The difference appears to be mainly driven by volume, which at year end is 9.5% below the budgeted level. This is partially offset by a year-end RUC

[62] Source: Arup analysis (based on data provided in "MasterTemplateRenP13 - civils adj.xls" (worksheet "Structures Input Schedule")

value 5.7% higher than budget. The greatest differences between budget and year-end figures relate to the baseline RUC value – with the year-end baseline of £1,580/m^2 over 19% higher than the budget baseline value of £1,330/m^2.

For the two overbridge categories ("Overbridges", and "Overbridges-Bridguard 3")[63], when combining total expenditure, volume and cost, year-end total expenditure of £37.2m is 16.9% below the budgeted £44.8m. A similar pattern is reflected in combined overbridge volume, which at year-end volume is 18.9% below budget. However, combined budget and year-end RUC levels (weighted according to volume) are similar, with year-end combined RUC of £2,050/m^2 slightly higher than the budget combined RUC level of £2,000/m^2.

Similarly, when comparing the year-end and budget volumes, the figures once again differ considerably. Year-end delivered volumes are below those projected in the budget in all but one category, including for all three over-/underbridge categories for which year-end volumes were between 10% and 24% below budget. The greatest year-end volume reduction was for retaining walls, 39% below budget. Remaining renewals categories were around 10-12% below budget with the exception of culverts for which volume increased by 46%.

3.5.6 Arup assessment

The 10.7% unit cost efficiency recorded for civils renewals reflects in full the overall efficiency figure for volume-based civils assets; this is because a 0% volume efficiency is claimed for this asset category.

The unit cost efficiency figure of 10.7% (Table 14) is significantly lower than the 14.4% efficiency (Table 15) projected in the budget. There have also been significant fluctuations between the activity volumes shown in the Delivery Plan, budget and year-end actual figures, indicating a significant level of uncertainty in work planning for Civil renewals activities. The uncertainty in planning of renewals work and significant amount of slippage[64] throughout the year is likely to have contributed to the significant variance between the projected unit costs in the budget and the year-end actual unit costs.

[63] Network Rail suggested the instability in these two categories may be explained in part by the reallocation of cost between them; although we have not been able to review specifically the basis by which cost is reallocated between these categories, a comparison of the total expenditure and volume figures combining these two categories results in lesser variance. For the "Overbridges" category, year-end expenditure is 6% higher than budget, driven by the substantially higher unit cost (which more than offsets lower year-end volume). However for the other overbridges category "Bridguard 3", year-end total expenditure is 34% lower and unit cost rate also significantly below the budget level – although the volume again is lower.

[64] According to "Buildings and Civil Efficiency Review", (Network Rail, 24th June 2011) p.13 , year-end figures show a total slippage in volume terms of 193,976 units "when measured against the 10/11 Baseline Plan (Period 10, 2009)." This is broken down set out as follows:

- "Slippage: 97,000 units (Earthworks).
- Overlay (unidentified provision): 45,000 units (Earthworks)
- Change in the way volume measured 62,000 units - Forth & Tay Bridge, previously reported as surface area, now reflecting deck area to comply with Phase 2b of the Volume Verification Exercise (Major Structures)."

When reviewing combined volume and non-volume based civils expenditure (see also Chapter 4), Network Rail has also indicated that of the £34m variance in total civils expenditure between the 2010 Delivery Plan projection and year-end figures, £18m (53%) is due to further efficiency above the level envisaged in Delivery Plan, while £16m (47%) is due to the net effect of slippage and new renewals schemes. [65] The underlying evidence provided by Network Rail to underpin the efficiency figures declared is assessed further in Chapter 6.

[65] "Buildings and Civil Efficiency Review", p.11-12

4 Renewals efficiency review – non-volume costs

4.1 Non-volume renewals costs

This chapter of our review relates to the following renewals expenditure categories that are not accounted for in volume and RUC terms under the CEM, and hence for which no volume or unit-cost efficiency percentage is calculated:

- Track (non-volume costs only)
- Signalling (non-volume costs only)
- Civils (non-volume costs only)
- HQ / EEA/ Other
- Telecoms
- Electrification
- Plant & Machinery
- Operational Property
- IT
- FTN (Fixed Telecoms Network)

Total non-volume renewals costs of £1.24bn accounted for 56.9 % of total overall renewals expenditure at FY 2010/11 year-end.

4.2 CEM efficiency calculation (non-volume renewals costs)

We set out in Table 18 the year-end expenditure figures for each of the non-volume renewals categories, together with the following two adjustments through which the CEM baseline figure is determined:

- assumed efficiency percentage: this represents Network Rail's assumed rate of efficiency savings in line with total efficiency projections to be achieved over CP4;
- efficiency outperformance: this is relates to cost savings regarded by Network Rail as being additional to the assumed efficiency percentage, specific to individual renewals categories.

Non-volume renewals category	CEM year-end renewals costs (£k) (FY10/11)	% efficiency/ (inefficiency)	Efficiency outperform-ance / (under-performance) (£k)	Year-end Baseline (£k)	Remarks
Items with efficiency outperformance (underperformance)					
Telecoms	32,515	23.81%	6,000	42,676	% efficiency as implied by stated outperformance significantly above the 9.75% assumed level
Electrification	78,138	(0.54%)	(8,000)	77,715	% inefficiency as implied by stated underperformance post application of 9.75% assumed efficiency level.
Operational Property	254,932	12.16%	7,000	290,229	% efficiency as implied by stated outperformance above the 9.75% assumed level
HQ / EEA/ Other	78,588	39.10%	37,874	129,044	% efficiency as implied by stated outperformance significantly above the 9.75% assumed level
Items without efficiency outperformance					
Track (non-volume)	50,869	9.75%			9.75% assumed efficiency level (no breakdown on individual asset category basis)
Signalling (non-volume)	238,280				
Civils (non-volume)	108,804				
Plant & Machinery	99,023				
IT	87,262				
FTN	209,268				
Total	**1,237,679**	**12.77%**		**1,418,896**	

Table 18: Year-end and baseline figures for non-volume renewals for CEM calculation

As indicated above, a basic efficiency percentage of 9.75% is applied across all asset categories. Included within the non-volume renewals categories are the proportions of track, signalling and civils expenditure not reported in volume / unit-cost terms. These represent significant proportions of expenditure – particularly for signalling and civils, for which non-volume costs account for approximately 64% and 31% of overall expenditure respectively for these two categories.

Individual efficiency figures are reported for telecoms, electrification and operational property – on the basis of efficiency outperformance figures provided. Overall efficiency levels of between -0.54% and 39.10% can be seen in the table above based on Network Rail's explanations of its efficiency calculation methodology.

However, for the remaining categories, no further breakdown of the overall efficiency level is provided.

We discuss the specific elements of the efficiency calculations for non-volume renewals costs in further detail below.

4.3 Determination of assumed efficiency percentage (9.75%)

Network Rail's assumed efficiency for non-volume costs relates to the projected total efficiency to be achieved over the full Control Period of 23.8%, as set out in the ORR's PR08 determination (see Section 2.2). In the second year of the 5-year Control Period, the percentage efficiency in cumulative terms against the original baseline figure is 9.75%.

The application of the 9.75% efficiency reflects Network Rail's underlying assumption for these renewals categories, whereby "if the Delivery Plan update shows that expenditure will be within the post efficient determination, then the conclusion is that the 23.8% efficiency will be achieved."[66]

On the basis of the rationale discussed in the previous paragraph and the fact that overall renewals expenditure levels are significantly below the "efficient" levels set out in the PR08 determination (see Section 2.1), Network Rail considers it is on track to deliver efficiencies.

4.4 Budget variance and deferral

We compare in Table 19 below the year-end expenditure for non-volume renewals categories projected in the budget with actual year-end expenditures.

Renewals category	FY10/11 Budget (£k)	FY10/11 year-end actual (£k)	% variance vs. budget	Efficiency outperfor-mance (£k)	Deferral of FY10/ 11 expenditure within CP4 (£k)	Deferral of FY10/ 11 expenditure into CP5 (£k)[67]
Track (non-volume)	50,800	50,869	0.1%	-	-	-
Signalling (non-volume)	312,796	238,280	-23.8%	-	74,516	-
Civils (non-volume)	108,038	108,804	0.7%	-	-	-
Telecoms	58,494	32,515	-44.4%	6,000	5,331	14,000
Electrification	107,076	78,138	-27.0%	-8,000	37,802	-
Plant & Machinery	136,638	99,023	-27.5%	-	37,615	-
Operational Property	303,761	254,932	-16.1%	7,000	40,073	1,000

[66] "Calculation of Renewals Efficiency in Network Rail for the Financial Year ended 31 March 2011", p.4.
[67] Source: calculation spreadsheets "CEM REEM Summary by Assetv3.xls", "MasterTemplateRenP13 - civils adj.xls" (worksheet "Structures Input Schedule"), "CP5 rollover.xls"

IT	90,000	87,262	-3.0%	-	2,738	-
FTN	240,669	209,268	-13.0%	-	31,401	-
HQ / EEA/ Other	242,420	78,588	-67.6%	37,874	121,866	-
Total	**1,650,692**	**1,237,679**	**-25.0%**	**42,874**	**351,342**	**15,000**

Table 19: 2010/11 budget vs. year end variance and expenditure deferral for non-volume renewals costs

It can be seen that FY10/11 year-end expenditure for non-volume renewals costs of £1.24bn was 25% (£413.0m) lower than the budgeted expenditure level of £1.65bn. The level of variability differs significantly between asset categories. Track and civils non-volume expenditure levels were within 1% of the budget value. Year-end expenditure in all remaining non-volume renewals categories was below budget – although the variance ranges from just 3.0% lower (£2.7m) for IT, to 67.6% lower (£163.8m) for HQ/EEA/Other costs.

Of the £413m variance between the year-end actual spending and budget, £42.9m can be accounted for by Network Rail's declared efficiency outperformance in telecoms, electrification, operational property and others. The vast majority (£351.3m) of the variance is accounted for as deferred expenditure, to be incurred later within the Control Period.

A far smaller amount of the deferred expenditure – £15m in total – is projected for deferral into CP5. It is not clear, based on the information provided by NR, exactly what expenditure this deferral amount relates to, nor whether this has been endorsed by the ORR.

A review of the evidence base provided by Network Rail for non-volume renewals is included in Chapter 6 of this report. For the categories Plant & Machinery, FTN and HQ/EEA/Other that no detailed information was provided to explain the basis for the calculation of the efficiencies set out Table 19.

4.5 Efficiency outperformance

As indicated in Table 19, "efficiency outperformance" amounts have been reported for four renewals asset categories.

For three of the four asset categories, the following outperformance amounts represent additional efficiencies achieved over and above the 9.75% "standard" efficiency level:

- Telecoms: an additional exactly £6m of cost efficiency has been reported. We review the information provide by Network Rail to support efficiency figures for telecoms renewals in chapter 6 of this report;
- Operational property: an additional exactly £7m of cost efficiency has been reported. The information provided by Network Rail to support this efficiency amount is also reviewed in chapter 6;
- HQ/EEA/Other: an additional £37.8m of efficiency has been reported, which we understand relates to the release of a renewals contingency sum.[68] Details with

[68] "Calculation of Renewals Efficiency in Network Rail for the Financial Year ended 31 March 2011", p.6.

> regard to the specific efficiencies that this figure represents were not provided by Network Rail.

The fourth efficiency outperformance figure, reported for electrification renewals, is a negative value. This is considered to reflect the relative inefficiency for electrification renewals; the negative efficiency figure of £8m exactly reverses the impact of the 9.75% efficiency factor, leading to a net inefficiency in year-end reported expenditure vs. baseline of 0.54%. We also review information provided by Network Rail to support the cost and efficiency calculation for electrification assets in chapter 6.

4.6 Arup opinion

This chapter has described how the assumed efficiency level of 9.75% has been applied across all ten of the non-volume based asset renewals categories for the CEM efficiency calculation (with further adjustments applied to four out of the ten categories under "outperformance").

In documentation provided since 24th June, Network Rail has stated that the 9.75% assumed efficiency level has simply been applied on a "global" basis. As stated in the "Calculation of Renewals Efficiency" document:

> "...a 9.8% inherent efficiency can be claimed for CEM purposes;... Although previously this methodology and fixed percentage was applied to the expenditure on each asset category in turn, it became clear that this was flawed as the efficiency achieved by each asset is different. By way of example, no efficiency should be claimed for FTN, however other assets are overachieving to compensate and thus the global efficiency target is being met." [69]

Although the above statement indicates that varying levels of efficiency are evident between the different categories, it also seems to suggest that Network Rail is unable to provide a further breakdown of efficiency on an individual asset category basis.

Network Rail has provided information to support efficiencies achieved for four of the non-volume based categories – telecoms, operational property, electrification, and IT[70] – but no specific efficiency figures (i.e. amounts / percentages) are now provided for the individual asset categories within the umbrella 9.75% amount. Chapter 6 of this report set out our review of the evidence base provided. We note that for the categories Plant & Machinery, FTN and HQ/EEA/Other no detailed information was provided to explain the basis by which the efficiencies set out ***Table 19*** were calculated. We therefore consider that at this time it is not possible to validate the declared efficiency levels for non-volume based renewals categories, because it appears no specific efficiency figures can be provided to measure efficiency on an asset specific basis.

[69] "Calculation of Renewals Efficiency in Network Rail for the Financial Year ended 31 March 2011", p.5-6.
[70] See Chapter 6.

5 Process assurance key findings – renewals efficiency reporting

5.1 Summary of key findings

We set out in the table below the key findings of our process assurance review for CEM renewals efficiencies, focussing in particular upon the "analysis, challenge and reporting" of renewals efficiencies within the Regulatory Accounts, as required by the mandate.

As well as reviewing the "top-down" mechanism by which renewals efficiencies are calculated (see previous section), we have reviewed the process by which renewals efficiencies are subject to analysis and challenge by the Finance function. This includes an assessment of the extent to which "auditable" evidence of efficiencies is provided to support the efficiency statements, and how far these are systematically reviewed and challenged.

The results of our assessment are set out in Table 20 below, together with our assessment of the level of risk from an audit perspective for the respective aspects of the CEM reporting process.

Aspect	Level of risk	Arup assessment
Definitions	Medium risk	• The CEM is supported by various guidance documents and presentations; however, a fully systematic and comprehensive guide, setting out source data, calculation process / rationale and outputs has not been provided. • The CEM metric is derived from a number of separate but interlinked spreadsheets containing the respective cost input data and adjustment for respective asset categories; no high-level documentation appears to exist to illustrate how these map together and where the data are derived from. • Data analysis was further complicated by the use of baseline terminology that was at times difficult to follow and inconsistent from an external review perspective. (This could be improved to simplify and speed up future reviews.)
Source Data	Low risk	• The CEM metric is drawn from calculations combining data contained in a number of source spreadsheets. These spreadsheets combine year-end outturn costs with budget figures, providing a clear audit trail. • The calculation formulae and output figures have been reviewed and appear to be robust.
Variability of inputs	High risk	• Significant levels of variability have been identified in renewals volumes when comparing Delivery Plan and budget projections with actual volumes – particularly for track and civils assets. A significant degree of variability in projected vs. actual cost levels was also evident in the majority of other non-

Aspect	Level of risk	Arup assessment
		volume based asset categories. • This implies instability in the renewals delivery process and volumes delivered (rather than volume data *per se*). • Variability has also been identified in the calculation formulae from which the CEM metric is calculated; this includes alterations in baseline approach in calculations provided to Arup since June 24th 2011 compared to earlier calculations.[71]
Process & analysis	High risk	• Top-down calculation processes for renewals efficiency generally apply the assumption by default that expenditure incurred is by its nature "efficient" in line with projected levels. • The methodology for estimating efficiency gains is in essence a top down *ex post* approach which involves re-baselining Network Rail expenditure to reflect efficiency gains the business considers it has achieved. The re-baselining methodology effectively assumes that renewals volume envisaged in the Delivery Plan can be delivered by the end of the Control Period and volume efficiency can be achieved regardless of the amount of slippage and deferrals occurred during the financial year. • Reliance for the substantiation of efficiency declarations is placed on project consultation and review procedures, by which Financial Controllers participate in asset / investment panels / workshops / meetings etc. relating to delivery and alteration of renewals projects. We consider there is a limited base of detailed, quantified documentation to support and quantify cost alterations made and associated efficiencies at the project level. • Provision of clear "bottom-up" quantified base of auditable evidence to justify efficiencies is not readily available, e.g. compliance with asset policies, sustainability of volume reductions, robustness of deferrals, positive management actions that have achieved efficiencies. There is uncertainty around whether management actions identified *ex post* can explain the underspend occurring during the year in question. The evaluation of amount of efficiency saving contributed by individual management actions appears to depend on the management's subjective judgement. • Efficiency calculations are performed with a complex system of spreadsheets. There are limited commentaries and labels that identify sources of data and calculation methodology. The lack of clarity in how these spreadsheets operate could potentially complicate effective internal checking and external review

[71] See Appendix O.

Aspect	Level of risk	Arup assessment
		processes, and make it less likely that human error can be identified.[72]
Coverage	Low risk	• We are satisfied that the CEM measure encompasses the full scope of renewals activities undertaken by Network Rail. • The efficiency for non-volume based renewal activities are currently reported as one combined efficiency figure. There is a lack of clarity over how much efficiency each asset in this category has achieved individually. • Breakdown of renewals costs by volume and unit cost through the RUC calculation helps improve visibility of the nature of efficiencies being attained. We consider that increasing the present level of CAF coverage of 43.1% for CEM purposes total renewals expenditure is desirable to further reduce risk around coverage.

Table 20: CEM Renewals Efficiency Process Assurance: key findings

5.2 Recommendations for renewals efficiency calculation process

We set out in the table below our recommendations based on our process assurance review of the renewals efficiency calculation process.

No.	Recommendation to Network Rail
2011.RA.1	We recommend a fully systematic and comprehensive guide setting out source data is developed for the CEM and REEM calculation processes. This should include: • Explanation of purpose, rationale and key assumptions for the calculations undertaken • A comprehensive illustration of how various interlinked spreadsheets used for CEM calculations map together • Explanation of how the various baseline cost figures are derived, including variations in the process across different asset types. • Overview of the baseline adjustments applied to the CEM baselines in order to derive the REEM figures. • Clear procedures for internal controls, tests and analysis to be applied to the input data during the calculation and reporting process.

[72] We note that the calculation of CEM / REEM efficiency for civils renewals has been subject to alteration, due to errors in the original calculation process; (see Section **Error! Reference source not found.**).

No.	Recommendation to Network Rail
2011.RA.2	We recommend the system of spreadsheets used to calculate the CEM efficiency measure is re-organised and integrated to simplify the flow of data and linkage among them. This should include: • Re-structuring of CEM calculation tables, to improve visibility of input data / figures, and provide clear linkage between high-level figures and underlying sets and subsets of input data. • Clear and comprehensive labeling of data fields, full visibility of linkages and up-to-date references to source data / input files • separation of inputs, calculations and outputs. • An additional table showing the individual adjustments applied to the CEM baseline values in order to derive the REEM measure should also be considered as part of the integrated spreadsheet system.
2011.RA.3	For non-reportable volume based renewal activities we recommend the disaggregation of the renewals efficiency calculation by asset category. To provide a robust and auditable basis for efficiency calculations we consider it essential that outturn expenditure levels can be compared against a credible pre-efficient baseline value for every individual asset category. .
2011.RA.4	We recommend that the present level of unit cost coverage utilized for CEM purposes is increased through the incorporation of other asset categories for which the CAF unit cost framework is already utilized, including operational property, telecoms and electrification renewals.
2011.RA.5	We recommend that Network Rail improves the granularity of efficiency reporting for non-unit cost based asset categories, (i.e. categories that cannot be captured under the CAF framework (see RA.4)), through breakdown of given asset cost categories into sub-categories, to give greater visibility of the performance and efficiency levels for given asset categories.

Table 21: Recommendations for the efficiency calculation process

6 Evidence base for renewals efficiencies – key findings

6.1 Areas of focus to support efficiency statements

We summarise in this section the underlying evidence base that forms the basis upon which NR's efficiency statements are supported.

As noted earlier, following the submission of our initial draft report on 8th May 2011, additional information was provided by NR and a number of meetings took place, focusing on "bottom-up" cost and efficiency information provided at an asset-specific level. This was provided in order to support the "top-down" calculations described earlier in this report from which the CEM / REEM efficiency metrics are derived.

For any regulated utility in a quasi-monopoly position, we think that the test for evidence around delivery of efficiency is very important. It can be difficult simply to justify efficiency on the basis of movements in key cost or volume indicators. It is possible for NR or indeed a comparable enterprise to deliver efficiency in a number of ways which by their very nature move in opposite directions. This is particularly true for renewals where the impacts of investment decisions may take many years to materialize.[73] Table 22 overleaf attempts to illustrate these points.

[73] In the case of maintenance, this is generally not perceived to be the case. Failure to maintain the railway is considered likely to lead to impact on outcomes in the short term – so the linkage between inputs and outputs is shorter and more straightforward to identify. Having said this, there is clearly an interaction between some maintenance activities (designed to protect an asset from premature failure) and longer term asset performance which would affect renewals.

Change in expenditure/activity (when compared to the Control Period 4 (Pr08) pre-efficient baseline/assessed volume)	More Efficient?	Less Efficient?
Reduced total expenditure	Yes, if for example, required "sustainable" outputs can be maintained (through compliance with asset policies deemed to be sustainable)	Yes, if required "sustainable" outputs cannot be maintained
Increased total expenditure	Yes, if for example expenditure today can be demonstrated to reduce the need for expenditure in the future (using relevant discounting techniques)	Yes, if expenditure is wasteful (e.g. an abortive project) or an over-engineered "gold-plated" solution is adopted
Reduced unit cost	Yes, if the outputs delivered are of the same quality/just as sustainable in asset policy, whole life terms	Possibly, if the driver of reduced unit cost leads to a disproportionately lower level of asset life or performance typically over the longer term
Increased unit cost	Possibly, if expenditure today can be demonstrated to reduce the need for expenditure in the future (using appropriate discounting techniques)	Yes, if expenditure cannot be demonstrated to reduce the need for expenditure in the future (again, using relevant discounting techniques)
Reduced volume	Yes, for example, if assets are no longer being replaced unnecessarily (for example, as a result of more effective ways of assessing risk, usable life etc)	Yes, particularly if the volume reduction is achieved through deferring asset replacement that should be undertaken today
Increased volume	Possibly, for example if grouping asset renewal produces reduced unit costs	Yes, for example if assets that don't require replacement are being replaced
Reduced scope	Yes, for example if parts of assets are no longer being replaced unnecessarily	Yes, for example if parts of an asset are not being replaced when they should not be
Increased scope	Possibly, if for example, wider unit cost efficiencies can be achieved, whole life costs can be reduced	Yes if parts of an asset are being replaced when they should not be

Table 22: Assessment of changes in renewals that could be notionally classed as efficient or inefficient

As Table 22 shows, it is in theory possible to justify higher or lower levels of expenditure (and to even to some extent higher or lower unit costs) on the grounds of efficiency. This

therefore places the onus on management for the provision of specific, evidence-based analysis to support efficiencies being claimed.[74] Examples are shown in Table 22 below.

Change in expenditure/activity (when compared to the Control Period 4 (Pr08) pre-efficient baseline/assessed volume)	Evidence?
Reduced/ total expenditure	Whole life cost modelling, longer term asset condition projections which can demonstrate that reduced expenditure is sustainable (compliant with asset policy)
Increased total expenditure	Whole life cost modelling, longer term asset condition projections which can demonstrate that reduced expenditure is sustainable (compliant with asset policy)
Reduced unit cost	Specific positive management actions that, all things being equal, result in a reduction in unit costs that makes the activity more efficient without materially affecting the sustainability of the asset
Increased unit cost	Research, asset surveys and/or other analysis demonstrating that all things being considered, increased cost now will generate longer term benefits ("disproportionate" extension in asset life, reduced maintenance costs etc) that can be quantified with an acceptable level of certainty
Reduced volume	Asset condition surveys and/or other analysis that demonstrates a reduction in volumes is sustainable (e.g. compliant with asset management policies)
Increased volume	Asst condition surveys and/or other analysis that demonstrates the increase in volumes is justifiable and compliant with asset management policies
Reduced scope	Research and/or analysis demonstrating that all things being equal, increased cost now will generate longer term benefits that can be quantified with an acceptable level of certainty
Increased scope	Research and or analysis demonstrating that all things being equal, increased cost now will generate longer term benefits that can be quantified with an acceptable level of certainty

Table 23: Assessment of changes in renewals that could be notionally classed as efficient or inefficient

6.1.1 Asset Policies

In overall terms, NR's efficiency from a regulatory perspective is being measured against the PR08 Determination. ORR has stated it is interested in "the extent to which Network Rail's …policies and plans…demonstrate robustness and sustainability…both having been informed by the PR08 Determination."[75]

[74] Appendix M provides examples of best practice from the UK water industry.
[75] Letter from Michael Lee, Director, Railway Planning and Performance, ORR to Paul Plummer, Director Planning and Development, Network Rail, dated 1 June 2010

ORR's test of robustness relates to the extent to which asset policies can "deliver the required CP4 outputs for England & Wales and Scotland. This test for this is considered "relatively weak" by ORR because "a policy will pass the test unless there are strong grounds to believe it would *not* deliver the outputs." [76]

With respect to sustainability, ORR states the test used here is, "if demand on the network were to remain steady, would application of the same policy continue to deliver the outputs specified for the final year of CP4 indefinitely? This is a stronger test to ensure that, in managing within CP4 funding, NR is **making genuine efficiencies and is not deferring essential work** at the cost of inefficiently higher expenditure in later control periods." (Arup emphasis).

ORR concluded in the same letter that all NR's proposals satisfy its "robustness" assessment and that (with the exception of civils structures), "they also appear to be sustainable."

The following sections summarise Network Rail's statements and our own findings in respect of meetings, focusing on the following two principal aspects of the evidence base:

- Positive management actions: the extent to which improvements in efficiency can be specifically evidenced by tangible positive management actions
- Sustainability: the extent to which stated efficiencies are achieved for the given asset area, without any adverse impact on Network Rail's ability to sustain delivery of the asset to the same level as specified for the end of CP4 indefinitely (in line with the ORR's definition of sustainability)

6.2 Track

6.2.1 Summary of evidence presented

NR's evidence for track-related positive management actions was presented as a schedule providing a breakdown of the seven efficiency elements contributing to the total efficiency amount for the respective track volume cost categories (Plain Line and S&C), with an explanation of total efficiencies attributed to the respective elements that sum to the total efficiency amount.

This was supported by a spreadsheet breaking down the efficiency calculations in detail.

The summary of variances provided is reproduced in Table 24 overleaf.

[76] *Ibid*

Cost efficiency element	Plain Line (£m)	S&C (£m)
Indirect costs	**-5**	**+13**
Site costs	**-19**	**-29**
Rail, Sleeper, Ballast, Haulage	**8**	**+1**
S&C Units	**n/a**	**-4**
Enhancements	**2**	**-1**
Other	**0**	**0**
Maintenance	**-0**	**-6**
Workmix	**3**	**-5**
Sub-total unit cost variance	**-11**	**-30**
Volume variance	**-66**	**-47**
Total variance	**-77**	**-77**

Table 24: Breakdown of track unit cost variance between FY 08/09 and 10/11(£m)

The total efficiency amounts, as set out in the table above, are consistent with the calculation input figures and formulae already provided to us prior to completion of our initial draft report (see Section 3.3 for our review workings).[77]

6.2.2 Positive management actions

The most significant driver of efficiency at the RUC level has been improvements in procurement and contracting processes – reflected in the reduced "Site Cost" figures. Network Rail has described a number of recent changes including improved workload visibility and changes to contracting strategy, such as the increased use of competition and use of contract unit rates.

Arup was shown two sample contracts containing the new contractor payment structure based on a schedule of target rates (as well as a previous contract containing the original "cost reimbursable" payment basis as a means of comparison).

NR also described other areas of efficiency improvement including:

- Improved levels of efficiency for track renewals works delivered by the maintenance function; this includes completion of the "2A reorganization" (including headcount reduction), driving greater efficiency from the supply chain, fixing of OTL rates, improved productivity and the introduction of improved management processes on overtime as well as increased utilisation of the maintenance function on lower-complexity / partial renewals activities.
- Improvements in S&C production process including greater use of modular components.

These efficiencies are partially offset by the following factors:

[77] Note that the precise amounts and totals shown in this table relate to the REEM calculation, and therefore differ slightly from the figures analysed in Section 3.3 of our report which are based on the CEM.

- "Indirect costs": taking the total cost impact across the two categories, indirect costs show an overall increase. This relates to fixed overheads, which when measured on an RUC basis are higher as a result of lower delivery volumes; NR expects this effect to reverse with the ramp up of volumes in forthcoming years. Differences between the two categories reflect NR's reallocation of general overheads, with a higher proportion reallocated to S&C to reflect higher management outlay; we have not been able to review the reallocation process in detail.
- Increases in materials costs (Rail, Sleeper, Ballast, Haulage).

Summary Arup view

No bottom-up presentation of volume-based efficiencies on a project by project basis was provided; however, given the explanations provided and the scope and breakdown of cost savings associated with them, Arup considers the level of cost efficiencies attributed on a unit-cost level appears reasonable.

6.2.3 Sustainability

Implementation of new asset policy

NR has attributed the achievement of the volume efficiency to the introduction of the new track asset management policy in 2010. This policy change has reduced the volume requirement compared to the CP4 determination, with prioritisation of more critical route sections and a greater focus on refurbishment. The Richard Spoors report on renewals volumes was provided to demonstrate the ORR's approval of this policy.

NR explained the impact of the track asset policy change including application of a "top-down" categorisation and prioritisation of activities by requirements at Strategic Route Section level. It was explained how this interfaces with the "bottom-up" RAMP plan, including the processes by which originally programmed works are reduced in scope / amended / reprogrammed and the change review and control processes that such changes are subject to.

NR explained that the changes in policy have resulted in significant variations between CP4 periods. Due to the historical legacy of condition-based asset management, a significant length of time will be required to rebalance asset programmes on the basis of the new policy. However, NR considers that this is likely to lead to a more stable state of volumes renewals in future.

NR also stated (in line with Arup's previous findings) that the demonstration of "bottom up" workbank prioritization is a low priority development area for the company.

Evidence to support the sustainability of NR's track renewals programme going forward included a number of track condition and performance graphs, with performance levels modelled over forthcoming Control Periods.

In the absence of a detailed bottom-up demonstration of volume efficiencies achieved, the efficiency level declared cannot be verified in detail. However, subject to the validity of the modelling approach and performance and condition metrics referred to in the

documentation, we consider that the level of volume efficiencies being attributed to the implementation of the new track asset management policy appears reasonable.

Delivery volumes for the remainder of CP4

Significantly higher volumes of Plain Line renewal are required for the remainder of the Control Period, in order for the required CP4 total volumes to be achieved. NR indicated reductions in planned volumes were partly due to the caution of teams in applying the new track policy to ensure the right areas of prioritisation, but also in part due to the non-availability of a high-output track renewals machine, as well as poor weather conditions.

NR described the process by which alterations to programmed works and deferrals are subject to the RADR process.

The forward looking projection of track renewals volume entails a significant increase in renewals of Category 1 and 2 track – which over the first two years of the Control Period has, on average, been delivered at less than half the volume projected for delivery going forward.

Summary Arup view

The evidence provided of the sustainability of NR's track renewals programme, including the condition and performance indicators, appears reasonable. However, given the extent of shortfalls in planned volumes delivered to date, and the ramp-up in volumes required for remainder of CP4, we consider there remains some risk around the delivery of required volumes on this basis.

6.3 Signalling

6.3.1 Summary of evidence presented

NR has declared a total unit cost efficiency in the REEM measure for volume-based signalling costs of £32.9m in total, of which £32.1m is related to unit cost efficiency, and the remainder related to volume efficiency.

Table 25 overleaf provides a breakdown of elements this efficiency was provided.

Item	Positive management action	Saving identified (£k)
1	Activity and scope efficiencies through development	1,392
2	Additional scope identified during development	(1,533)
3	Application of policy: Scope rationalization	5,835
4	Application of policy: Scope rationalization (non-volume)	3,188
5	Application of policy: Scope rationalization/work packaging (non-volume)	3,646
6	Application of policy: Scope rationalization/acceleration	3,276
7	Contractual Management on final account settlement	2,594
8	Scope rationalization (removal of circa 180)	8,449
9	Other	5,257
	Total unit cost efficiency	**32,095**
10	Volume efficiency	784
	Total efficiency on SEUs	**32,879**

Table 25: Positive management actions: Signalling renewals

Source: Signalling BAU Efficiency Table, Network Rail

The total unit cost efficiency calculation set out above is consistent with calculation input figures and formulae already provided to us prior to completion of our initial draft report; the volume efficiency figure is consistent with the altered volume efficiency calculation formulae presented to us on 24th June (see Section 3.4 for our review workings).[78]

6.3.2 Positive management actions

Documented efficiency by project

The total efficiency saving figure was supported by a table of individual signalling projects, showing the total current AFC for each project, together with a comparison of the original project cost for each project provided in the SBPU as the baseline. A 2010/11 efficiency (or inefficiency) figure was attributed to each project, representing a proportion of the total SBPU vs. current AFC variance figure for each project; this is based on the proportion of overall total expenditure of the project allocated for the given year. Arup considers this allocation methodology for efficiency measurement to be reasonable. Based on the review a number of individual projects the application of this approach appears to be robust.

However, we consider the categorization and terminology of the cost savings reflected in the supporting data to be confusing. The majority of category labels make reference to project scope rationalization (see items 2, 3, 8 and 10 in the Table); it is not clear why such efficiencies are deemed to be related to unit costs if volume reduction is the reason for the cost saving; (as indicated, the volume efficiency is calculated at only £0.8m). Furthermore, the issue of scope rationalization / reduction was not discussed during

[78] Note that the precise amounts and totals shown in this table relate to the REEM calculation, and therefore differ slightly from the figures analysed in Section 3.4 of our report which are based on the CEM.

Arup's meetings with NR as a significant driver for efficiency arising from positive management actions (see overleaf).

Arup reviewed in detail investment papers detailing scope and expenditure for three randomly-selected signalling projects[79]. In general terms, current expenditure levels appear to be broadly consistent with the AFC figures provided in the tables (although some individual cost variances were apparent). However, most of the documentation made no reference to the deviation from the original SBPU baseline cost cited, and none of the documentation set out specific reasons for positive management efficiencies attributed to them in the efficiency tables provided.

Discussion of specific positive management actions

NR described a range of positive management actions, to which the achievement of signalling efficiencies has been attributed. A number of specific efficiency improvements were described, which included:

- Improved coordination and integrated team working between divisions within NR
- Improved interfaces, buy-in and direct participation of other stakeholders (e.g. TOCs, ORR, external bodies)
- Improvements in equipment supply arrangements including reduction in non-standardised / bespoke items, increased off-site equipment testing
- Greater workbank stability, including greater use of framework contracts
- Minimisation of design changes – more stringent GRIP process and engagement of other stakeholders earlier in the design process.

NR described four specific renewals projects – at Southampton, Hitchin, South Erewash, and Reading – where specific efficiencies had been realized.

Summary Arup view

Overall, we noted that the evidence of positive management actions was of a qualitative nature rather than quantitative There appears to be a high degree of subjectivity in determining how savings have been achieved at project level. In our view, the allocation of positive management actions was also poorly defined.

However, we consider the project-specific figures provided setting out SBPU and current AFC cost variance and related efficiency allocation provide a reasonable indication of the scope of efficiency savings being realized (notwithstanding our concerns about the categorization and terminology of the cost savings in Table 25 and supporting documents set out above).

We note that signalling unit cost efficiencies have been measured on the basis of reported SEUs in the CEM calculation against a baseline RUC value that was consistent in both the original budget prior to commencement of the year and the year-end figures. Furthermore, the unit cost efficiency calculation has not been subject to alteration since Arup's initial draft report (dated 9th May 2011). We therefore consider that subject to the

[79] Refs. 107074 Medway valley crossing ,117800 East Suffolk, 107663 Wimbledon Clapham Jn.

accuracy of the outturn total expenditure and delivered volumes reported, the basis upon which unit cost efficiency is calculated appears reasonable.

6.3.3 Sustainability

As evidence of the sustainability of current and projected renewals delivery volumes NR provided evidence of two asset condition metrics (Signalling Asset Condition (M10) / Signalling Failures >10min (M9)); the figures presented indicate that the M9 measure is ahead of target, but the M10 figure slightly below.

With regard to reported and projected delivery volumes, NR indicated that the bottom-up workbank for signalling renewals is in place and has been stable for some time.

This appears to be reflected in the information that has been provided, detailing volume and cost data on a project by project basis. This included 2010 and 2011 versions of the signalling business plan with annual cost profiles and delivery volumes, as well as spreadsheets setting out variances in reported volumes between the 2010 and 2011 Delivery Plan figures on an in-year and CP4 basis.

Summary Arup view

Our view is that the information provided appears to indicate a reasonable level of stability in signalling renewals delivery volumes. We regard the long-term performance of signalling assets typically to be more stable than other asset types once installed – i.e. performance or condition degradation over time is typically more predictable. We therefore consider that the reported volume efficiency level in relation to the sustainability of signalling performance and the robustness of delivery volumes going forward appears reasonable.

6.4 Civils (structures & geotechnics)

6.4.1 Summary of evidence presented

Network Rail presented civils cost efficiency relating to positive management actions in the form of a table breaking down total efficiency amounts into four efficiency categories. We reproduce this table below:

Category		Positive Management Actions				
	Actual 10/11 (£m)	Workbank planning (£m)	Cost & Modelling (£m)	Design to Cost (£m)	Efficient Project Governance (£m)	Total (£m)
Civils reportable	247.1	22.3	1.1	2.2	2.2	27.7
Civils other	108.8	9.8	0.5	1.0	1.0	12.2

Table 26: Positive Management Actions civils efficiency impact

Source: "Civils and Operational Property Positive Management Actions", NR.

The total efficiency amounts presented above of £27.7m for civils reportable and £12.2m for other (non-volume) civils differ from the values presented in the updated REEM calculation of £35.0m and £14.25m respectively; (the latter figure based on the "assumed" non-volume renewals efficiency percentage of 9.75%) (see Sections 3.5.1 and 4.2).

The efficiency benefits of the respective categories listed in the table above are described in the "Positive Management Actions" document in qualitative terms, and tables setting out quantitative impact of the efficiency factors on specific cost elements within the overall civils cost base are provided in percentage terms.

It has not been possible to review the impact of the efficiency factors presented – which appear to represent high-level estimations – because no further breakdown, in terms of actual underlying cost amounts from which the high-level totals set out in Table 26 are totaled, could be located in the supporting documentation.

6.4.2 Positive management actions

Key aspects of positive management actions

The impact of positive management actions taken by in respect of Civils efficiency has been broken down by NR under the five categories set out in Table 26. The above items represent the five core EID (Efficient Infrastructure Delivery) projects.

A range of qualitative information setting out efficiencies achieved in relation to these aspects has been provided in documentation and review meetings.

As the most significant efficiency factor, improvements in Workbank planning include the following:

- improving the visibility and stability of the workbank;
- reducing the number of framework contractors;
- increasing the use of competitive frameworks and reduced use of framework agreements;
- reduced liquidated damages; and
- earlier contract award timescales.

Designing to cost has led to significant savings in Civils renewals, through the development of standard designs or details for approximately 50%+ of scenarios.

Cost Modelling and Investment efficiencies relate to improved project controls and tighter controls of contingency budgets.

Project governance savings have been made in response to the shift in procurement policy with a significant headcount reduction – as well as the aggressive targeting of an increase in renewals expenditure committed per staff headcount.

These items can be categorized as "non-financial" in nature and are difficult to quantify in practice. However the documentation provided also provides non-financial

performance indicators that reflect whether the efficiency measures and management actions required are being undertaken and implemented. These indicators are as follows:

- Percentage of workbank remitted and locked down.
- Percentage of budget competitively tendered.
- Lead time from main contract award to beginning of the financial year of implementation.
- Budget expended in periods 1-7.
- Number of developed schemes subsequently omitted from the workbank.

Management KPIs were provided as evidence of the implementation of cost saving measures going forwards. These can be considered to be tangible indicators of efficiency-related measures going forward – although they are not in themselves financial metrics.

Calculation of unit cost efficiency

The documentation provided presents a general trend of continual efficiency improvements represented through both the CAF renewals unit cost framework (utilised for renewals cost estimating purposes), but also other cost / efficiency metrics, which NR considers represent substantiation for the 2010/11 civils efficiencies being reported.

The documentation includes graphs setting out a trend of increasing efficiency since 2003, reflected not only through the CAF measure, but also two alternative cost efficiency indicators - CEI and Civils MBR – that are also utilized for civils cost efficiency measurement. The document projects a continuation of the upward trajectory of the respective efficiency measures.

For 2010/11, the document refers to the process by which it is assumed an overall Civils efficiency level of around 12% has been achieved, based on a combination of indicators; these include on a Civils MBR variance of 11.2% and a CEI variance of 13.9%. However, the document also states that it has not been possible to declare an actual CAF unit cost result for FY2010/11 due to problems with the current CAF unit cost database.

However, despite the non-availability of the CAF unit cost database, a full set of RUC figures has been presented in the updated CEM and REEM figures; (see Section 3.5 for a review of the calculations); the figures include variances by individual asset category.

NR indicated that the baseline values utilized for calculation of the unit cost efficiencies are based on 2008/09 CAF values. Arup has recently been provided with source spreadsheets, containing 2008/09 outturn project cost data from which the 2008/09 baseline CAF unit costs rates have been calculated. [80] [81] We consider the information

[80] We note that the calculation of unit cost efficiency for civils assets was previously calculated on a different basis (documented in full in Arup's initial draft report, 9th May 2011). Network Rail has stated that this original calculation was undertaken in error, and that the basis for this calculation has since been altered, as set out in this version of our report.

[81] The following calculation spreadsheets containing source data for baseline civils unit cost values have been provided: CP3 0809 Volume Report v1.xls, 0809 baseline calculation.xls, CP3 0809 Volume Report v2.xls

provided represents an acceptable audit trail from which the source data for the baseline civils RUC values can be identified.

Arup has requested evidence of positive management actions that relate to the unit cost efficiency levels being declared for individual civils asset categories. To date no information specific to individual asset categories has been provided.

Arup assessment

We consider that the reporting of civils renewals efficiencies on an RUC, utilising 2008/09 project cost data as the basis for establishing baseline unit cost values to be a reasonable approach for comparison with current unit cost levels.

From a qualitative perspective, we also consider that a reasonable amount of evidence has been provided that management actions were resulting in cost savings, and project examples discussed in the meeting demonstrated that management actions were resulting in on-site efficiency.

However, there appears to be a high degree of subjectivity in determining how savings have been achieved. Examples of the quantified impact of the positive management actions referred to have not been provided either at a level that enables them to be linked with individual projects, or with the varying levels of unit cost efficiency being reported across the civils asset types.

6.4.3 Sustainability

Given current discussions between the ORR and NR regarding the sustainability of civils asset policy, we do not consider it appropriate to comment upon the validity of underlying sustainability assumptions associated with the civils renewals efficiency statements. However we have reviewed efficiency from the context of robustness, in terms of the deliverability of renewals to required levels for the remainder of CP4.

The planned and actual expenditure levels for the various civils asset categories have been subject to a significant level of variability, such that identification of consistent trends of expenditure and associated volumes are difficult in light of substantial alterations applied to respective budget and Delivery Plan amounts.

NR describes in its “Buildings and Civils Efficiency Review” document the timescales by which the bottom-up Civils Business Plan was completed – which included completion for the first two years of CP4 prior to Control Period commencement. The document also makes reference to the review of the bottom-up plan as part of the “B&C Efficiency Programme”, and subsequent “scope and programme revisions” on this basis.

Although NR has indicated that workbank stability is now expected to stabilize going forward, we consider that the recent nature of many of the measures for improved planning and the extent to which alterations have been necessary to date, means there is not yet a sufficient evidence base of stable historical workbank planning that supports the assumption of that volumes and associated expenditures will be robust going forwards.

Furthermore, we note that there appears to be a degree of uncertainty relating to asset condition indicators – which form a critical element in the planning of civils workbanks. On page 2 of the "Buildings and Civils Efficiency Review" document it states that:

"the condition may deteriorate over the rest of CP4 …"

"if we wish to adopt a lowest whole life cost approach we would need to increase volumes in CP5…"

"More work is required to complete our review of the asset policy and the potential scale of its implications…"

It was also stated in the meeting at NR that provisional condition indicators do in fact show a slight deterioration.

Conversely, planning improvement initiatives such as VAWP have in fact been in place since 2009, but improved stability on the basis of such measures is not yet evident following this initiative.

NR makes also makes reference to "transfer of funds between RWIs", which is "fully explained in recent correspondence between NR and the ORR." Whilst such correspondence may explain the nature of and justification for such expenditure reallocations, we do not consider this is likely to mitigate the risk associated with inherent instability of planned expenditure going forward – given the extent of variances in cost to date.

Arup assessment

Overall, we believe the evidence indicates that a degree of uncertainty surrounds current forward planning of workloads, in order that required output levels can be meet.

In overall terms we consider there to be risks relating to the projected civils volume and expenditure levels currently projected, based on the areas of uncertainty described above.

6.5 Buildings / operational property

6.5.1 Summary of evidence presented

NR presented buildings / operational property cost efficiency relating to positive management actions in the form of a table breaking down total efficiency amounts into four efficiency categories. We reproduce this table below:

Category		Positive Management Actions				
	Actual 10/11 (£m)	Workbank planning (£m)	Cost & Modelling (£m)	Design to Cost (£m)	Efficient Project Governance (£m)	Total (£m)
Operational property	254.9	23.0	1.1	2.3	2.3	28.6

Table 27: Positive Management Actions operational property efficiency impact

Source: "Civils and Operational Property Positive Management Actions", NR.

The total efficiency amount of £28.6m presented above differs from both the updated £35.3m CEM efficiency calculation amount calculated using the methodology of treating "further efficiency" as described in Network Rail's "Renewals Efficiency Calculation 2010/11" document and the £41.4m REEM efficiency calculated in a similar fashion.

6.5.2 Positive management actions

As with the evidence base submitted for civils renewals, it is not clear how efficiency amounts have been allocated to each positive management action listed in Table 27 above. Tables setting out assumptions used for the top-down estimate of efficiency benefit from each of these management actions over CP4 have been provided. The combined efficiency delivered by these management actions has been estimated at 23.60% over CP4 – just slightly lower than the 23.8% target set by ORR. It is not clear how this CP4 estimate translates into the £28.6m efficiency for 10/11 as shown in Table 27.

An example of the change control log used for recording decisions made at Change Control meeting for the purpose of scrutinising the change to workbanks proposed by Route teams was also submitted as part of the evidence base. Whilst the "MBR Variance Category"[82] column in the change control log includes categories such as 'scope efficiency' and 'activity efficiency' that could potentially explain some efficiency achieved during the year, it is not clear how these are related to the positive management actions identified by Network Rail and how efficiencies reported by MBR variance are related to the CEM/REEM efficiencies reported.

6.5.3 Sustainability

Network Rail's updated buildings asset policy was accepted by ORR as sustainable in April 2010. According to Network Rail, the workbank was subsequently fully aligned with the revised policy. Proposed changes to the workbank by Route teams are subject to review at the Change Control meeting chaired by Asset Heads. Justifications for these changes and approval decisions at the meeting are recorded in the change control log document.

Our review of the change control log document suggests a reasonable checking mechanism is in place that ensures changes to the workbank are justified. A one-line justification has been provided for each proposed change in workbank and clarifications were sought where justifications are deemed insufficient. However, although Network Rail's updated Asset Management Policy for operational property states that the renewals decisions are to be made based on Asset Risk Score and Station Stewardship Measure (SSM), limited reference to the two measures can be seen. Of the 167 proposed change items listed in the Period 3 change log example provided by Network Rail, SSM is only specifically mentioned in 3 instances where SSM and Asset Remaining Life are said to be 'satisfactory'. No reference to Asset Risk Score could be found.

[82] Six MBR Variance Categories can be found in the change control log for Period 3 2010/11. The categories include 'work reprioritised in CP', 'scope efficiency', 'activity efficiency', 'slip due to 3rd party', 'unplanned slip' and 'cancellation'.

The Buildings & Civils Business Plan as of the end of FY 10/11 was also provided by Network Rail for our review. Information recorded in the Business Plan includes project title / location, asset type, structure policy, RWI, budget in each CP4 year, budget change in each CP4 year, volume in each CP4 year and volume change in each CP4 years etc. Although the 'Structure Policy' column indicates clearly what asset policy code is applied for each project, no Asset Risk Score or SSM has been recorded in the Business Plan.

In Network Rail's submitted evidence base for buildings it is shown that Station Stewardship Measure (SSM) and Light Maintenance Depot Stewardship Measure (LMDSM) have shown slight improvements between FY 09/10 and 10/11. Reference is also made to Network Rail's modeling work being done for PR13. We are yet to see the output from this modeling work.

Arup assessment

We consider that the detailed descriptions for the positive management actions provided by Network Rail appear credible and are likely to have resulted in some efficiency savings reported. However there appears to be a high degree of subjectivity in determining how much in terms of savings each of the identified management actions has contributed to the efficiency figures declared. We are also unable to reconcile the savings figures shown on Network Rail's documents submitted as supporting evidence and the efficiencies calculated in other documentation. Because Network Rail has been unable to provide bottom-up evidence of how efficiency figures have been built up from individual buildings projects, we are unable to verify the extent to which the identified positive management actions can explain efficiency figures being declared.

6.6 Telecoms

6.6.1 Summary of evidence presented

In its updated accounts, NR has declared an efficiency outperformance of £6m for telecoms renewals. Using the methodology illustrated in the *Calculation of Renewals Efficiency in Network Rail for the Financial Year ended 31 March 2011*, we calculated that the CEM and REEM efficiency figures are £10.1m (23.8%) and £11.1m (25.4%) respectively (see Section 4.2).

NR has provided a table that lists the cost efficiency resulting from each positive management action category. Efficiency attributed to each management action is further divided into 'business as usual' efficiency and 'further' efficiencies. Total efficiency for telecoms renewals identified in this table is £13.8m, which differs from the CEM and REEM efficiency figures discussed above.

A table breaking down the £13.8m efficiency amount by project has also been provided by NR, which we reproduce below.

Management Action	BAU	Further	Total
	£	£	£
Benefit gained on advantageous Claim settlement	-	1,177,603	1,177,603
Benefit of new/application of asset policy and work packaging	3,736,596	2,797,633	6,534,230
Benefit of stable work bank	2,772,535	1,169,673	3,942,208
Benefit of standard design	31,034	16,034	47,068
Benefit of using maintenance	203,034	299,681	502,714
Benefit of using new technology	435,808	833,026	1,268,834
Contingency release - through effective risk mitigation	(317,708)	604,181	286,473
Contingency release and buying gain contract on contract award	3,044	66,431	69,475
TOTAL COST EFFICIENCY	**6,864,343**	**6,964,261**	**13,828,604**

Table 28: Positive management actions: telecoms renewals

As indicated in the table above, the movement between anticipated final cost (AFC) projected in the Strategic Business Plan update (SBPu) and current Business Plan is shown for each project. This movement in AFC is then assigned as efficiency for the current financial year on a *pro rata* basis, based on project expenditure in the current year versus AFC in current Business Plan.

Arup has reviewed in detail investment papers detailing scope and expenditure for two randomly selected telecoms projects.[83] In general terms, current expenditure levels appeared to be broadly consistent with the AFC figures provided in the tables (although some individual cost variances were apparent).

However, as with signalling efficiencies (see Section 6.3.2), none of the documentation sets out specific reasons for positive management efficiencies attributed to them in the efficiency tables provided. Furthermore, we do not presently have visibility of the methodology by which the efficiency amounts (positive and negative) are attributed to the respective "BAU" and "further" efficiency categories indicated above.

6.6.2 Positive management actions

Management action categories identified by NR in documents provided to us include the following:

- Advantages Claim settlement
- New/application of asset policy and work packaging
- Stable work bank
- Use of standard design
- Use of maintenance
- Use of new technology

[83] Project refs.: 106683 LNE DOO, and 103862 Territory CIS renewals

- Release of contingency through effective risk mitigation
- Release of contingency and buying gain contract on contract award

NR has also discussed specific management actions at recent meetings, including taking renewal works in-house, working with TOCs to stabilise work bank and engaging TOCs in earlier stages of the design process.

Arup assessment

Whilst we consider that management actions identified by NR are likely to have resulted in some cost efficiencies declared, there appears to be high degree of subjectivity in assigning positive management action categories to individual projects. The specific management actions have also been discussed only in general terms with limited details on the quantified benefits each specific action had / would bring.

The fact that positive management actions have been identified even for projects that show higher AFC in current Business Plan compared to SBPu highlights the limitations in the way in which positive management actions are linked to efficiencies at the project level.

It is also not immediately clear whether movements in AFC shown in tables provided have been adjusted for deferrals and unplanned slippage, which could have significant impact on declared efficiencies.

We consider that detailed bottom-up evidence, demonstrating the extent to which specific management actions have contributed to efficiencies realised for each project would help improve confidence in the declared efficiency figures.

6.6.3 Sustainability

Historically there have been significant fluctuations in telecoms renewal volumes, reflected in significant changes between Final Determination volumes and respective versions of the Delivery Plan / Delivery Plan update. NR has indicated that recent alterations to telecoms volumes are due to the following:

- Improved asset information
- Recent asset condition assessments
- Revised design standards
- Revised commissioning strategy
- Comprehensive station survey started during the 2010/11 financial year
- Supplier and technical related issues associated with new technology

By engaging TOCs to stabilise work bank and working with suppliers to deploy new technologies, NR is hoping to achieve a more stable workbank for telecoms assets going forward.

NR has also indicated that it expects exceed required performance levels measures through the Asset Stewardship Indicator (ASI) through the current ongoing level of intervention currently planned.

Arup assessment

Telecoms expenditure levels have shown significant levels of variation, for instance between the FY10/11 budget and year-end expenditure levels. However, given Network Rail's improved understanding of asset condition and its effort to engage with TOCs and suppliers in planning and delivering telecoms renewals work going forward, we consider that a greater degree of stability in the planning of telecoms activities and expenditure should be achieved in forthcoming years.

6.7 Electrification

6.7.1 Summary of evidence presented

Based on the calculation methodology described in the Calculation of Renewals Efficiency in Network Rail for the Financial Year ended 31 March 2011 document together with the £8m negative efficiency adjustment NR applied to electrification renewals compared to Delivery Plan assumptions, we calculate that the CEM and REEM (in)efficiencies for electrification are -0.54% and 1.5% respectively.

NR has indicated during meetings with our team that the level of visibility in relation to electrification efficiency is limited. This is partly due to limited knowledge of asset condition, which has caused volume fluctuations in the workbank. NR has indicated that a significant amount of planned electrification renewals work has been deferred until later in the Control Period. As a result, electrification volume is to ramp up by 20% in 2011/12 and to ramp up considerably in final 2 years of CP4.

Part of the change in planned renewals volume between 2010/11 Delivery Plan and the Final Determination was due to deferrals from CP3. From documents provided by NR it is also apparent that 125 out of 593 units of DC LV switchgear originally planned in Delivery Plan update in 2010 will now be deferred to CP5 in order to provide funding for GE OLE renewals. However, this deferral has not been reflected in the figures provided to Arup in our analysis of non-volume based renewals efficiencies (see Section 4.4)There has also been a degree of slippage in planned activities, due to the need to re-do option selection and single option design when tender returns were found to be unaffordable for the efficiency targets. NR expects to have better understanding of its efficiency position in electrification during the next 12 months, and is now working on stabilising the workbank, in order to improve forward visibility and the efficiency of tendering processes for electrification renewal works.

NR also indicated that a condition-based approach to electrification renewals has replaced the age-based approach taken previously, which has also driven changes in renewals workbank volumes for a number of electrification asset types.

Other factors that have caused workbank fluctuations were also cited, including reprioritisation of work to better align with track access and possessions, and introduction of new technologies such as auto-transformer

When questioned about the possibility of unitising renewal costs for electrification, NR indicated there is low level of granularity for electrification renewals costs, and the large number of different components that forms the system also make it difficult to unitise electrification renewals costs.

NR forecasts the Asset Stewardship Indicators (ASIs) for electrification & plant are to remain stable and within target for the rest of CP4.

Arup assessment

Network Rail has indicated previous instability in the planning and delivery of electrification renewals has arisen in part due to a lack of knowledge of asset condition for electrification renewals. Furthermore, the significant levels of expenditure deferral for electrification renewals (see also Section 4.4), suggest there is uncertainty in relation to the required nature and volume of electrification renewals work going forward. Without further details, it is not possible at this point to comment whether this could have an adverse impact on the robustness of renewals programme for the remainder of CP4

We consider that better understanding of asset condition should allow Network Rail to apply condition-based renewals approach more consistently to reduce costs. Unitising cost data where possible would also enable Network Rail to take more effective measures to achieve greater efficiency in electrification renewals costs.

6.8 Information Management

6.8.1 Summary of evidence presented

Information management efficiency savings have been broadly categorised as hardware efficiencies, software efficiencies or system integrator efficiencies. NR has calculated that the total efficiencies delivered through the three saving categories is £11.4m. Given that the reported actual expenditure for IT was £87.3m in 2010/11, the combined percentage efficiency delivered by the three saving categories would be 11.6%, which is consistent with the aggregate REEM efficiency percentage declared collectively for non-volume based renewals.

Arup assessment

NR has provided some detailed explanations for each of the three efficiency savings categories identified. Although it has not been possible to review underlying evidence base or the efficiencies achieved through management actions such as the Central Infrastructure Delivery Programme in further detail, we consider that the scope of efficiencies attributed to the respective categories appear plausible.

6.9 Recommendations for renewals efficiency reporting

6.9.1 Previous recommendations

In our previous reports covering the robustness of NR's unit cost framework and the 2009/10 Annual Return/CAF and MUC, Arup made a number of recommendations that relate to the evidence base surrounding specific efficiency activities used to improve the cost effectiveness of the business. Those that we think are most relevant to the question of efficiency and the responses received from NR are included over the next few pages. We have also included our observations in light of the work completed as part of this review.

Reference	Recommendation	Network Rail response	NR status[84]	Arup comments in light of work completed to date as part of this review
2010.CAF.9 (November 2010)	We recommend that a formalized method for establishing/ qualifying unit cost efficiency for track renewals is developed this should enable the demonstration of the proportion of track savings attributable to: a) Improved asset management policies b) Deferrals based on more efficient working methods yet to be developed.	The current methodology is to categorise track renewals savings between volume, unit cost and other (for volumes related items such a fencing). Volume efficiencies (which arise from revised asset policies) are therefore separately identified. Any savings arising from the deferral of capex works into later years are not considered to be an efficiency and are not recorded as such.	Complete	We have seen only limited evidence not an "auditable" trail for asset management policies or positive management actions.
2010.CAF.10 (November 2010)	Network Rail should share with ORR how it intends to reliably measure financial savings and whole life cost benefits attributable to improved asset management. We would recommend that qualification test procedure/protocol to confirm and validate any declared efficiencies, with a record of: a) The technical basis/ reason for the declared efficiency (e.g. quantified process saving, proof of improved/ better than expected asset condition). b) The resulting scope of efficiency	NR revised its asset policies which have been accepted by the ORR with the exception of civils. The discussions regarding civils are on-going with the ORR. No volume efficiencies have been recognized for civils to date as the suitability of the asset policies has yet to be fully resolved with the ORR.	On-going	As noted in the main body of our report, we understand that ORR has (with the exception of Civils assets) accepted that Network Rail's asset policies are all both robust and sustainable. We consider that Network Rail does not have in place a comprehensive and "auditable" process by which to monitor efficiency gains.

[84] NR response to Arup recommendations as stated in the period up to March 2011.

Reference	Recommendation	Network Rail response	NR status[84]	Arup comments in light of work completed to date as part of this review
	saving directly attributable. (Note this may have been covered in asset strategies that we understand may have been discussed and agreed with NR).			
2010.CAF. 11 (November 2010)	Consistent with our previous CAF recommendations (May 2010 report), we recommend that NR reviews the calculation for measuring unit cost efficiency with regard to the use of baseline volumes this is actual volumes using consistent base lines, based on actual volumes delivered rather than notional baselines.	Models to be amended by year end	Ongoing	We understand this process has been adopted for signalling and track. In the case of civils, we note that NR is forgoing any volume efficiency.
2010.CAF. 12 (November 2010)	Consistent with our previous CAF recommendations (May 2010 report), which respect to declared efficiencies, we recommend that NR develops a qualification test procedure/ protocol to confirm and validate any declared efficiencies, with a record of: a) The technical basis/ reason for the declared efficiency (e.g. quantified process saving, proof of improved/ better than expected asset condition). b) The resulting scope of efficiency saving directly attributable.	Document to capture this information for distribution to senior management is currently in production. Document illustrating how savings had been made in FY09/10 and how they plan to be made in FY10/11 onwards shared with ORR.	On-going	We are yet to see this document.
2010.CEM	Network Rail should consider bringing		Complete	Our recommendation was not suggesting that

Reference	Recommendation	Network Rail response	NR status[84]	Arup comments in light of work completed to date as part of this review
.1 (May 2010)	in concepts such as asset condition shortfall tests, residual life and residual value type measures into the review of asset sustainability	• We recognize that sustainability is an important issue and we take into account the extent to which variances are caused by deferral within the CEM • However, we do not believe that it is appropriate for CEM to include these issues		these sorts of measures should be directly incorporated into the CEM/REEM It is about specifically providing NR's finance function with auditable evidence that renewal efficiencies are being delivered in a sustainable and robust manner (as defined by ORR). We would argue that these sorts of analyses are absolutely essential to enhancing the level of reliance that can be placed on renewal efficiencies being declared by the business
2010.CEM .2 (May 2010)	There is considerable scope for Network Rail to improve the way in which it devises and reports renewals efficiencies. There is strong evidence of increased awareness and motivation at a regional level to deliver renewals efficiencies, we would suggest that these initiatives are more robustly captured and controlled.	However, this is not something which should be targeted through CEM. Best practice concepts of delivering capex should rest with the asset directors and asset management teams. It should not require the results of CEM to establish what techniques NR should be using throughout the business to deliver savings. Asset pack ERM meetings (or something similar) would be a more appropriate forum for this.		Our recommendation was not suggesting that these sorts of activities should be directly incorporated into the CEM/REEM. The issue is once again around providing an auditable trail of activities being pursued by managers and decision-makers within the business to deliver efficiencies. Without this, there is some uncertainty over the extent to which initiatives are actually delivering the efficiencies that are claimed for them.
2010.CEM .3 (May 2010)	Network Rail should consider undertaking a greater frequency of efficiency audits, so reducing the risk of year-end 'surprises'.	Rejected • We consider that it is important that line management takes responsibility for the underlying data rather than relying on audits	Complete	We disagree with NR's response. As with last year, we noticed a material shift in P12 to P13 efficiency figures both at individual asset levels and at the "Unit Cost efficiency", "Volume efficiency" and " Other direct cost

Reference	Recommendation	Network Rail response	NR status[84]	Arup comments in light of work completed to date as part of this review
		and other checks • There weren't any 'surprises' in 9/10		efficiency" measures. For FY 10/11 there are significant variances between the P12 FY forecast for CEM and the P13 actual FY CEM in some sub-categories such as maintenance unit cost efficiency (9.1% vs. 12.1%), maintenance volume efficiency (9.2% vs. 12.3%) and maintenance other direct cost efficiency (0.9% vs. 4.8%).
2010.CEM .7 (May 2010)	Network Rail should issue variance reports, on at least a 6 monthly basis, that detail how the efficiency reported by the CEM has been delivered.	This has been investigated. The level of analysis required to robustly identify and quantify the impact of various causes upon driving efficiencies would be considerable and beyond the scope of the current resources available. Action Plan: Efficiency trackers are currently being used in Maintenance and Operations & Customer Services functions to record efficiencies at a local level. Once this system has become embedded the outputs of this work stream will be assessed to see whether these could provide a list of how all efficiencies have been achieved.	Ongoing	We consider this response risks being too slow. We think this sort of activity is essential to increase the reliance that can be placed in efficiencies included in the CEM/REEM. The fact that the level of resources required to "identify and quantify the various causes…driving efficiencies would be considerable" reflects the challenge associated with creating an audit trail for efficiencies being declared by the business. The Efficiency Trackers mentioned in Network Rail's response do not appear to contain the sort of quantified estimates of impact we were anticipating. We are unable to comment on the effectiveness of this measure in recording how efficiency reported by the CEM has been delivered.
2010.CEM .9 (May	Auditable 'efficiency improvement plans' with clearly defined owners,	A Key deliverables schedule is now included in the periodic	Complete	In the P12 Finance Board pack we received, we could not find a key deliverables schedule.

Reference	Recommendation	Network Rail response	NR status[84]	Arup comments in light of work completed to date as part of this review
2010)	impacts and timescales should be produced covering the delivery of efficiencies. These should give details of the positive management actions lying behind savings. Consideration should be given to monitoring progress against the plans using Earned Value type analysis	Finance Board pack. This states the key actions required to achieve financial targets and the progress against these targets.		

Table 29: Previous selected recommendations made by Arup in relation to evidence to support Network Rail efficiency statements

6.9.2 Current recommendations

We set out in Table 30 our recommendations based on our review of the evidence base supporting the renewals efficiency reporting process.

No.	Recommendation to Network Rail
2011.RA.6	We recommend the implementation of a robust, documented procedure for the monitoring and analysis of unit cost efficiencies through which specific forward-looking efficiency targets are embedded into the efficiency reporting process. This should encompass the following: • Prior to commencement of a given financial year, baseline and target unit cost values for each individual unit cost category are fully documented. This should set out tangible and quantified positive management actions / specific measures, on the basis of which the target efficiency levels for the given unit costs are established; • Progress against target unit cost efficiency level to be documented and monitored on a quarterly basis throughout the year. Areas of emerging uncertainty / divergence from target efficiency levels should be reviewed. • Documented review of actual unit cost efficiency level vs. target at year-end, including progress in relation to specific positive management actions for each unit cost category (see also recommendation RA8), Should any alterations be made to the original baseline unit cost value or the calculation approach, this should be fully documented and justified.
2011.RA.7	We recommend the implementation of a robust, documented procedure for the monitoring and analysis of efficiencies for non-volume based asset categories, through which specific forward-looking efficiency targets are embedded into the efficiency reporting process. This should encompass the following: • Prior to commencement of a given financial year, baseline and target total expenditure for each asset category (and sub-category) are fully documented. This should set out tangible and quantified positive management actions / specific measures, on the basis of which the target efficiency levels for the given unit costs are established; • Progress against target efficiency level to be documented and monitored on a quarterly basis throughout the year. Areas of emerging uncertainty / divergence from target efficiency levels should be reviewed. • Documented review of actual efficiency level vs. target at year-end, including progress in relation to specific positive management actions for asset category / sub-category (see also recommendation RA8), Should any alterations be made to any original baseline values or the

No.	Recommendation to Network Rail
	calculation approach, this should be fully documented and justified.
2011.RA.8	To support the documented efficiency monitoring and analysis procedures set out under recommendations RA6 and RA7, we recommend that Network Rail develops specific tests / criteria setting out minimum requirements for the provision of "bottom-up", asset specific evidence through which declared efficiencies for each asset type / unit cost category are substantiated. This should include: • Quantifiable evidence of positive management actions. • Bottom-up evidence of the robustness and sustainability of the nature and volume of work undertaken for the given asset category.
2011.RA.9	We recommend that Network Rail and the ORR explore options for alteration of the methodology by which volume efficiency is calculated in the CEM, to enable any uncertainties in relation to forward-looking / CP4 volumes, associated with deferral and deviation/slippage vs. plan, to be taken into account within the volume efficiency calculation.
2011.RA.10	We recommend that Network Rail and ORR to review asset policies and how they influence and shape work banks. These may well have help to reduce the level of uncertainty associated with the sustainability test on NR's asset policies that ORR performed previously.

Table 30: Recommendations for renewals efficiency evidence base

7 MUC (Maintenance Unit Cost) Confidence Grading Analysis

7.1 Introduction

We set out in this chapter our Confidence Grading Analysis of Maintenance Unit Costs included in the FY10/11 Regulatory Accounts.

Statement 14 of the FY10/11 Regulatory Accounts provides an overview of MUCs from both FY09/10 and FY10/11, although this is limited to just 22 MNT codes out of over 45 MNT codes that are routinely reported against. (All 45 of the MNT codes are utilised for the calculation of maintenance efficiency feeding into the CEM efficiency measure). The 22 MUCs reported in the 2010/11 Regulatory Accounts are the same MNT codes as reported in the 2009/10 Annual Return.

We reproduce the MUCs provided in Statement 14 of the Regulatory Accounts in Table 31 below.

Ref	Description	Unit of Measure (unit)	2010/11 Unit Cost (£/unit)	2009/10 Unit Cost (£/unit)	Movement
MNT001	Manual Ultrasonic Inspection of Rail	Rail Mile	373	340	-33
MNT002	Rail Changing	Rail Yard	173	115	-58
MNT003	Manual Spot Re-sleepering	No. of Sleepers	193	178	-15
MNT004	Plain Line Tamping	Track Mile	5630	4321	-1309
MNT005	Stoneblowing	Track Mile	2665	3955	1290
MNT006	Manual Wet Bed Removal	No. of Bays	132	141	9
MNT008	S&C Unit Renewal	No. of S&C units	12848	10608	-2240
MNT010	Replacement of S&C Bearers	No. of S&C Bearers	310	221	-89
MNT011	S&C Arc Weld Repair	No. of Repairs	533	708	175
MNT013	Level 1 Patrolling Track Inspection	Each	70	87	17
MNT015	Weld Repair of Defective Rail	Repairs (weld)	466	513	47
MNT016	Installation of Pre-Fabricated IRJs	No. of Joints	1653	1429	-224
MNT019	Manual Correction of Plain Line Track Geometry	Track Yards	16	19	3
MNT020	Manual Reprofiling of Ballast	Track Yards	3	4	1
MNT026	Replenishment of Ballast Train	Tonnes	19	18	-1
MNT027	Maintenance of Rail Lubricators	Each	92	219	127
MNT029	Signs	Sleepers	15	20	5
MNT050	Point End Routine Maintenance	Services	53	58	5
MNT051	Signals Routine Maintenance	Services	76	91	15
MNT052	Train Detection	Services	55	54	-1
MNT077	Drainage	Drainage Yards	7	7	-
MNT073	Replacement of Pads & Insulators	Track Miles Inspections	5	5	-

Table 31: MUCs as presented in Statement 14 of the Regulatory Accounts

7.2 Results of previous Confidence Grading analysis

Arup completed a previous data quality and confidence grading analysis of MUC unit costs in September 2010[85]. This review focused both on input data quality and accuracy, and levels of robustness of underlying processes and systems from which the MUC figures were formulated.

Our analysis resulted in the assignment of a Confidence Grading of C4; this comprised:

- a Reliability Grading of "C": some significant shortcomings in the process which require urgent attention; and
- an Accuracy Grading of "4": accuracy level outside +/-10%, but within +/-25%.

Our report also highlighted key areas for improvement, and provided recommendations on this basis. We review progress made against recommendations below.

7.3 Key developments and outstanding issues

7.3.1 Summary and timeline of key MUC developments

Our previous review (AO/003) of MUC data entailed a comprehensive review of the MUC process, data quality and systems. To avoid duplicating this work, the focus of this section of our review is on key developments during FY10/11 (since the AO/003 review was undertaken), together with an assessment of progress against recommendations. We review how improvements have been implemented and issues have been addressed, and assess how this is likely to impact on data quality and reliability.

Overall a great deal of focus has been given to Maintenance Unit Costs within Network Rail during the last year. It has been evident that improving MUCs has been considered important with the introduction of a governance structure and communication initiatives supported at Director level.

A number of key measures have been implemented over the course of FY 10/11, including the following:

- Period 1 - A data quality report highlighting work order flagged as complete with zero volume was developed. This is published every Thursday and emailed to all section planners to correct the information in time for weekly KPI 1 which is produced on Fridays.
- Period 4 - MUC Metrics began.
- Period 5 - A new Plan vs Actual report was drafted and fed to all Route Infrastructure Maintenance Directors (RIMDs) for feedback before it was commissioned to be developed in Business Objects. The report was made available in period 10 and it outlines:
    - Volume of work completed at MNT level for the last period.
    - Volume Planned at MNT level for the last period.

[85] Arup Independent Reporter (part A) mandate AO/003: NR Annual Return Audit 2009/10

  - Plan vs Actual variance for last period.
  - Volume of work completed at MNT level for YTD.
  - Volume Planned at MNT level for YTD.
  - Plan vs Actual variance for YTD.
  - Variance in YTD volume of work delivered between current and previous year.
  - Required run rates for remaining periods to meet the year end volumes.
- Period 7 - Obtained list of productivity champions from all 40 Infrastructure Maintenance Delivery Managers. Working with Asset Reporting team, we highlight all work orders with large volumes and forward to the relevant champions to verify or make the appropriate adjustments. This is a weekly exercise.
- Period 8 – MUC League table rolled out along with the non-labour exception report.

In addition to the above, from Period 7 onwards, a programme of monthly meetings was introduced involving a Steering Group, National Working Group and Route Working Group.

Network Rail also developed a MUC Process Handbook, which was finalised and issued in March 2011 – shortly before the end of the Financial Year.

We take the above developments into account in our updated Confidence Grading assessment, although it is important to note the following:

- Firstly, the timing of this review is such that the developments and improvements outlined above will at best have an impact on the data quality of MUC figures in the regulatory accounts, given that these have been collated over the whole of the year (i.e. since April 2010); many of the improvements are still planned, or so early in the implementation stage that they will not impact MUCs reported for FY10/11 at all.
- Secondly, we consider that a number of process-related recommendations necessary to improve reliability remain outstanding.

Nevertheless, we have sought to form a view of reliability by focussing upon what we consider the status of the MUC process "as is" – thereby taking into account the measures we consider to have already been having a real impact on the MUC process at the end of FY10/11.

7.3.2 Progress in relation to previous recommendations

We set out in Table 32 overleaf Arup's recommendations from our previous review of September 2010,[86] together with the progress made by Network Rail in response, and our comment in that regard.

[86] Arup Independent Reporter (part A) mandate AO/003: NR Annual Return Audit 2009/10

Ref.	Recommendation	Progress	Arup comment
2010. MUC. 8	We recommend that a comprehensive and detailed MUC handbook is produced, that encompasses as a minimum:		The Maintenance Unit Cost Process has been written in a format which aids people involved in the day to day management of systems to ensure consistency in approach and application across Network Rail. This forms a useful guide that can be referred to each month by parties involved in the MUC process. Whilst this is part of what was requested, there is still a lack of detail and documentation surrounding the design of the source data systems and the mechanisms of how these feed the MUC calculations. This makes it difficult to achieve robust change management, assess the implications of changes and carry out comparisons between years.
	• A system and data process map.	• A very high level map has been produced, but this does not contain the level of detail expected.	
	• A data dictionary describing the relevant fields from the source systems.	• This has not been included in the new process.	
	• A register of documents and standards supporting both the MUC process and the source systems.	• This has not been included in the new process, although some other documents are referred to.	
	• Instructions for the correct entry and processing of relevant data through the Ellipse, OTL and BMIS systems. (This should include data validation checks.)	• The process contains information on what needs to be done and highlights what to do when a situation outside of the norm occurs. Other processes are referred to, relating to how to use the systems.	
	• A process overview documenting the extraction of data from source systems through to formulation of MUC figures.	• The process focuses on the entry of data into the source systems. There is no mention how this data are extracted or how the MUC figures are calculated.	
	• A list of data validation reports, with brief details of the content and purpose of each report.	• Fully implemented.	
	• Definition of responsibilities for each action.	• Fully implemented.	

Ref.	Recommendation	Progress	Arup comment
	• Timeline(s) showing when each of the above process steps should be carried out.	• Fully implemented. Also includes day by day breakdown of responsibilities by role.	
	• Change control on each of the above documents.	• Steering Group and Working Groups are mentioned but there is no mention of change control governing the process, calculations or systems contributing to the MUC calculations.	
2010. MUC. 9	As part of Network Rail's development of a business case for linkage of key MUC input systems (see note 1 below), we would recommend that time recorded in OTL is linked back to the level of individual Work Order number (as it in Ellipse). This would provide a full audit trail for labour cost booked, ensures consistency and makes the correction of misallocated time easier. This also enables costs to be re-allocated if the definition or mapping of Standard Job numbers to a particular MUC changes.	NR is proposing to record hours in Ellipse from Period 1.	The action to address this recommendation appears reasonable, although this will not have had an impact on MUC figures calculated during the reporting period (FY 10/11) covered by this report.
2010. MUC. 10	We recommend an alteration of the data inputting fields in the NROL system (which feeds into the General Ledger) to enable the manual inputting / amendment of the MNT code allocated to a given material order (presently this is fixed for the given material type and cannot be altered by the user).	NR has proposed to meet this recommendation by allocating materials at a standard rate in the future. Further discussion is needed to ascertain whether this response will rectify the issue being addressed by this recommendation.	The action to address this recommendation appears reasonable, although this will not have had an impact on MUC figures calculated during the reporting period (FY 10/11) covered by this report.

Ref.	Recommendation	Progress	Arup comment
2010. MUC. 11	We recommend reconfiguration of data fields attached to materials orders held within the NROL system, so that the Work Order that the materials are being used for is entered as a mandatory field at the point of order placement. This would enable the materials order to map directly to the Work Order and its associated MNT code, thereby avoiding the misallocation of materials costs to the incorrect MNT code in the General Ledger. [87]	NR has proposed to meet this recommendation by allocating materials at a standard rate in the future. Further discussion is needed to ascertain whether this response will rectify the issue being addressed by this recommendation.	The action to address this recommendation appears reasonable, although this will not have had an impact on MUC figures calculated during the reporting period (FY 10/11) covered by this report.
2010. MUC. 12	Development of an IT application that enables the full range of relevant materials data from the General Ledger feeding the MUC calculations to be controlled, before the data are posted at the end of each period. This should be configured to enable Section Management to perform quality checks for the relevant data fields more robustly, and to provide an auditable record of any input adjustments / corrections made in the General Ledger following completion of the checks. This should improve the reliability and robustness of the input data entering the MUC calculations.	The non-labour exception report is being used by all DUs to sense-check that all cost items is booked to the correct place. However, this does not address the potential for error associated with the MNT Data spreadsheet, which would hinder the ability to perform the above check.	Whilst a sense check is being carried out, there are still risks associated with the way in which NROL works and the reliance on locally held spreadsheets that may result in errors not being identified. However, as previously stated the likelihood of this happening and impacting on the MUC figures is low.

Table 32: Arup's recommendations from previous review of September 2010 (AO/003)

[87] We also note that material costs recorded in Network Rail's Internal Stock Control system are captured when the Purchase Order is raised, not when the items are used. This means that such costs are factored into the MUC calculations at a different time to when the work is carried out. This was flagged as an issue to be addressed by NR in our previous mandate (AO/003:NR Annual Return MUC and CAF Audit 2009/10, September 2010).

7.4 Approach to updated Confidence Grading analysis

7.4.1 Scope

Whilst Arup's previous Confidence Grading analysis (AO/003) focused on the assessment of a single overall Confidence Grading figure applicable to all MUCs included within the Annual Return, the mandate for this review has required individual Confidence Grading scores to be assigned for each of the 22 MUCs (i.e. each MNT code) presented within the Regulatory Accounts.

7.4.2 Approach to reliability grading

Our approach to the development of a reliability grading for the MUC figures builds upon our existing knowledge and analysis of the MUC process gained through our previous Confidence Grading review (AO/003), combined with an analysis of improvements and developments implemented by Network Rail since that time, including specifically activities that relate to Arup's recommendations (see above).

7.4.3 Approach to accuracy grading

Our accuracy grading approach combines a number of analytical calculations.

To begin with, an independent calculation of Unit Cost has been undertaken combining source data from Ellipse, BMIS and OTL systems. The resulting unit cost figures have been compared to the figures within the MUC Macro output, and an assessment made of the variances that emerge.

We have also performed an analysis of all of the MUC Macro Output files produced during week 1 and week 3 of each period during 2010/11, combining the following calculations as indicators of the accuracy level of the MUC data for each respective MNT code:

- **YTD variance** – variance between Year To Date (YTD) and baseline unit cost values. The level of variability has been reviewed for each route and for each period, and an accuracy score allocated. The analysis allows for the significant differences in MUC cost levels that will inevitably arise as a result of structural factors affecting cost levels for a given activity; hence the allocation of a variability score is based on an order of magnitude that we consider should discount structural variations for a particular MUC code, but which should identify outliers and inaccuracies.
- **Period variance** – variance between Period and baseline unit cost values for each route for each period, allocation of a variability score following the same approach as for YTD variance.
- **Costs With No Units** – review of proportion of Week 3 figures that have a cost associated with them but no volume of work recorded.
- **Units With No Costs** – review of proportion of Week 3 figures that have a work volume recorded but no cost.

- **5% Error non-correction** – measure reflecting the total impact in accuracy terms of uncorrected errors, assuming that 1 out of every 20 errors (i.e. 5%) goes uncorrected.

For each of the above calculations, the resulting figure for the given MNT code is correlated to an accuracy score, the logic of which corresponds to the accuracy scoring component of the Confidence Grading, i.e. "1" represents the highest level of accuracy (within +/-1%), and "5" the lowest (outside 25% accuracy band).

The average of the above indicators is calculated, and a rounding formula applied. whereby any average score that is not a whole number, i.e. that contains a decimal place, will be rounded up to the next integer (e.g. an average score of 2.0 will result in an overall Accuracy Grading of 2, but an average score of 2.1 will result in an overall Accuracy Grading of 3). This is in line with the premise for allocating Accuracy Gradings, in that an inaccuracy beyond a given threshold results in the movement to a lower accuracy category. Full details of our MUC Confidence Grading methodology are set out in Appendix L.

7.5 MUC confidence grading – results

7.5.1 Reliability

We set out in this section our Reliability Grading for the MUCs presented in the 2010/11 Regulatory Accounts. Taking into account our understanding of the MUC process as it now stands, building upon our review completed in September 2010, and analysing progress and developments since that time (see Section 7.3), we make the following general observations:

- Although significant focus has been given to improving MUCs within the Network Rail organisation during the last year, we have found that many of the measures already introduced or being introduced have not progressed sufficiently enough to significantly impact unit cost process reliability
- A major improvement from last year has been the development of the MUC Process/Handbook. However, this process is arguably very user focused and does not contain enough detail on the design, configuration and change control/documentation of the MUC system. This is of particular concern for next year given the amount of development currently underway and the need to assess the impact on the MUCs of such development.

We set out in Table 33 below the results of our Reliability Grading. Because the formulation process is exactly the same for all MUCs, the reliability grading applies to all MNT codes.

Reliability Band	Description	Comments
A	Sound textual records, procedures, investigations or analysis properly documented and recognised as the best method of assessment. Appropriate levels of internal verification and adequate numbers of fully trained individuals.	MUC process is not documented to a satisfactory level. Also, there are too many points at which errors can occur to consider the current method of producing MUCs to be the best method of assessment.
B	As A, but with minor shortcomings. Examples include old assessment, some missing documentation, insufficient internal verification, undocumented reliance on third-party data.	Without clarity and visibility of design and taking into account the amount of ongoing development surrounding the MUCs, we cannot consider that Network Rail is operating at this level.
C	**Some significant shortcomings in the process which need urgent attention.**	**We believe that the concerns previously identified which have not been adequately addressed, along with the lack of design documentation amount to a significant shortcoming in process. Therefore we consider this to be the level at which Network Rail is operating.**
D	Major shortcomings in all aspects of KPI: process unfit for purpose	The activities described give us confidence that the MUC figure produced is calculated in a consistent manner.

Table 33: MUC Reliability Grading results

7.5.2 Accuracy

We set out in the Table 34 below the results of our Confidence Grading analysis on an individual MNT-code level, with assignment of the Accuracy Grading based on the methodology described in Section 7.4.3.

(Please note that we set our full Accuracy Grading results for all MUC unit costs, including those not included within Statement 14 of the Regulatory Accounts, in Appendix L).

Accuracy by individual MNT code

MUC code	Activity Description	Reliability Score	Accuracy Score
MNT001	Manual Ultrasonic Inspection of Rail	C	2
MNT002	Rail Changing	C	2
MNT003	Manual Spot Re-sleepering	C	2
MNT004	Plain Line Tamping	C	2
MNT005	Stoneblowing	C	3
MNT006	Manual Wet Bed removal	C	2
MNT008	S&C Unit Renewal	C	2
MNT010	Replacement of S&C bearers	C	2
MNT011	S&C weld repairs	C	2
MNT013	Level 1 Track Inspections	C	1
MNT015	Weld Repairs of Defective Rails	C	2
MNT016	Installation of pre fabricated IRJs	C	3
MNT019	Manual correction of plain line track geometry	C	1
MNT020	Manual reprofiling of ballast	C	2
MNT026	Replenish Ballast Manual (train)	C	3
MNT027	Maintenance of Rail Lubricators	C	1
MNT029	Replacement of Pads & Insulators	C	2
MNT050	Point End Routine Maintenance	C	1
MNT051	Signals Routine Maintenance	C	2
MNT052	Track Circuits / Train Detection Services	C	1
MNT077	Signs	C	3
MNT073	Drainage	C	4

Table 34: MUC Confidence Gradings by MNT code

As shown in the table above, accuracy scores for individual MNT codes vary from "1" (accuracy of ±1%) to "4" (accuracy of ±25%).[88] This level of variability reflects the fact that whilst improvements in the process have been or are being implemented leading to improvements in data quality, a number of outstanding issues have yet to be addressed (as discussed in Section 7.3).

Nevertheless, with the effective implementation of the recommendations set out in Sections 7.3 and 7.5 of this report and in our previous review of the MUC framework[89], we consider that it should be within NR's capability to achieve an accuracy grade of "1" across all MNT codes.

[88] As a means of illustration, certain MNT codes were able to achieve an accuracy rating of "1" on the following basis:

- baseline MUC values were relatively close to the year-end MUC vaules;
- there were no costs recorded without work;
- there was no work recorded with no cost; and
- a low proportion of errors were corrected (e.g. assuming 5% of the errors were "missed" for the given job code, this would still lead to only a minor deviation in the unit cost below the 1% accuracy threshold).

[89] Arup Independent Reporter (part A) mandate AO/003: NR Annual Return Audit 2009/10

Summary accuracy grading

We have also provided a summary accuracy grading for the MUC figures, based on our overall assessment of MUC accuracy. This is set out in the table below.

Accuracy Band	Description	But outside +/-
1	Calculation processes automated (to a degree commensurate with dataset size); calculations verified to be accurate and based on 100% sample of data; external data sources fully verified. KPIs expected to be accurate to within ±1%.	Calculation processes are automated but there are too many opportunities for error due to manual entry of data and differences between source systems.
2	**[see note below]: KPIs expected to be accurate to within ±5%.**	**The accuracy analysis puts Network Rail close to the boundary between a score of 2 and 3. We consider the accuracy analysis to be an indicator of accuracy and not a definitive answer. Taking into account the work that Network Rail has carried out over the last year, the strong proven link between source data and MUC figures and that the analysis above gives an indication of accuracy, not a definitive figure, we consider that it is appropriate to allocate an accuracy score of 2; accurate to within 5%.**
3	Shortfalls against several attributes: e.g. significant manual input to calculations or incomplete data verification or less than 100% sampling used. KPIs expected to be accurate to within ±10%.	Our analysis of the MUC Macro data suggests that an accuracy score of 3 could possibly be appropriate but we believe that given the evidence, NR are carrying out appropriate mitigation measures to identify and correct errors; have a process which does not rely upon manual input into calculations; have put a great deal of effort into reducing data errors at source via communication, raising awareness, sharing best practice, setting up working groups etc. Therefore we consider an accuracy score of 3 to be overly conservative.
4	[see note below]: KPIs expected to be accurate to within ±25%.	See above.

Accuracy Band	Description	But outside +/-
5	Calculation processes largely manual with significant errors; data inconsistently reported and unverified; KPI based on small data sample or cursory inspections and verbal reports. KPIs unlikely to be accurate to less than ±25%.	The use of Ellipse, OTL and the General Ledger ensures that the MUC figures at MNT level are based on 100% of the data recorded rather than a small data sample. Although there is a large amount of manual intervention this is consistently reported, and processes are in place to correct errors before they are used for calculations.
X1	KPI is calculated on a very small sample of data.	
X2	Accuracy cannot be assessed for some other reason (to be qualified in text of report).	

Table 35: Summary accuracy grading for MUC data

7.5.3 Key findings for CEM Maintenance Efficiency Calculations

The maintenance efficiency figures contain visible and transparent links back to the Maintenance Unit Costs for the activities that are covered by the MUC framework and can be traced down to an appropriate level. We therefore consider there to be an auditable link between output efficiency metrics and source data for the efficiencies reported against unit costs, subject to the integrity/accuracy of the MUC process (see Chapter 7).

Other Direct Costs, especially relating to the maintenance sections, is not broken down into sufficient detail to understand how the reported efficiency figures have been achieved. Approximately 60% of the total maintenance expenditure is included in Other Direct Costs with approximately 32% belonging to the maintenance sections and approximately 26% belonging to HQ.

In order to confirm that the reported efficiencies being claimed are a result of volume and cost efficiencies associated with sustainable levels of maintenance, we consider that clear, auditable evidence is required to confirm that this level of maintenance is sustainable without jeopardizing performance, condition, underlying risk, impact on capital expenditure whilst fulfilling engineering, legal, regulatory and legislative requirements.

A detailed review of CEM maintenance efficiency calculations is provided in Appendix B.

7.5.4 Recommendations

Based on findings from our review of MUC and maintenance efficiency calculations, we summarise our recommendations in Table 36 below:

No.	Recommendation to Network Rail
2011.MUC.1	We recommend that documentation is developed through which the design of the MUC source data systems and the mechanisms of how these feed the MUC calculations is clearly defined. This should enable robust change management processes to be implemented, and enable the implications of changes to be assessed, and comparisons between years to be carried out.
2011.MUC.2	We recommend that Network Rail increases the proportion of maintenance expenditure captured on a unit cost basis in the CEM calculation, to encompass the full range of activities captured under the MUC unit cost framework .
2011.MUC.3	We recommend the development of documentation setting out in full the process through which maintenance efficiency is calculated for the purposes of the CEM / REEM is calculated.

Table 36: Recommendations for MUC and maintenance efficiency reporting

8 CAF (Cost Analysis Framework) Confidence Grading Analysis

8.1 Introduction

We set out in this chapter our Confidence grading analysis of CAF unit costs. This relates to the reliability and accuracy of renewals unit costs derived from the CAF framework, and presented in the Regulatory Accounts Statements (14, 15 and 17). CAF unit costs are used to inform the future benchmarking and modelling of unit costs for similar activities in Network Rail. CAF unit costs differ from the renewals unit costs (RUCs) utilised for CEM / REEM efficiency reporting (see Section 3.2.1).

Please note: the symbol " ✂ " indicates where cost figures within the tables in this chapter have been redacted for reasons of commercial confidentiality.

8.2 Results of our previous Confidence Grading Analysis

Full details of the CAF process can be found in our November 2010 report "Audit of the Robustness of the Network Rail Unit Cost Framework". In this report we made several recommendations with regard to the process and highlighted the issue of low coverage as being a key area for improved performance.

Subsequently, we have reviewed the reliability and accuracy of CAF in the 2010 Annual Return Audit. We reviewed a sample of renewals projects and the CAF returns produced. Our confidence rating in relation to CAF unit costs at this time was C3.

8.3 Key developments

Since the Annual Return review, Network Rail has reviewed the CAF process and the overarching estimating service under which the CAF process is applied. In meetings, Network Rail has described its objectives for the estimating service and identified a transformation programme with the following workstreams:

1. Refresh procedures.
2. Re-engage with staff/consultants to set service expectations.
3. Roll our UCM (Unit Cost Model) into Investment Authority processes.
4. Develop and issue an estimating service bulletin.
5. Improve benchmarking data.
6. Develop performance metrics.

All of the above workstreams were scheduled to be completed in 2010/11.

Workstreams 3, 5 and 6 listed above relate specifically to or involve the CAF process. The UCM is a benchmarking analysis tool that incorporates the data produced by the CAF on a project by project basis. If not included in the Investment Authority process the usefulness of the CAF data would be very

restricted; we therefore consider the inclusion and practical use of the UCM as a positive step towards Network Rail demonstrating a detailed understanding of the cost of renewals delivery.

Network Rail has stated that improving benchmarking data and developing performance metrics requires the improvement of CAF in the following areas:

- Coverage.
- Data quality.
- Products (CAF Log, CAF Tracker, CAF Returns).
- Unit Cost Models.
- Supporting documentation, briefings and training.

Our review has focused on these issues and the steps taken by Network Rail in response to our previous recommendations.

8.4 Progress in relation to previous recommendations

The following table sets out our previous recommendations from the 2010 review of CAF and our findings with respect to the progress made in the period.

No.	Recommendation to Network Rail	Progress since previous review
2010.CAF.1	Implement management action plans to resolve non-coverage at local level for the asset categories identified. Clearly demonstrate to the Regulator that low coverage is being addressed.	CAF coverage has greatly increased in the period to 96%. This is particularly good performance given that track data (that historically achieves >90% coverage) are not included in this figure.
2010.CAF.2	Identify actions to be taken to deal with the "lag" (delay in capturing CAF data for a given control period due to the length of time for some projects to be closed out and CAF data captured) evidenced by this year's CAF returns - particularly with regard to the needs of PR13.	CAF data are clearly being captured more quickly due to improved overall management of the process. However a risk still exists with respect to the availability of data for use at PR13.
2010.CAF.3	Identify track renewals process benefits and implement across other asset categories particularly with regard to a "programme" approach to procurement and delivery	Network Rail noted our comments although no significant changes appear to have been made in this regard.
2010.CAF.4	Improve the quality of Work Instructions with regard to context, roles and responsibilities (e.g. RACI matrix) and toolboxes. Consider the use of process "Champions" by territory to provide advice and	Work Instructions have not yet changed greatly in response to our recommendation. Greater focus has been given to achieving higher levels of

No.	Recommendation to Network Rail	Progress since previous review
	guidance.	coverage. We maintain our previous comments in light of the results of this review.
2010.CAF.5	Performance measurement is clearly labour intensive. Review whether present staffing levels are sufficient to comply fully with the CAF process	Network Rail has indicated that coverage has improved using existing levels of resource. We consider this appears reasonable, although we have not independently reviewed this issue.
2010.CAF.6	Consider the use of refurbishment project categories to reflect the extent of work (e.g. Cat A to C is common in the commercial fit-out sector). Present structure is basic and external consultation with sector experts may be advisable.	No further action has yet been taken in this regard. The present RWI structure remains basic.
2010.CAF.7	Implement target benchmark rates into the UCM for RWIs where new technologies or construction methods are being implemented. This would provide greater visibility of performance targets and provide a benchmark to monitor future performance.	No evidence has yet been provided that this action has been considered within the scope of this review. We maintain that this recommendation should be given further consideration.

Table 37: Previous CAF recommendations and progress since previous review

In summary, progress from our previous review has focused on the improvement of CAF coverage, improving data integrity and utilizing Unit Cost Modeling to a greater extent.

CAF coverage for GRIP 7 reportable projects (excluding enhancements and track) in the period has risen to 96% for all CAF 7 returns. This represents 330 reported projects out of a total of 350. Coverage by value is £633m versus a maximum achievable of £661m or 96%. This compares to overall spend in renewals in the period (excluding track) of £1.569bn or 42%. Network Rail attributes the variance between CAF value and actual spend in the period to work currently in progress.

The following table details the CAF data by asset category obtained in 2010/11. It should be noted that Track data, which are not compiled using the CAF process (Track uses P3e and the MBR process), are not included in the data. However, Track unit coverage is greater than 90% in 2010/11 and does therefore not materially affect the levels of coverage achieved.

From our discussions with Network Rail we understand that this improvement has been largely the result of behavioural change and greater diligence in the tracking and production of CAF returns. Raising awareness of the importance of producing CAF returns has been a significant factor in improved performance.

The improvement of CAF coverage in 2010/11 is significant and addresses a key concern raised in our 2010 report. Collating cost data is extremely important for Network Rail but wider understanding and use of the data is the next logical step, increasing cost awareness across the business. The processes and the tools used to achieve the objective of increased cost awareness should continue to evolve and improve so long as they continue to demonstrably contribute to improved business performance.

CAF 7 ANALYSIS		ANTICIPATED		YEAR TO DATE			
Value (Project AFC £m)		P 13	TOTAL	Expected	Actual		Diff.
AM.SPC		1.8	91.6	91.6	84.0	92%	7.6
IP.B&C		21.9	191.6	191.6	177.1	92%	14.4
IP.ENH		455.2	591.6	591.6	555.7	94%	35.9
IP.S&E			364.4	364.4	363.8	100%	0.5
IP.TLK			8.1	8.1	8.1	100%	
UNASSIGNED			*5.0*	*5.0*			*5.0*
CAF 7 EXPECTED TOTAL	Period	478.9	1,252.3	1,252.3	1,188.7	95%	63.5
	Cumulative	*1,252.3*					

Table 38: CAF 7 analysis

8.5 CAF Confidence Grading approach

8.5.1 Approach to reliability grading

Our approach to the development of a reliability grading for CAF unit costs is based on our existing knowledge of the CAF process and our findings regarding the developments made in the intervening period. Measures taken to address our previous concerns are also taken into account if relevant.

8.5.2 Approach to accuracy grading

Our approach to determining the accuracy of CAF unit costs is based on an analysis of a sample of CAF returns. As per our review of the Annual Return in 2010 our process is as follows:

1. Obtain CAF returns: these are sourced for a selection of high value (e.g. significant in audit terms) projects from the Network Rail Central Estimating Team.
2. Quantitative check: The costs stated within the CAF return are validated by cross checking with Oracle Projects (OP), the finance system used to manage renewals projects.
3. Qualitative check: The CAF returns are reviewed to identify any gaps in information at individual GRIP stages.

4. RWI check: We have reviewed the appropriateness of the RWI (Repeatable Work Item) used to calculate volume compared to the scope of work described.
5. Review of discrepancies with the Central Estimating Team.
6. Determine accuracy and corresponding Confidence Grading.

Step 4 is taken to ensure that errors are not escalated when a reasonable explanation may exist for the discrepancy identified.

It should be noted that the review of volumes presented in the CAF returns and their accuracy is the subject of a separate mandate relating to the assessment of renewals volume reporting by Network Rail (mandate AO/013).

The following table identifies the projects completed to GRIP Stage 7 selected for review. The sample represents £246m of project costs or 39% by value of the CAF returns produced in 2010/11 in renewals (excluding enhancements and track).

Western region	LNW region	SEA region	SEA region	SEA region
Buildings project refs.	Civils project refs	Signalling project refs	Telecoms project refs	Electrification project refs
104335	FFE36A	HH7850	104570	101522
104431	104209	BBM250	112253	107128
104435	114904	BBB440	101364	101527
107687	109359	BBC160	101885	HHR814
108820	100552	HHR747	106667	BBI180
111276	108737	101878	103873	109257
686976	115391	HHR707	106654	
112476	EEPG58	101858	106658	
108458	105038	101859		
111297	114907	100394		

Table 39: GRIP 7 stage projects selected for CAF unit cost data quality review

The following sections detail our findings with regard to each asset category.

8.6 CAF Confidence Grading Analysis: Results

8.6.1 Operational property review results

Table 40 below details the results of the Buildings analysis:

Territory: Western	CAF Return	OP Analysis			
Buildings Project ID	**CAF Return Total Cost (£)**	**Actual cost (£)**	**Forecast cost (£)**	**Variance: CAF total cost vs OP Forecast**	**Variance: CAF total cost vs OP actuals**
104,335	✂				
104,431	✂				
104,435	✂				
107,687	✂	✂	✂	-6.7%	-5.5%
108,820	✂	✂	✂	2.8%	3.0%
111,276	✂	✂	✂	0.7%	0.7%
686,976					
112,476	✂	✂	✂	0.6%	10.5%
108,458	✂	✂	✂	-0.8%	-0.6%
111,297	✂	✂	✂	7.6%	11.7%

Table 40: CAF return analysis for operational property

Of the selected projects, project 686976 was eliminated due to an error in project identification.

The CAF returns provided by the Central Estimating Team were reviewed, and it was identified that three projects (104335, 104431, 104435) were incorrectly categorised as Renewals projects when they were in fact Enhancement projects. This was due to an error in the production of the CAF returns.

- When compared to the project data in Oracle Projects (OP) the variance between CAF return was found to be between 0.6 to 12%. Variances are most commonly due to unresolved final account agreements
- Unresolved supplier claims
- Network Rail withholding retention payments

These are acceptable reasons for variances in the CAF return versus OP data and a Network Rail Work Instructions exist to provide guidance on when CAF returns should be reviewed. At the present time, CAF returns are reviewed when final accounts or payments have been made effectively closing the project. This is frequently some months after GRIP Stage 7. If the variance is less than 5% then it is not considered cost effective to amend the CAF return. Variances greater than 5% require the CAF return to be amended. In our opinion, a tolerance of 5-10% should be applied when reviewing the data before the variance can be considered to be significant in audit terms. In summary, our review identified errors in Buildings CAF returns of £7.8m or 3% of the sample size due to incorrect completion of the CAF. The variances in excess of 5% identified between CAF total costs and costs and forecasts in OP were not considered to be material

although future reviews must identify if and when corrective actions have been taken.

8.6.2 Civils review results

Table 41 below details the results of the Civils analysis:

Territory: LNW	CAF Return	OP Analysis			
Civils Project ID	**CAF Return Total Cost (£)**	**Actual cost (£)**	**Forecast cost (£)**	**Variance: CAF total cost vs OP Forecast**	**Variance: CAF total cost vs OP actuals**
FFE36A	✂	✂	✂	-0.4%	0.6%
104209	✂	✂	✂	33.6%	40.0%
114904	✂	✂	✂	7.9%	7.9%
109359	✂	✂	✂	5.4%	5.5%
100552	✂	✂	✂	-4.9%	-1.3%
108737	✂	✂	✂	-0.3%	-0.2%
115391	✂	✂	✂	3.7%	11.5%
EEPG58	✂	✂	✂	-7.4%	1.2%
105038	✂	✂	✂	79.1%	79.5%
114907	✂	✂	✂	-6.4%	4.4%

Table 41: Civils CAF return analysis

Of the selected projects, the CAF returns for projects 104209 and 105038 were found to have significant variances in actual costs versus those presented in the CAF return. The causes of these variances were identified as follows:

104209 – Correct CAF return compiled by the project team but not included in the CAF database.

105038 – CAF return drafted by Network Rail contractor responsible for the works. Track mobilization costs of £683k are double counted in the CAF.

Notably, both errors are procedural in nature with the appropriate cross checks not being made on the costs presented in the CAF versus the costs presented in OP.

In summary, the variances identified represented 32% of the sample size for the Civils asset category. Errors are considered to be the result of inadequate checks of contractors CAF submissions. The high quantity of Civils projects and corresponding CAF returns compared to other asset categories may also be a factor in the errors identified.

8.6.3 Signalling review results

Table 52 below details the results of the Signalling analysis.

Territory: SEA	CAF Return	OP Analysis			
Signalling Project ID	**CAF Return Total Cost (£)**	**Actual cost (£)**	**Forecast cost (£)**	**Variance: CAF total cost vs OP Forecast**	**Variance: CAF total cost vs OP actuals**
HH7850	✂	✂	✂	-0.9%	-0.1%
BBM250	✂	✂	✂	0.0%	0.3%
BBB440	✂	✂	✂	0.0%	0.2%
BBC160	✂	✂	✂	0.0%	1.6%
HHR747	✂	✂	✂	0.0%	0.0%
101878	✂	✂	✂	0.0%	0.0%
HHR707	✂	✂	✂	0.0%	0.0%
101858	✂	✂	✂	0.0%	0.0%
101859	✂	✂	✂	0.0%	0.0%
100394	✂	✂	✂	-3.1%	0.4%

Table 42: Signalling CAF return analysis

As shown, no material issues were identified with the project sample. All project data was within acceptable tolerances.

8.6.4 Telecoms review results

Table 43 below details the results of the Signalling analysis:

Territory: SEA	CAF Return	OP Analysis			
Telecoms Project ID	**CAF Return Total Cost (£)**	**Actual cost (£)**	**Forecast cost (£)**	**Variance: CAF total cost vs OP Forecast**	**Variance: CAF total cost vs OP actuals**
104570	✂	✂	✂	0.1%	0.1%
112253	✂	✂	✂	-18.0%	-11.6%
101364	✂	✂	✂	0.0%	0.4%
101885	✂	✂	✂	0.0%	13.9%
106667	✂	✂	✂	0.0%	17.2%
103873	✂	✂	✂	-1.1%	3.1%
106654	✂	✂	✂	-0.5%	1.3%
106658	✂	✂	✂	-3.4%	-2.1%

Table 43: Telecoms CAF return analysis

From the project sample, three projects were identified that had tolerances outside of what could reasonably be expected. The projects represent 7.3% of the sample taken for telecoms projects.

The variances were found to be due to the negotiation of final account agreements for all three projects. Whilst variances were significant the causes were found to be legitimate and would be adjusted under the guidance of the relevant Work Instruction. These inaccuracies have therefore not been included or considered material in the context of our audit.

8.6.5 Electrification review results

Table 54 below details the results of the Electrification analysis:

Territory: SEA	CAF Return	OP Analysis			
Electrification Project ID	**CAF Return Total Cost**	**Actual cost**	**Forecast cost**	**Variance: CAF total cost vs OP Forecast**	**Variance: CAF total cost vs OP actuals**
101522	✂	✂	✂	0.7%	0.7%
107128	✂	✂	✂	0.0%	0.2%
101527	✂	✂	✂	-0.4%	0.0%
HHR814	✂	✂	✂	0.0%	1.2%
BBI180	✂	✂	✂	0.0%	0.0%
109257	✂	✂	✂	-9.3%	-8.6%

Table 44: Electrification CAF return analysis

As shown, no material issues were identified with the project sample. All project data were within acceptable tolerances.

8.7 Summary of accuracy grading

Table 55 below summarises our assessment of the accuracy of CAF unit costs:

Asset	Sample size	Value of material inaccuracies (£)	Inaccuracy	Cause (Procedural/Financial)
Buildings	16,627,048	7,793,186	46.9%	Procedural: CAF returns submitted as Renewals projects when actually Enhancements
Civils	24,314,472	7,681,463	31.6%	Procedural: CAF return filled in incorrectly.
Signalling	163,084,561	-	0%	No issues identified
Telecoms	19,641,173	-	0%	High variance (in excess of 10%) between CAF return and actual costs identified however these were explained as being the result of final account

				negotiations. Forecast costs variances also noted
Electrification	21,978,442	-	0%	No issues identified
Totals	**245,645,696**	**15,474,649**	**6%**	

Table 45: Summary of CAF unit cost accuracy

For the purposes of the review, where a material issue has been identified in the sample, the value of the project and the CAF return is deemed to be inaccurate. The total value of CAF returns considered to be inaccurate is shown in the above table is has a material impact on accuracy of 6%.

In summary, based on our analysis of the measures taken in the period and the assessment of accuracy undertaken above we believe an appropriate Confidence Grading to be **B3.**

It should be noted that if not for the errors in process identified (e.g. errors in CAF data such as project reference) the Confidence Grading would have been B2 as few material cost variances were identified.

8.8 Recommendations

We provide our recommendations for CAF in Table 46 below:

No.	Recommendation to Network Rail
2011.CAF.1	We recommend the implementation of additional checking procedures to audit the data reported in the CAF returns . This should occur at the territory level before submission to the Central Estimating Team.
2011.CAF.2	We recommend the high number of procedural errors, particularly in Buildings and Civils asset categories, is investigated and corrective actions are identified.
2011.CAF.3	We recommend that a process is put in place whereby CAF returns are systematically cross checked against OP (Oracle Projects) and material variances explained to the Central Estimating Team.
2011.CAF.4	We recommend that Network Rail investigates the use of alternative IT platforms for the CAF process to accommodate the volume of data anticipated in future years and Control Periods. The use of the current IT platform (Excel) presents risks to the collation of data in the future.

Table 46: CAF recommendations

We also consider that the actions identified in our review of previous review recommendations remain valid at this time.

8.9 Track review results

Track audit data was provided by the Central Estimating Team and consisted of a number of spreadsheets detailing the costs of individual projects in the following territories:

- Scotland
- London North East
- London North West (including Northern & Southern sub-territories)
- South Eastern (including Anglia/Wessex and Sussex/Kent sub-territories)
- Western (including Wales)

As such, the data presented consists of Period 10 data drawn from all Network Rail territories.

Table 47 overleaf details the total cost and volumes presented in the Period 10 data:

Plain line		
Territory	**Cost (£m)**	**Volume (km)**
London North East	✂	424
London North West	✂	321
Scotland	✂	129
South East	✂	254
Western	✂	473
Totals	✂	1,602
S&C		
Territory	**Cost (£m)**	**Volume (units)**
London North East	✂	71
London North West	✂	66
Scotland	✂	34
South East	✂	107
Western	✂	108
Totals	✂	386

Table 47: Track Period 10 costs and volumes

The above data can be consolidated to present an overall picture for track renewals unit costs as follows:

Category	Cost (£m)	Volume	Units	Unit Cost (£k/unit)
Plain line	337.92	1,602	km	210.94
S&C	157.55	386	No	408.16

Table 48: Track Period 10 unit costs

This compares to the data in Table 49 below as summarised in the 2010/11 Regulatory Accounts.

Category	Cost (£m)	Volume	Units	Unit Cost (£k/unit)
Plain line	405.90	1,557	km	260.70
S&C	147.90	347	No	425.90

Table 49: Track unit cost data in 2010/11 Regulatory Accounts

For the above comparison we have drawn the following conclusions:

1. Plain line actual costs recorded at Period 10 are commensurate with the full year position
2. Plain line volumes recorded at Period 10 appear inaccurate compared with the full year position
3. S&C actual costs recorded at Period 10 are in excess of the full year position. Some adjustments have therefore been made in the following three periods
4. S&C volumes recorded at Period 10 appear inaccurate compared to the full year position.

Of the above conclusions, we consider that items 2, 3 and 4 would require further investigation to understand how costs and volumes have changed between periods 11 and 13. The use of Period 10 data is clearly a factor although we would expect to see a broader correlation between the data and the end of year position.

In summary, with the data set available it is not possible to determine a confidence grading explicitly for track renewals unit costs presented. However, we consider that the processes and procedures in place for recording track volumes and costs have not changed significantly since our 2010 Annual Return Audit and that the reliability and accuracy of track data remains the same.

Further information would be required to identify the finalised Period 13 costs that relate to the Regulatory Accounts unit costs presented on a disaggregated basis showing any adjustments made by the central Finance Team. On this basis we consider that the overall grading for CAF unit costs including those presented for track is **B3**.

9 Regulatory Accounts Statements Data Review

9.1 Introduction

We set out in this chapter our review of the following specific statements within the Regulatory Accounts:

- Statement 8b (parts (1) and (2) – Analysis of maintenance expenditure by MDU
- Statement 9b – Detailed analysis of renewals expenditure
- Statement 12 – Analysis of efficiency (year-on-year economic efficiency measure)
- Statement 13 – Volume Incentives
- Statement 14 – Unit Costs
- Statement 15 – Renewals unit costs and coverage
- Statement 16 – Renewals - track unit costs and volumes
- Statement 17 – Other

We also reproduce Arup's opinion letter with regard to the regulatory accounts statements 2010/11, provided on 22nd July 2011.

9.2 Statement 8b : Maintenance costs

9.2.1 Statement 8b (part 1) – Analysis of maintenance expenditure by MDU

We summarise our review of Statement 8b (part 1) in Table 50 below:

Review area	Arup Assessment
Whether the breakdown of spend by asset category by MDU is consistent with the remainder of the Regulatory Accounts	The breakdown of spend by MDU in this statement is consistent with the way that headcount is broken down by MDU in Statement 8b (part 2). No breakdown of spend by asset is shown in this statement.
Whether the amounts of spend by MDU agrees to the underlying accounting records and have been correctly extracted	Spending data shown in this statement have been compiled directly from Hyperion, Network Rail's financial management system. Total maintenance expenditure for the current year shown in this statement also matches the figure used for calculating CEM efficiency for maintenance activities and Network Rail's own MUC analysis.
Where costs have been allocated, whether this allocation has been made on a reasonable basis and any other estimate used is reasonable	The maintenance costs allocated to each MDU are reasonable and in line with allocation in the underlying accounting system.
Whether the sub-totals and totals in the table down cast and cross cast	The sub-totals and totals in the table presented and spreadsheet used for the calculations down cast and cross cast correctly.
Whether the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts	Disaggregated maintenance expenditures for England and Wales and Scotland add up to the Great Britain maintenance expenditures.
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation	Network Rail's narrative on the table is a fair representation of the data presented in this statement and relevant accounting records. No commentary has been provided in the underlying accounting records.

Table 50: Review of Statement 8b (part 1) – Analysis of maintenance expenditure by MDU

9.2.2 Statement 8b (part 2) – Analysis of maintenance headcount by MDU

We summarise our review of Statement 8b (part 2) in Table 51 below:

Review area	Arup Assessment
Where headcounts have been allocated, whether this allocation has been made on a reasonable basis and any other estimate used is reasonable	Headcount allocated to MDUs appears reasonable and consistent with the accounts from which these data have been extracted. There is slight inconsistency between the ways that headcounts are allocated to Route HQ and Other HQ in this statement and in the underlying system record[90]. However the total headcount in this to the underlying system record from which data have been extracted. There is also typing error in the year heading of this statement.[91]
Whether the headcount has been correctly extracted from the underlying records and that any estimates used are reasonable	There is slight inconsistency between the ways that headcounts are allocated to Route HQ and Other HQ in this statement and in the underlying system record[90]. However total headcount in this statement agrees to the underlying system record from which data have been extracted. Total headcount also agrees to the number used for the pension adjustments applied for CEM to REEM efficiency reconciliation.
Whether the sub-totals and totals in the table down cast and cross cast	The sub-totals and totals in the table down cast and cross cast.
Whether the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts	The disaggregated headcounts for England and Wales and Scotland add up to the Great Britain total headcount.
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation	Network Rail's narrative explaining the reduction of headcount appears reasonable and agrees with the reduction in headcount number shown in the statement.

Table 51: Review of Statement 8b (part 2) – Analysis of maintenance headcount by MDU

[90] Whilst headcounts of 111and 1,231 have been allocated to 'route HQ' and 'other HQ' in the underlying system records, 86 and 1,256 have been allocated to 'route HQ' and 'other HQ' respectively in this statement.

[91] Based on information from the underlying system records and Regulatory Financial Statements for the previous year, the 'Actuals' and '2010-11' headings in this statement should read '2010-11' and '2009-10' respectively.

9.3 Statement 9b – Detailed analysis of renewals expenditure

We summarise our review of Statement 9b in Table 52 below:

Review area	Arup Assessment
Whether the breakdown of spend by asset category by total is consistent with the remainder of the regulatory accounts	Total renewals expenditure reported in this statement (£2.23 billion) is £61m higher than total expenditure figure utilised in the revised CEM and REEM renewals efficiency calculations[92] (£2.17 billion) feeding into Statement 12. The breakdown of spend by asset category is broadly in line with that found in the underlying spreadsheets used by Network Rail for renewals efficiency calculations, but discrepancies of expenditure figures in the majority of sub-asset categories have caused the variance in the total renewals expenditure figure[93].
Whether the amounts of spend by asset type agree to the underlying accounting records and have been correctly extracted	Amounts of spend by asset and sub-asset have been correctly extracted from the underlying accounting spreadsheets provided by Network Rail specifically for this statement. However, there are variances between expenditures for sub-asset categories reported in this statement and those found in the efficiency calculation spreadsheets[94], which appear to be based on a different set of underlying spreadsheets.
Where costs have been allocated between categories whether this allocation has been made on a reasonable basis and any other estimate used is reasonable	Indirect costs are allocated to sub-asset categories on a *pro rata* basis according to the proportion of the year-end actual spend each represents. We consider such allocation to be reasonable.
Whether the sub-totals and totals in the table down cast and cross cast	The sub-totals and totals in the table down cast and cross cast.
Whether the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts	The disaggregated renewals expenditures for England and Wales and Scotland add up to the Great Britain renewals expenditures.
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation.	The narratives provide Network Rail's view on the main reasons for the variance between actual renewals spending in the 2010/11 financial year and that projected in ORR's PR08 Determination. The difference between the assumed timing of works in PR08 and Network Rail's own plan has been cited to explain the difference in expenditure figures in year-end accounts and PR08. Whilst this is true, we consider that there are risks around whether total renewal volumes planned in the original Delivery Plan can be delivered by the end of CP4 given the amount of work that has been deferred in first two years of the Control Period. Refer to Chapter 6 for detailed discussion.

Table 52: Review of Statement 9b – Detailed analysis of renewals expenditure

[92] CEM REEM Summary by Assetv3.xls provided by Network Rail in June 2011.

[93] The £61m variance between total renewals expenditures presented in this statement and the revised renewals efficiency account is due to the following items, which are included in this statement but not included in the renewals efficiency calculations:

- Telecoms – concentrators, cables and routes £6m
- Operational property – lineside buildings £17m
- Other renewals £37.4m

[94] Examples for this include plain line track £413m (£405m in the revised renewals efficiency accounts), track other direct costs £44m (51m in the revised renewals efficiency accounts) and Re-signalling £227m (£135m in the revised renewals efficiency accounts)

9.4 Statement 12 – Analysis of efficiency (year-on-year economic efficiency measure)

We summarise our review of Statement 12 in ***Table 53*** below:

Review area	Arup Assessment
Whether Network Rail's calculation of its real economic efficiency measure is in accordance with its policy and is reasonable. This should include an assessment of whether the data used to calculate the measures is accurate, of a sufficient quality and consistent with the purpose of the measures	REEM efficiencies have been calculated based on the CEM measure with a number of adjustments applied[95]. The adjustments and inflation figures used in the REEM calculation are in line with Network Rail's policies as described in their CEM vs. REEM presentation[96] provided to us. This is discussed further in Appendix O. We have identified some uncertainties around the CEM renewals efficiency calculation process, which have a direct impact on REEM. These are discussed in detail in Chapters 3, 0 and 5.
Whether the amounts of income and expenditure used in the efficiency calculation agree to the underlying accounting records and have been correctly extracted	The expenditure figures used in the efficiency calculation agree to the accounting records and have been correctly extracted from underlying systems. We consider the use of the term "cumulative" may cause confusion, since this relates to a measurement of 2010/11 expenditure in comparison to the "pre-efficient" 2008/09 expenditure level, but the sum does not encompass efficiency amounts calculated from 2009/10 expenditure, and hence is not cumulative in that sense.
Whether the baselines used are the ones agreed by ORR	The adjustments made to the CEM baselines and inflation assumptions are in line with the ones agreed by ORR.
Where income or costs have been allocated that this allocation has been made on a reasonable basis and any other estimate used is reasonable	Allocation of opex, maintenance and renewals expenditures are consistent with the underlying accounts.
Whether the sub-totals and totals in the table down cast and cross cast	The efficiencies reported for opex, maintenance and renewals sum to the total efficiency reported. The 2010-11 percentage efficiencies reported are correct based on the 'cumulative' percentage efficiencies reported and the percentage efficiencies calculated for 2009-10 in the underlying spreadsheet.
Whether the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts	Disaggregated efficiency amounts for England and Wales and Scotland add up to the Great Britain efficiency amounts.

[95] We were provided with the draft version of the calculation spreadsheets for REEM and CEM, which were subsequently superseded when Network Rail sent us new accounts on 24th June 2011. No spreadsheets for the updated efficiency calculations have been provided. However, Network Rail has indicated that the new efficiency figures have been calculated with the same principles as in the draft accounts. Our comments in Table 53 are based on the draft versions of the calculation spreadsheets that we were able to review.

[96] REEM CEM for Arup Mar11.ppt

Review area	Arup Assessment
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation	Comments (1) to (4) are fair descriptions of REEM and efficiency targets. Comments (5) to (9) relate to sustainability of the efficiency savings made and the positive management actions that could have resulted in efficiencies declared. We consider there to be uncertainties around these factors. Refer to Chapter 6 for discussions on positive management actions and sustainability of renewals efficiency.

Table 53: Review of Statement 12 – Analysis of efficiency

9.5 Statement 13 – Volume incentives

A detailed discussion of the review of Statement 13 – volume incentives is included in Appendix D. We summarise our review of Statement 13 in Table 54 below:

Audit area	Arup Assessment
Whether Network Rail's calculation of its performance on the volume incentive is in accordance with the PR08 determination.	The calculation methodology used by Network Rail to calculate volume incentives generally agrees to the methodology used by ORR. We note that passenger train miles is the only volume metric that has triggered incentive payments.
Whether where income or costs have been allocated that this allocation has been made on a reasonable basis and any other estimate used is reasonable	Passenger traffic data used for the calculation of volume incentive has been taken from Network Rail's train performance database, which includes detailed and reasonable breakdown of data into routes and train operators.
Whether the sub-totals and totals in the table down cast and cross cast	The sub-totals and totals in the table presented and spreadsheet used for the calculations down cast and cross cast correctly.
Whether the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts	There is some minor error in the allocation of revenue for England and Wales[97] . Since the total accrued volume incentive payment has been calculated based on total revenue figures provided by ORR, the error does not have material impact on the total volume incentive calculation.
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation	Narrative on the table includes an explanation to the purpose of volume incentive payments and the volume incentive amounts earned in the current year. They are in line with the descriptions set out in PR08 determination and the figures presented in the statement.

Table 54: Review of Statement 13 – Volume Incentives

[97]There is a minor error in the proportion used for allocating passenger revenues to England & Wales so that the sum of passenger revenue for Scotland and England & Wales is £6 million less than the total value for Great Britain.

9.6 Statement 14 – Unit Costs

We summarise our review of Statement 14 in ***Table 55*** below:

Review area	Arup Assessment
Whether the unit costs have been calculated in accordance with the company's unit cost handbook	Unit costs have been calculated in line with methodology described in Network Rail's Corporate KPI Manual.
Whether the information to calculate the unit costs has been correctly extracted from the underlying accounting records and that any estimates used are reasonable	Actual costs and volume data have been correctly extracted correctly from the underlying spreadsheets. We consider that the visibility and traceability of the Maintenance Unit Cost data is good as is the level of granularity provided in the data.
Whether the sub-totals and totals in the table down cast and cross cast where applicable	Not applicable to this statement (unit cost data are not summed up as total / sub-total figures).
Whether applicable the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts where applicable	Whilst it appears that the disaggregated amounts for England & Wales and Scotland appear to reflect their relative weighting in terms of total expenditure, the detailed formulae through which the total Great Britain amounts are disaggregated have not been provided.
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation	No narrative has been provided for this statement.

Table 55: Review of Statement 14 – Unit costs

9.7 Statement 15 - Renewals unit costs and coverage

We summarise our review of Statement 15 in Table 56 below:

Review area	Arup Assessment
Whether the unit costs have been calculated in accordance with the company's unit cost handbook	Unit costs have been calculated in line with methodology described in Network Rail's Corporate KPI Manual.
Whether the information to calculate the unit costs has been correctly extracted from the underlying accounting records and that any estimates used are reasonable	Civils unit cost data presented in this statement agree to data in the efficiency calculation spreadsheets provided by Network Rail in April 2011[98] but do not match figures in the revised renewals efficiency accounts provided to us in June 2011[99]. The unit cost figure for re-signalling presented in this statement appears to be calculated on a different basis to the Conventional re-signalling RUC values utilised for the purposes of the CEM and REEM efficiency calculations. Other signalling unit costs and telecoms unit costs presented in this statement do not form part of the renewals efficiency calculations. We are unable to verify these unit cost categories as we have not been provided with spreadsheets that link to the underlying accounting records.
Whether the sub-totals and totals in the table down cast and cross cast where applicable	Activity costs for individual unit cost categories sum to the total activity cost presented for each asset category.
Whether applicable the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts where applicable	The disaggregated amounts for England & Wales and Scotland add up to the Great Britain amounts for civils and telecoms. There is some minor variance[100] between the Great Britain amount and total amount for England & Wales and Scotland for signalling.
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation	No narrative has been provided for this statement.

Table 56: Review of Statement 15 – Renewals unit costs and coverage[101]

[98] MasterTemplateRenP11 BP P13 1011 REEM.xls
[99] CEM REEM Summary by Assetv3.xls
[100] Whilst the total England & Wales and Scotland amount is £216.3m, the Great Britain amount is £219.6m, a £3.3m (1.5%) variance
[101] Source spreadsheet - "stat15signalling.xls"

9.8 Statement 16 – Renewals - track unit costs and volumes

We summarise our review of Statement 16 in Table 57 below:

Review area	Arup Assessment
Whether the unit costs have been calculated in accordance with the company's unit cost handbook	Unit costs have been calculated in line with methodology described in Network Rail's Corporate KPI Manual.
Whether the information to calculate the unit costs has been correctly extracted from the underlying accounting records and that any estimates used are reasonable	The 2010/11 volumes and unit costs presented in this statement are consistent with the figures in the underlying accounts and spreadsheets that are used for efficiency calculations. The 2009/10 unit costs presented are consistent with figures shown in 2010 Regulatory Financial Statements when adjusted for inflation. The inflation adjustment applied to unit cost is consistent with that used for efficiency calculations. The volumes for 2009/10 in this statement match those in 2010 Regulatory Financial Statements. Actual volumes for each plain line renewal category agree to the data in underlying accounting spreadsheet.
Whether the sub-totals and totals in the table down cast and cross cast where applicable	The percentage volumes for plain line subcategories presented sum correctly to 100%.
Whether the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts where applicable	No England & Wales and Scotland breakdown has been given for this statement.
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation	The narratives attempt to explain the movements in unit costs and volumes between 2009/10 and 2010/11. These explanations are consistent with the supporting evidence that Network Rail provided us and appear reasonable – although there are uncertainties around whether factors indentified can fully explain the movements in unit costs and efficiencies declared, as discussed in Chapter 6.2.

Table 57: Review of Statement 16 – Track unit costs and volumes

9.9 Statement 17 – Other

We summarise our review of Statement 17 in Table 58 below:

Review area	Arup Assessment
Whether the unit costs have been calculated in accordance with the company's unit cost handbook	Unit costs have been calculated in line with methodology described in Network Rail's Corporate KPI Manual.
Whether the information to calculate the unit costs has been correctly extracted from the underlying accounting records and that any estimates used are reasonable	The 2010/11 unit costs presented in this statement are consistent with the figures in the underlying accounts and spreadsheets that are used for efficiency calculations. The 2009/10 unit costs presented are consistent with figures shown in 2010 Regulatory Financial Statements when adjusted for inflation. The inflation adjustment applied to unit cost is consistent with that used for efficiency calculations. Given the fact that the 2009/10 units costs have been taken straight from the 2010 Regulatory Financial Statements with no adjustments applied, it is unlikely that the comparison between the current year unit costs and 2009/10 unit costs are truly like-for-like with impacts from different work mixes and indirect costs being zero. The change in plain line workmix between 2009/10 and 2010/11 reported in Statement 16 also seems contradictory to the zero workmix impact reported in this statement.
Whether the sub-totals and totals in the table down cast and cross cast where applicable	Not applicable to this statement (unit cost data are not summed up as total / sub-total figures).
Whether applicable the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts where applicable	Whilst it appears that the disaggregated amounts for England & Wales and Scotland appear to reflect their relative weighting in terms of total expenditure, the detailed formulae through which the total Great Britain amounts are disaggregated have not been provided.
Whether Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation	No narrative has been provided for this statement.

Table 58: Review of Statement 16 – Track unit costs and volumes

9.10 Independent Reporter Regulatory Accounts opinion letter (22nd July 2011)

We reproduce below Arup's opinion letter of 22nd July 2011 with regard to the 2010/11regulatory accounts statements.

Please note that our assessment of uncertainty has been updated since this letter was produced – see Section 0.8.2.

We have calculated a revised uncertainty relating to "reported volumes" of up to £26m (lower than the original uncertainty estimation of up to £50m set out below). With regard to the penultimate paragraph in this letter, the figure of £26m would suggest that total cumulative efficiency savings in Statement 12 could be between 12.7% and 13.7%, compared to the reported figure of 13.2%.

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The Board of Directors
Network Rail Infrastructure Limited
Kings Place
90 York Way
London
N1 9AG

For the attention of Patrick Butcher, Group Finance Director

22nd July 2011

Dear Sirs,

Network Rail Infrastructure Limited, regulatory accounts statements 2010/11: Independent Reporter's Report to the Company and the Office of Rail Regulation (ORR) – Reporter's opinion

Introduction

In accordance with the terms of engagement for the Independent Reporter, we have reviewed the sections of the regulatory financial statements of Network Rail Infrastructure Limited (the Company) for the year ended 31 March 2011, which comprise:

Statement 8b – Analysis of maintenance expenditure by MDU;
Statement 9b – Detailed analysis of renewals expenditure;
Statement 12 – Analysis of efficiency (year on year efficiency measure);
Statement 13 – Volume Incentives;
Statement 14 – Unit Costs;
Statement 15 – Renewals unit costs and coverage;
Statement 16 – Renewals - track unit costs and volumes; and
Statement 17 – Other.

Respective responsibilities of directors and reporters

As described in the statement of directors' responsibilities, the Company's directors are responsible for the preparation of the regulatory financial statements in accordance with Condition 11 of the Network Licence. As stated in the Regulatory Accounting Guidelines (RAGs) dated January 2011, the Regulator may use a reporter to validate some of the information provided by Network Rail in the regulatory accounts. This complements the work of the auditors.

Work completed – basis of opinion

We have conducted our review on a test basis, focusing upon evidence relevant to the amounts and disclosures in the statements listed in our terms of reference. Our review has comprised sample testing of the regulatory financial statements to underlying supporting information and reconciliation to other parts of the financial statements where appropriate.

We have performed where possible compliance tests to confirm the adequacy of accounting controls and procedures and detailed substantive testing to confirm the accuracy of accounting entries with reference to original underlying data records.

Opinion

Based on our review and audit of information and evidence provided in respect of the statements within the Regulatory Accounts, we confirm that in our opinion the statements that we have reviewed (listed in the introduction above) have been prepared in accordance with the Regulatory Accounting Guidelines and are consistent with the underlying financial statements, subject to the following areas of uncertainty.

In reviewing the accuracy of the data underlying the efficiency calculations, we have identified the following uncertainty:

- **Reported volumes**. The analysis of efficiency for renewals is based on renewals volume data where possible and includes a volume - and unit cost - based efficiency calculation relating to 42% of renewals expenditure overall. A review of the accuracy of the renewals volume reporting process has indicated that there is a risk that the renewal volumes may be up to five per cent over or understated. As a result of this uncertainty, renewals efficiency savings may be up to £50m higher or lower.

We have also considered whether the Network Rail's plans for the remainder of Control Period 4 are deliverable and sustainable. There is clearly a degree of uncertainty in the accuracy of future plans and any assessment requires judgment. We have identified the following specific issues:

- **Plain line track renewals.** The analysis of efficiency includes volume efficiency for track renewals. In 2010/11 Network Rail has delivered a

lower level of track activity than planned. As a result, it will therefore need to deliver a larger volume of work in the remaining years of the Control Period, particularly for "Category 1" plain line track renewals, if Network Rail is to remain in line with its current Delivery Plan. We are concerned that this will be a significant challenge for Network Rail. There is risk that Network Rail will be unable to deliver the planned volumes. We consider that this may impact future costs which could lead to a reversal of savings achieved in the first two years of CP4. We have estimated that there is a risk that track renewals efficiency may have been overstated by up to £4.5m on an annualized basis, based on a 25% shortfall in delivering volume deferred from the 2010/11 Delivery Plan.

- **CP4 civils renewals volumes**. We consider that there is uncertainty with regard to the precise nature and the total volume of work that Network Rail will need to deliver for the remaining years of CP4. Network Rail may need to spend more than is currently planned. As a result, we consider this could lead to a reversal in the savings achieved in the first two years of CP4. We have estimated that there is a risk that civils renewals efficiency may be overstated by up to £7m on an annualized basis, based on a 20% reversal in the civils unit cost efficiency value.

Due to time constraints, we have been unable to complete our work to assess the deliverability and sustainability of non-volume based renewals.

The impact of uncertainty

Based on the specific estimates detailed above, we believe that there is uncertainty about the accuracy of data underlying the efficiency assumptions which could result in renewal efficiency savings being up to £50m higher or lower than reported. This suggests that total cumulative efficiency savings in Statement 12 could be between 12% and 14% compared to the reported figure of 13%.

There is also some uncertainty about the deliverability and sustainability of Network Rail's plans for the remainder of CP4. Based on the specific estimates detailed above, these could lead to efficiency savings being overstated by up to £11.5m on an annualized basis.

Yours faithfully.

Stefan J Sanders
Named Independent Reporter
Ove Arup & Partners Ltd
22 July 2011

Appendix A: Network Rail Regulatory Accounts Statements 2010/11

Provided to Arup on 1st August 2011.

Please note:

- The contents of Arup's draft final report (Draft 2.0, 28th July 2011) were based on a previous version of the relevant Regulatory Accounts statements, provided to Arup on 7th June 2011.
- A number of the statements provided below have been updated from the figures provided to Arup on 7th June.
- Arup has not previously been provided with a version of the Directors' Review. Therefore, the Director's Review has not specifically been reviewed within the scope of this report.

Statement 8b (1): GB Analysis of maintenance expenditure by Maintenance Delivery Unit (MDU) (not published)

Statement 8b (1): GB Analysis of maintenance expenditure by Maintenance Delivery Unit (MDU) (not published) continued

Statement 8b (2): GB Analysis of maintenance headcount by MDU (not published)

Statement 8b (2): GB Analysis of maintenance headcount by MDU (not published) continued

Statement 9b: GB Detailed analysis of renewals expenditure (not published)

Statement 9b: GB Detailed analysis of renewals expenditure (not published) continued

Statement 12: GB Analysis of efficiency (Real Economic Efficiency Measure)

In £m 2010-11 prices unless stated otherwise

	Controllable Opex	Maintenance	Renewals	Total (OMR)
2010-11				
Efficiency (£m)	67	138	243	448
Efficiency (%)	6.7%	11.3%	9.9%	9.7%
Cumulative				
Efficiency (£m)	33	164	423	620
Efficiency (%)	3.5%	13.3%	16.3%	13.0%

Comments:

(1) The above table measures progress on the REEM (Real Economic Efficiency Measure). This is a measure of efficiency for which the principles have been agreed by the ORR and Network Rail. It is not the same as Network Rail's internal measure of efficiency, the CEM (Cost Efficiency Measure).

(2) The REEM indicates the level of efficiency made in comparison to the CP3 exit point, the baseline. The baseline is adjusted for inflation, volumes and additional outputs required in CP4 compared to CP3.

(3) In their PR08 settlement, ORR set Network Rail the target of reducing controllable opex, maintenance and renewals costs by 21% by the end of CP4.

(4) This is the second year of the five year control period and the efficiencies achieved will be assesses against the target at the end of the control period. The position reported here indicates management's expectations with regards to the quantum of efficiencies achieved during 2010-11 and in the control period to date.

(5) Measuring efficiencies require judgements to be made particularly with regard to the sustainability of cost savings. We consider the key judgement in these accounts to be renewals scope efficiencies. Positive management action has included the development of asset policies which reduce the whole life cost while continued to improve asset condition. In reporting these efficiencies we place reliance on the asset policies, developed by Network Rail's engineers, as evidence of sustainability. In doing so we judge the work undertaken to be compliant with those asset policies and that evidence suggests the condition of Network Rail's assets is not deteriorating.

(6) The REEM methodology uses in year inflation (November RPI) to uplift baseline prices (CP3 exit point). Therefore in FY09/10, the baselines in FY08/09 prices were uplifted by 0.3% in FY10/11 the FY09/10 baselines were uplifted by a further 4.71%.

(7) Controllable opex – savings in the year arose from headcount reductions and restricting pay awards to less than RPI.

Statement 12: GB Analysis of efficiency (Real Economic Efficiency Measure) continued

(8) Maintenance - cost reductions have been achieved through a major reorganisation that allowed for the standardisation and optimisation of maintenance delivery and improved the usage of unit cost information. By better planning of works and better use of possessions, the maintenance team have been able to reduce costs. This includes better planning and control over overtime working. New technologies and capital investment have also played a major part in reducing costs. For example, Network Rail purchased vegetation cutters and mounted them on road rail vehicles to undertake vegetation clearance. The mechanical system is more effective than hand-held chain-saws. A single shift the mechanical cutters clear over 6 times as much vegetation and save over 70% on costs.

(9) Renewals - this has been achieved by implementing revised asset management plans and route management policies, introducing smarter working practices, and investment in equipment that enables Network Rail to carry out tasks faster, with less disruption and at a lower cost. Asset management plans aim to provide the most efficient whole-life cost after taking into account route asset management policies. These plans define the maintenance and renewal work required to produce sustainable route outputs for the level of funding available. Smarter working practices include the use of modular designs, which are constructed off-site and placed into position. This cuts possession times, is less disruptive, less labour intensive and cheaper than traditional build methods. Another example of modular designs are the switch & crossing units which are factory assembled, tested and shipped to site ready to install without any dismantling and reassembling. This technology is expected to reduce the replacement time for switches and crossings from 54 hours to 8 hours, over the next three years. This will not only be more cost effective, but will also increase network availability and reduce disruption. By optimising the use of high output plant, such as the track laying machine we have been able to drive further efficiencies which are evidenced by reduced track unit costs. Such plant reduces the time it takes to replace track which increases network availability and reduces disruption to users of the railway.

Statement 13: GB Volume incentives

In £m 2010-11 prices unless stated otherwise

	Volume incentive (£m)	Actual	2008-09 baseline	Baseline annual growth (trigger target)	Outperformance reward	Outperformance reward - notes
Passenger train miles	50	300.13 m	282.66 m	0.80%	69p	per passenger train mile
Passenger farebox	-	£6,521 m	£6,004 m	4.7% (real)	1.50%	% of additional revenue
Freight train miles	-	24.1 m	27.2 m	2.30%	111p	per freight train mile
Freight gross tonne miles	-	26,062 m	28,438 m	1.60%	100p	per freight 1000 gross tonne mile
Total incentive	**50**			**-**	**-**	

Comment:

(1) Under the PR08 settlement Network Rail was allowed expenditure based on anticipated future network capacity in CP4. Demand growth could be higher than envisaged; therefore the PR08 makes provision to incentivise Network Rail to meet unanticipated increases in demand. The above table illustrates the targets Network Rail has to achieve to trigger these rewards. In the control period to date, the passenger train miles target was achieved resulting in volume incentive amounts of £50m being earned. Under the terms of the volume incentive mechanism the cash is paid in the first year of the next control period.

Statement 14: GB Maintenance unit costs

In £m 2010-11 prices unless stated otherwise

Ref	Description	Unit of Measure (unit)	2010/11 Unit Cost (£/unit)	2009/10 Unit Cost (£/unit)	Movement
MNT001	Manual Ultrasonic Inspection of Rail	Rail Mile	373	340	-33
MNT002	Rail Changing	Rail Yard	173	115	-58
MNT003	Manual Spot Re-sleepering	No. of Sleepers	193	178	-15
MNT004	Plain Line Tamping	Track Mile	5630	4321	-1309
MNT005	Stoneblowing	Track Mile	2665	3955	1290
MNT006	Manual Wet Bed Removal	No. of Bays	132	141	9
MNT008	S&C Unit Renewal	No. of S&C units	12848	10608	-2240
MNT010	Replacement of S&C Bearers	No. of S&C Bearers	310	221	-89
MNT011	S&C Arc Weld Repair	No. of Repairs	533	708	175
MNT013	Level 1 Patrolling Track Inspection	Each	70	87	17
MNT015	Weld Repair of Defective Rail	Repairs (weld)	466	513	47
MNT016	Installation of Pre-Fabricated IRJs	No. of Joints	1653	1429	-224
MNT019	Manual Correction of Plain Line Track Geometry	Track Yards	16	19	3
MNT020	Manual Reprofiling of Ballast	Track Yards	3	4	1
MNT026	Replenishment of Ballast Train	Tonnes	19	18	-1
MNT027	Maintenance of Rail Lubricators	Each	92	219	127
MNT029	Signs	Sleepers	15	20	5
MNT050	Point End Routine Maintenance	Services	53	58	5
MNT051	Signals Routine Maintenance	Services	76	91	15
MNT052	Train Detection	Services	55	54	-1
MNT077	Drainage	Drainage Yards	7	7	-
MNT073	Replacement of Pads & Insulators	Track Miles Inspections	5	5	-

Statement 15: GB Renewals unit costs and coverage

In £m 2010-11 prices unless stated otherwise

Asset	Activity type	Unit cost 2010/11 *£000/unit*	Unit cost 2009/10 *£000/unit*	Activity costs reported 2010/11 *£000s*	Proportion of each asset total renewals spend *%*
CIVILS	701 Overbridge	1.63	3.09	19,313	5
	702 Underbridge	1.26	1.71	110,766	31
	703 Overbridge - Bridgeguard 3	2.62	2.88	16,455	5
	704 Footbridge	4.18	5.28	5,118	1
	705 Tunnel	0.71	0.97	12,570	4
	706 Culvert	2.29	2.92	5,353	2
	707 Retaining Wall	0.68	0.93	1,779	0
	708 Earthworks	0.17	0.26	66,254	19
	Total			**237,607**	**67**
Signalling	101 - Re-signalling	194.52	200.53	179,063	48
	102 - Control Renewal	N/A	69.78	3,268	1
	103 – Interlocking renewal	102.77	N/A	18,741	5
	108 – Level crossing renewals – MCB Type	920.84	1087.5	18,459	5
	108 – Level crossing renewals – MCB Type with CCTV	N/A	N/A	-	-
	Total			**219,531**	**59**
Telecoms	501 - Large concentrator	3.72	5.61	1	0
	502 – DOO CCTV	61.14	97.61	1,447	5
	503 – PETS/Level crossing	34.26	n/a	117	0
	504 – Small signal box concentra	3.63	5.44	21	0
	506 – Customer Info system	6.09	8.79	10,230	26
	507 – Long line address system	n/a	n/a	n/a	n/a
	Total			**11,846**	**31**

Statement 16: GB Renewals - track unit costs and volumes

In £m 2010-11 prices unless stated otherwise

A) Composite rate measures

Rate at 2010/11 prices	2010/11	2009/10	Difference* (%)
Plain line renewal (£ per metre)	260	292	11
S&C equivalent unit renewal (£000 per unit)	425	535	21

Note: *Negative numbers represent inefficiency

B) Track volumes

	2010/11	2009/10	Difference (%)
Plain line (composite km - ckm)	1,557	1,756	11
S&C (equivalent units - equ)	347	319	-9

C) Plain line volumes

	2010/11 (%)	2009/10 (%)	Difference (%)
Cat 2 - Rerail both rails	10	14	-4
Cat 4 - Rerail, resleeper (steel)	20	17	3
Cat 10 - Rerail, resleeper, reballast (ABC method)	5	3	2
Cat 11 - Rerail, resleeper, reballast (Traxcavate method)	24	32	-8
Cat 14 - Rerail, resleepeer, reballast, formation (traxcavate)	6	6	0
Other	35	28	7
Total	**100**	**100**	-

Comments:

(1) Track unit costs – plain line – there are a number of reasons for this such as optimising the use of high output plant, such as the track laying machine to drive further efficiencies. Such plant reduces the time it takes to replace track which increases network availability and reduces disruption to users of the railway.

Statement 16: GB Renewals - track unit costs and volumes continued

(2) Track unit costs – S&C - there are a number of reasons for this such as modular designs which are factory assembled, tested and shipped to site ready to install without any dismantling and reassembling. This technology is expected to reduce the replacement time for switches and crossings from 54 hours to 8 hours, over the next three years. This will not only be more cost effective, but will also increase network availability and reduce disruption.

(3) Track volumes – plain line volumes were lower than FY09/10 and the Delivery Plan Update 2010 partly due to adverse weather conditions leading to postponement of work. Also, towards the end of the year some high output plant was damaged in an accident which decreased volumes. This high output plant is vital in recovering unit costs and so workbanks were re-planned to optimise efficient delivery.

(4) Track volumes – S&C volumes were higher then FY09/10 due to re-phasing of workbanks.

Statement 17: GB Other Unit Costs

In £m 2010-11 prices unless stated otherwise

A) Impact on unit cost factors 2010/11

	2009/10 unit rates	2010/11 gross unit cost	Indirect Cost Impact	Work mix impact	2010/11 net unit cost (like-for like)	Net efficiency (like-for-like) %
Plain line (£000/ckm)	292	260	0	0	260	11
S&C (£000/equ)	535	425	0	0	425	21

Statement 8b (1): England & Wales Analysis of maintenance expenditure by Maintenance Delivery Unit (MDU) (not published)

Statement 8b (1): England & Wales Analysis of maintenance expenditure by Maintenance Delivery Unit (MDU) (not published) continued

Statement 8b (2): England & Wales Analysis of maintenance headcount by MDU (not published)

Statement 8b (2): England & Wales Analysis of maintenance headcount by MDU (not published) continued

Statement 9b: England & Wales Detailed analysis of renewals expenditure (not published)

Statement 9b: England & Wales Detailed analysis of renewals expenditure (not published) continued

Statement 9b: England & Wales Detailed analysis of renewals expenditure (not published) continued

Statement 12: England & Wales Analysis of efficiency (Real Economic Efficiency Measure)

In £m 2010-11 prices unless stated otherwise

	Controllable Opex	Maintenance	Renewals	Total (OMR)
2010-11				
Efficiency (£m)	55	131	216	402
Efficiency (%)	6.1%	11.7%	10.2%	9.8%
Cumulative				
Efficiency (£m)	25	155	389	569
Efficiency (%)	3.0%	13.7%	16.9%	13.3%

Comments:

(1) The above table measures progress on the REEM (Real Economic Efficiency Measure). This is a measure of efficiency whose principles have been agreed by the ORR and Network Rail. It is not the same as Network Rail's internal measure of efficiency, the CEM (Cost Efficiency Measure)

(2) The REEM indicates the level of efficiency made in comparison to the CP3 exit position, the baseline. The baseline is adjusted for inflation, volumes and additional outputs required in CP4 compared to CP3.

(3) In their PR08 settlement, ORR set Network Rail the target of reducing controllable opex, maintenance and renewals costs by 21% in CP4.

(4) This is the second year of the five year control period and the efficiencies achieved will be assesses against the target at the end of the control period. The position reported here indicates management's expectations with regards to the quantum of efficiencies achieved during 2010-11 and in the control period to date.

(5) Measuring efficiencies require judgements to be made particularly with regard to the sustainability of cost savings. We consider the key judgement in these accounts to be renewals scope efficiencies. Positive management action has included the development of asset policies which reduce the whole life cost while continued to improve asset condition. In reporting these efficiencies we place reliance on the asset policies, developed by Network Rail's engineers, as evidence of sustainability. In doing so we judge the work undertaken to be compliant with those asset policies and that evidence suggests the condition of Network Rail's assets is not deteriorating.

Statement 12: England & Wales Analysis of efficiency (Real Economic Efficiency Measure) continued

(6) The REEM methodology uses in year inflation (November RPI) to uplift baseline prices (CP3 Exit Point). Therefore the baselines for FY09/10 were uplifted by 0.3% whilst the baselines for FY10/11 were uplifted by 4.71%.

(7) Controllable opex – savings in the year arose from headcount reductions and restricting pay awards to less than RPI.

(8) Maintenance - cost reductions have achieved through a major reorganisation that allowed for the standardisation and optimisation of maintenance delivery, and improved the usage of unit cost information. By better planning of works and better use of possessions, the maintenance team have been able to reduce costs. This includes better planning and control over overtime working. New technologies and capital investment have also played a major part in reducing costs. The example below shows how capital investment can be used to reduce costs in what was previously a labour-intensive activity. Network Rail purchased vegetation cutters and mounted them on road rail vehicles to undertake vegetation clearance. The mechanical system is more effective than hand-held chain-saws. A single shift the mechanical cutters clear over 6 times as much vegetation and save over 70% on costs.

(9) Renewals - This has been achieved by implementing revised asset management plans and route management policies, introducing smarter working practices, and investment in equipment that enables us to carry out tasks faster, with less disruption and at a lower cost. Asset management plans aim to provide the most efficient whole-life cost after taking into account route asset management policies. These plans define the maintenance and renewal work required to produce sustainable route outputs for the level of funding available. Smarter working practices include the use of modular designs, which are constructed off-site and placed into position. This cuts possession times, is less disruptive, less labour intensive and cheaper than traditional build methods. nother example of modular designs are the switch & crossing units which are factory assembled, tested and shipped to site ready to install without any dismantling and reassembling. This technology is expected to reduce the replacement time for switches and crossings from 54 hours to 8 hours, over the next three years. This will not only be more cost effective, but will also increase network availability and reduce disruption. By optimising the use of high output plant, such as the track laying machine we have been able to drive further efficiencies which are evidenced by reduced track unit costs. Such plant reduces the time it takes to replace track which increases network availability and reduces disruption to users of the railway.

Statement 13: England & Wales Volume incentives

In £m 2010-11 prices unless stated otherwise

	Volume incentive (£m)	Actual	2008-09 baseline	Baseline annual growth (trigger target)	Outperformance reward	Outperformance reward - notes
Passenger train miles	46	275.10 m	259.06 m	0.8%	69p	per passenger train mile
Passenger farebox	0	£6,262 m	£5,771 m	4.7% (real)	1.5%	% of additional revenue
Freight train miles	0	21.78 m	24.58 m	2.3%	111p	per freight train mile
Freight gross tonne miles	0	23,560 m	25,708 m	1.6%	100p	per freight 1000 gross tonne mile
Total incentive	**46**			**-**	**-**	

Comments:

(1) Under the PR08 settlement Network Rail was allowed expenditure based on anticipated future network capacity in CP4. Demand growth could be higher than envisaged; therefore the PR08 makes provision to incentivise Network Rail to meet unanticipated increases in demand. The above table illustrates the targets Network Rail has to achieve to trigger these rewards. In the control period to date, the passenger train miles target was achieved resulting in volume incentive amounts of £46m being earned. Under the terms of the volume incentive mechanism the cash is paid in the first year of the next control period.

Statement 14: England & Wales Maintenance unit costs

In £m 2010-11 prices unless stated otherwise

A) Maintenance

Ref	Description	Unit of Measure (unit)	2010/11 Unit Cost (£/unit)	2009/10 Unit Cost (£/unit)	Movement
MNT001	Manual Ultrasonic Inspection of Rail	Rail Mile	359	335	(24)
MNT002	Rail Changing	Rail Yard	174	116	(58)
MNT003	Manual Spot Re-sleepering	No. of Sleepers	199	180	(19)
MNT004	Plain Line Tamping	Track Mile	5,651	4,259	(1,392)
MNT005	Stoneblowing	Track Mile	2,580	3,911	1,331
MNT006	Manual Wet Bed Removal	No. of Bays	135	141	6
MNT008	S&C Unit Renewal	No. of S&C units	13,111	11,034	(2,077)
MNT010	Replacement of S&C Bearers	No. of S&C Bearers	318	217	(101)
MNT011	S&C Arc Weld Repair	No. of Repairs	532	707	175
MNT013	Level 1 Patrolling Track Inspection	Each	73	91	18
MNT015	Weld Repair of Defective Rail	No. of Repairs (weld)	458	510	52
MNT016	Installation of Pre-Fabricated IRJs	No. of Joints	1,676	1,469	(207)
MNT019	Manual Correction of Plain Line Track Geometry	Track Yards	16	19	3
MNT020	Manual Reprofiling of Ballast	Track Yards	3	4	1
MNT026	Replenishment of Ballast Train	Tonnes	20	18	(2)
MNT027	Maintenance of Rail Lubricators	Each	95	231	136
MNT029	Signs	Sleepers	22	21	(1)
MNT050	Point End Routine Maintenance	Services	55	59	4
MNT051	Signals Routine Maintenance	Services	77	90	13
MNT052	Train Detection	Services	56	54	(2)
MNT077	Drainage	Drainage Yards	8	7	(1)
MNT073	Replacement of Pads & Insulators	Track Miles Inspections	5	4	(1)

Statement 15: England & Wales Renewals unit costs and coverage

In £m 2010-11 prices unless stated otherwise

Asset	Activity type	Unit cost 2010/11 *£000/unit*	Unit cost 2009/10 *£000/unit*	Activity costs reported 2010/11 *£000s*	Proportion of each asset total renewals spend *%*
CIVILS	Overbridge	1.62	3.09	18,950	7
	Underbridge	1.07	1.51	84,904	30
	Overbridge - Bridgeguard 3	2.62	2.88	16,455	6
	Footbridge	4.01	5.35	4,803	2
	Tunnel	0.69	0.94	10,889	4
	Culvert	1.68	2.66	3,602	1
	Retaining Wall	0.64	0.93	1,589	1
	Earthworks	0.18	0.28	51,358	18
	Total			**192,549**	**69**
Signalling	Re-signalling	194.59	200.53	176,173	49
	Control Renewal	n/a	69.78	n/a	n/a
	Interlocking renewal	102.77	n/a	18,741	6
	Level crossing renewals – MCB Type	919.75	1087.50	14,760	4
	Level crossing renewals – MCB Type with CCTV	n/a	n/a	n/a	n/a
	Total			**209,674**	**59**
Telecoms	Large concentrator	3.72	5.61	1	0
	DOO CCTV	61.14	97.61	1,477	5
	PETS/Level crossing	34.26	n/a	117	0
	Small signal box concentrator	3.63	5.44	21	0
	Customer Info system	6.09	8.79	10,230	31
	Long line address system	n/a	n/a	n/a	n/a
	Total			**11,846**	**36**

Statement 17: England & Wales Other

In £m 2010-11 prices unless stated otherwise

A) Impact on unit cost factors 2010/11

	2009/10 unit rates	2010/11 gross unit cost	Indirect Cost Impact	Work mix impact	2010/11 net unit cost (like-for like)	Net efficiency (like-for-like) %
Plain line (£000/ckm)	296	262	0	0	262	11
S&C (£000/equ)	530	433	0	0	433	18

Statement 8b (1): Scotland Analysis of maintenance expenditure by Maintenance Delivery Unit (MDU) (not published)

Statement 8b (2): Scotland Analysis of maintenance headcount by MDU (not published)

Statement 9b: Scotland Detailed analysis of renewals expenditure (not published)

Statement 9b: Scotland Detailed analysis of renewals expenditure (not published)

Statement 12: Scotland Analysis of efficiency (Real Economic Efficiency Measure)

In £m 2010-11 prices unless stated otherwise

	Controllable Opex	Maintenance	Renewals	Total (OMR)
2010-11				
Efficiency (£m)	12	8	27	47
Efficiency (%)	12.4%	7.2%	8.7%	9.4%
Cumulative				
Efficiency (£m)	7	9	34	50
Efficiency (%)	8.3%	8.6%	11.4%	10.2%

Commentary:

(1) The above table measures progress on the REEM (Real Economic Efficiency Measure). This is a measure of efficiency whose principles have been agreed by the ORR and Network Rail. It is not the same as Network Rail's internal measure of efficiency, the CEM (Cost Efficiency Measure)

(2) The REEM indicates the level of efficiency made in comparison to the CP3 exit position, the baseline. The baseline is adjusted for inflation, volumes and additional outputs required in CP4 compared to CP3.

(3) In their PR08 settlement, ORR set Network Rail the target of reducing controllable opex, maintenance and renewals costs by 21% in CP4.

(4) This is the second year of the five year control period and the efficiencies achieved will be assesses against the target at the end of the control period. The position reported here indicates management's expectations with regards to the quantum of efficiencies achieved during 2010-11 and in the control period to date.

(5) Measuring efficiencies require judgements to be made particularly with regard to the sustainability of cost savings. We consider the key judgement in these accounts to be renewals scope efficiencies. Positive management action has included the development of asset policies which reduce the whole life cost while continued to improve asset condition. In reporting these efficiencies we place reliance on the asset policies, developed by Network Rail's engineers, as evidence of sustainability. In doing so we judge the work undertaken to be compliant with those asset policies and that evidence suggests the condition of Network Rail's assets is not deteriorating.

(6) The REEM methodology uses in year inflation (November RPI) to uplift baseline prices (CP3 Exit Point). Therefore the baselines for FY09/10 were uplifted by 0.3% whilst the baselines for FY10/11 were uplifted by 4.71%.

Statement 12: Scotland Analysis of efficiency (Real Economic Efficiency Measure) continued

(7) Controllable opex – savings in the year arose from headcount reductions and restricting pay awards to less than RPI.

(8) Maintenance - cost reductions have achieved through a major reorganisation that allowed for the standardisation and optimisation of maintenance delivery, and improved the usage of unit cost information. By better planning of works and better use of possessions, the maintenance team have been able to reduce costs. This includes better planning and control over overtime working. New technologies and capital investment have also played a major part in reducing costs. The example below shows how capital investment can be used to reduce costs in what was previously a labour-intensive activity. Network Rail purchased vegetation cutters and mounted them on road rail vehicles to undertake vegetation clearance. The mechanical system is more effective than hand-held chain-saws. A single shift the mechanical cutters clear over 6 times as much vegetation and save over 70% on costs.

(9) Renewals - This has been achieved by implementing revised asset management plans and route management policies, introducing smarter working practices, and investment in equipment that enables us to carry out tasks faster, with less disruption and at a lower cost. Asset management plans aim to provide the most efficient whole-life cost after taking into account route asset management policies. These plans define the maintenance and renewal work required to produce sustainable route outputs for the level of funding available. Smarter working practices include the use of modular designs, which are constructed off-site and placed into position. This cuts possession times, is less disruptive, less labour intensive and cheaper than traditional build methods. nother example of modular designs are the switch & crossing units which are factory assembled, tested and shipped to site ready to install without any dismantling and reassembling. This technology is expected to reduce the replacement time for switches and crossings from 54 hours to 8 hours, over the next three years. This will not only be more cost effective, but will also increase network availability and reduce disruption. By optimising the use of high output plant, such as the track laying machine we have been able to drive further efficiencies which are evidenced by reduced track unit costs. Such plant reduces the time it takes to replace track which increases network availability and reduces disruption to users of the railway.

Statement 13: Scotland Volume incentives

In £m 2010-11 prices unless stated otherwise

	Volume incentive (£m)	Actual	2008-09 baseline	Baseline annual growth (trigger target)	Outperformance reward	Outperformance reward - notes
Passenger train miles	4	25.02 m	23.60 m	0.80%	69p	per passenger train mile
Passenger farebox	-	£253 m	£233 m	4.7% (real)	1.50%	% of additional revenue
Freight train miles	-	2.31 m	2.61 m	2.30%	111p	per freight train mile
Freight gross tonne miles	-	2,502 m	2,730 m	1.60%	100p	per freight 1000 gross tonne mile
Total incentive	**4**			**-**	**-**	

Commentary:

(1) Under the PR08 settlement Network Rail was allowed expenditure based on anticipated future network capacity in CP4. Demand growth could be higher than envisaged; therefore the PR08 makes provision to incentivise Network Rail to meet unanticipated increases in demand. The above table illustrates the targets Network Rail has to achieve to trigger these rewards. In the control period to date, the passenger train miles target was achieved resulting in volume incentive amounts of £4m being earned. Under the terms of the volume incentive mechanism the cash is paid in the first year of the next control period.

Statement 14: Scotland Maintenance unit costs

In £m 2010-11 prices unless stated otherwise

Ref	Description	Unit of Measure (unit)	2010/11 Unit Cost (£/unit)	2009/10 Unit Cost (£/unit)	Movement
MNT001	Manual Ultrasonic Inspection of Rail	Rail Mile	544	340	-204
MNT002	Rail Changing	Rail Yard	161	115	-46
MNT003	Manual Spot Re-sleepering	No. of Sleepers	138	178	40
MNT004	Plain Line Tamping	Track Mile	5316	4321	-995
MNT005	Stoneblowing	Track Mile	5491	3955	-1536
MNT006	Manual Wet Bed Removal	No. of Bays	103	141	38
MNT008	S&C Unit Renewal	No. of S&C units	8850	10608	1758
MNT010	Replacement of S&C Bearers	No. of S&C Bearers	226	221	-5
MNT011	S&C Arc Weld Repair	No. of Repairs	558	708	150
MNT013	Level 1 Patrolling Track Inspection	Each	55	87	32
MNT015	Weld Repair of Defective Rail	No. of Repairs (weld)	542	513	-29
MNT016	Installation of Pre-Fabricated IRJs	No. of Joints	1252	1429	177
MNT019	Plain Line Track Geometry	Track Yards	16	19	3
MNT020	Manual Reprofiling of Ballast	Track Yards	4	4	-
MNT026	Replenishment of Ballast Train	Tonnes	18	18	-
MNT027	Maintenance of Rail Lubricators	Each	57	219	162
MNT029	Signs	Sleepers	2	20	18
MNT050	Point End Routine Maintenance	Services	36	58	22
MNT051	Signals Routine Maintenance	Services	67	91	24
MNT052	Train Detection	Services	51	54	3
MNT077	Drainage	Drainage Yards	3	7	4
MNT073	Replacement of Pads & Insulators	Track Miles Inspections	5	5	-

Statement 15: Scotland Renewals unit costs and coverage

In £m 2010-11 prices unless stated otherwise

Asset	Activity type	Unit cost 2010/11 *£000/unit*	Unit cost 2009/10 *£000/unit*	Activity costs reported 2010/11 *£000s*	Proportion of each asset total renewals spend *%*
CIVILS	701 Overbridge	2.29	n/a	364	0
	702 Underbridge	2.91	4.71	25,862	34
	703 Overbridge - Bridgeguard 3	n/a	n/a	0	0
	704 Footbridge	12.12	3.41	315	0
	705 Tunnel	0.91	2.46	1,681	2
	706 Culvert	8.98	4.1	1,751	2
	707 Retaining Wall	1.33	n/a	190	0
	708 Earthworks	0.14	0.15	14,896	20
	Total			**45,058**	**60**
Signalling	101 - Re-signalling	189.36	187.06	2,890	19
	102 - Control Renewal	n/a	n/a	n/a	n/a
	103 – Interlocking renewal	n/a	n/a	n/a	n/a
	108 – Level crossing renewals –	932.95	n/a	3,700	25
	108 – Level crossing renewals –	n/a	n/a	n/a	n/a
	Total			**6,589**	**44**
Telecoms	501 - Large concentrator	n/a	n/a	n/a	n/a
	502 – DOO CCTV	n/a	n/a	n/a	n/a
	503 – PETS/Level crossing	n/a	n/a	n/a	n/a
	504 – Small signal box concentrato	n/a	n/a	n/a	n/a
	506 – Customer Info system	n/a	n/a	n/a	n/a
	507 – Long line address system	n/a	n/a	n/a	n/a
	Total			n/a	n/a

Note:

(1) There is no Telecoms data included as no volumes were delivered in 2010-11 that were captured by the unit cost framework.

Statement 17: Scotland Other Unit Costs

In £m 2010-11 prices unless stated otherwise

A) Impact on unit cost factors 2010/11

	2009/10 unit rates	2010/11 gross unit cost	Indirect Cost Impact	Work mix impact	2010/11 net unit cost (like-for like)	Net efficiency (like-for-like) %
Plain line (£000/ckm)	254	250	0	0	250	2
S&C (£000/equ)	577	369	0	0	369	36

Appendix B: Review of CEM maintenance efficiency calculation

Maintenance efficiency – overview

Presentation of maintenance efficiency in the CEM

Overall maintenance efficiency is presented in the CEM as a percentage comparison of actual FY10/11 end of year expenditure, compared to FY09/10 expenditure (inflated) as the baseline.

Maintenance cost category	Baseline CP4	Year-end (FY10/11)	Variance	% variance
MUC activities (with vol & rate breakdown) (£m)	524.9	396.6	-128.3	-24.4%
-- of which volume change			-64.4	-12.3%
-- of which unit cost change			-63.9	-12.2%
Other maintenance costs (£m)	475.4	435.7	-39.7	-8.3%
of which proposed for MUC framework FY11/12		ca.£305m		
Pensions 09-10 (£m)	64.6	64.6	0.0	0.0%
Attributable non-maintenance function costs (£m)	164.5	170.1	5.6	3.4%
Total (£m)	**1229.5**	**1067.0**	**-162.4**	**-13.2%**

Table 59: FY10/11 maintenance efficiency as presented in CEM[102]

As shown in the table above, overall maintenance efficiency for the FY10/11 CEM is calculated at 13.2%. This breakdown of cost variances is discussed further below.

Unit cost coverage

As shown in the table above, unit cost-related components of maintenance expenditure are also compared through the CEM measure, in order for a volume and unit cost efficiency for the CEM "heat map" to be established.[103]

The MUC (maintenance unit cost) framework captures activity volumes and unit costs for around fifty defined "MNT" codes[104] – each representing a specific maintenance activity type. As indicated above, costs captured under the MUC framework accounted for £396.6m, which represents 37.2% of total year-end expenditure.

Non-volume categories

Other maintenance costs

As shown in the table above, other maintenance costs accounted for £436m of expenditure during FY10/11 – around 41% of the total.

[102] Source: calculation spreadsheet "MUC 10/11 vs 08/09 Yearly Analysis" provided in hard copy.
[103] See Appendix D for the CEM efficiency heatmap.
[104] MNT stands for "Maintenance Activity Code"; we provide our confidence grading analysis of reliability and accuracy for the 47 x MNT codes in Chapter 7.

The most significant cost element within this category relates non-MUC front-line maintenance costs, which account for around £370m of expenditure. Some of these costs are currently captured by the MUC process but are not used in the CEM calculations as follows:

MNT022 – Rail Changing - £86.9m

MNT053 – Other S&T Costs - £37.4m

MNT024 – E&P Other - £66.0m

MNT082 – Vegetation Management by Train - £0.6m

Total - £190.9m

Because these costs are not presently captured under the MUC framework, there is presently no visibility of the breakdown between scope and unit cost. However, we understand that NR is proposing to extend the MUC framework to cover approximately £305m of further maintenance activity presently captured under "Other maintenance costs" (using around one hundred additional MNT codes) during FY11/12.

Of the remainder of "Other maintenance costs" (around £160m), we understand that this constitutes the following elements:

- "Non-MUC-able" front-line maintenance activities: ca. £60-70m
- Telecoms maintenance: ca. £30m
- Telecoms service contract costs: ca. £35m
- Maintenance HQ and RMDI costs: ca. £20m

Network Rail indicated that efficiencies are being realised across all the major front-line maintenance activities – which will be reflected in the expanded MUC framework costs when these are rolled out in due course.

NR also indicated that for other cost areas under this category (telecoms, HQ, etc.) it has realised cost efficiencies

Remaining cost categories

The remaining cost items relate to pension costs (£64.6m) and attributable non-maintenance function costs (£170.1m).

We have not reviewed these cost elements in detail, but we understand these items will be reviewed as part of the formal audit of the company accounts by PWC.

Unit cost and volume efficiency calculation process

Maintenance activities captured under the MUC framework (which accounted for 37.2% of maintenance expenditure overall: see above) accounted for £396.6m of year-end cost, 24.4% below baseline costs for such activities. For the purposes of the CEM efficiency calculation, this cost reduction is split between volume and

unit cost efficiency on the basis described below.

Volume efficiencies

Maintenance volume efficiencies are calculated by multiplying the difference between baseline and year-end volumes (in terms of units of activity) by the baseline unit cost level.

When applied to the year-end MUC figures, this results in a 12.3% (£64.4m) volume efficiency.

A key underlying assumption to the volume efficiency calculation is that the level of maintenance output is unchanged. This is because output is measured in terms of operational track miles; because track miles remained unchanged between FY09/10 and FY10/11, it is therefore assumed that any reduction in units of activity against a given MNT represents a more efficient delivery, in volume terms, against a fixed level of output – i.e. the unchanged level of operational track miles.

No other metrics relating to maintenance delivery (e.g. hours of route availability, asset condition metrics) are factored into the measurement of maintenance output for CEM efficiency calculation purposes.

Unit cost efficiencies

Similar to volume efficiencies, unit cost efficiencies are calculated by multiplying the difference between baseline and year-end unit cost levels for each unit cost (MNT code) by the year-end volume for the given MNT code.

When applied to the year-end MUC figures, this results in a 12.2% (£63.9m) unit cost efficiency. Based on this formula, the remainder of the cost efficiency associated with the MUC activities, alongside the volume efficiencies described above, is fully accounted for within the CEM efficiency calculation.

Analysis, challenge and reporting of maintenance efficiency

There is an assumption relating to the claiming of maintenance efficiencies that a reduction in the volume of work carried out should be considered as an efficiency. It is our opinion that a reduction in the amount of maintenance work undertaken should only be claimed as an efficiency if the reduction has not had an adverse impact on performance, condition, risk, capital expenditure or compliance with engineering, legal, regulatory, and statutory standards/obligations. When challenged about this, Network Rail showed us examples suggesting that some of the above factors have not been impacted by volume reductions. However, this was in response to our question and not something that is taken into account during the CEM reporting process.

It should be noted that the maintenance efficiency figures contained in the 2009/10 report cannot be directly compared to the 2010/11 figures. This is due to the change in the baseline figures for 22 of the 43 MUCs used in the CEM

calculations. Resetting the baseline to the original baseline, the CEM efficiency for 2010/11 would be 18.5% compared to the 13.2% being reported.

Whilst the figures contributing to the CEM via the MUCs have been reviewed and the levels of transparency are high, we are concerned over the lack of detail relating to other direct costs. These costs comprise 63% of the total maintenance expenditure and there is no visibility whether any contribution to efficiency of such costs are due to volume or cost efficiencies.

Process assurance results – maintenance efficiency

Definitions	Low risk	The CEM / REEM measures appear to be understood by the people who compile the figures. No process, procedures, definitions or explanation documents have been found during this review. The only documented definition found is the calculation for the Maintenance Efficiency found in the KPI Manual.
Source Data	Medium risk	The source data has been reviewed. The highlighted discrepancy between the MUC Macro Output and the figures feeding the CEM/REEM calculations is due to the figures feeding the CEM/REEM calculations being forecasts until P13 when actual figures are used. The visibility and traceability of the Maintenance Unit Cost data feeding into the calculations is good as is the level of granularity provided in the data. However, no supporting evidence regarding the source of Other Direct Costs has been provided. This create significant certainty to maintenance efficiency calculations as Other Direct Costs make up approximately 60% of the Maintenance Total Cost. These costs can be traced to a figure by area but no more detail has been received.
Variability of inputs	Medium risk	It is accepted that there will be a natural level of variability due to structural factors and development of the MUCs but we have accounted for this by comparing against the baseline. Variance is greatest for Sussex, East Midlands and Scotland, however this is due to a corrected data error in Scotland and the presence of calculated baseline figures for East Midlands. It has also been highlighted that the baseline figures for the MUCs introduced during the 2009/10 period have been changed

		from those previously used as NR consider that this will provide a more accurate estimate for the baseline year. This has affected 21 of the MUCs; an additional 2 MUCs have had their baseline figures altered as errors in the data have subsequently been identified.
Process & analysis	High risk	The CEM figures appear to be collated and processed well with clear links between documents; the data inputting into the MUC element of the CEM is reviewed periodically and consistently. However, in order to be confident that volume efficiencies being claimed are sustainable we would like more evidence that other, non-financial analysis is undertaken and considered during the calculation of the CEM and claiming of efficiencies. We have not seen any evidence that the data inputting into Other Direct Costs are reviewed or how the resulting CEM is used to manage the business.
Coverage	High risk	We are satisfied that all appropriate MUC data has been included in the maintenance efficiency figures. We do not have visibility that all Other Direct Costs have been included. All costs related to Capital Expenditure are excluded from the maintenance efficiencies, along with the corresponding proportion of management overhead.

Table 60: Maintenance efficiencies review results

Key findings and conclusions

The maintenance efficiency figures contain visible and transparent links back to the Maintenance Unit Costs for the activities that are covered by the MUC framework and can be traced down to an appropriate level. We therefore consider there to be an auditable link between output efficiency metrics and source data for the efficiencies reported against unit costs, subject to the integrity/accuracy of the MUC process (see Chapter 7).

Approximately 60% of the total maintenance expenditure is included in Other Direct Costs category with approximately 32% belonging to the maintenance sections and approximately 26% belonging to HQ. Network Rail did not provide any written explanation or quantified breakdown explaining how the efficiencies for the respective cost categories captured as “Other Direct Costs” were achieved.

In order for us to be confident that the reported efficiencies being claimed are a result of volume and cost efficiencies associated with sustainable levels of

maintenance, we consider that clear, auditable evidence is required to confirm that this level of maintenance is sustainable without jeopardising performance, condition, underlying risk, impact on capital expenditure whilst fulfilling engineering, legal, regulatory and legislative requirements.

Recommendations

- Increase the visibility/traceability of the 60% of maintenance expenditure contained in the Other Direct Costs.
- Prove the sustainability of reported efficiencies by assessing the impact on performance, condition, risk and capital expenditure.
- Document the efficiency reporting process in a similar way as the MUC Process Document V1.pdf document explains the Maintenance Unit Cost process.
- Report and make clear any changes to the baseline figures used during calculations and distinguish between figures that have been calculated or based on actuals.

Appendix C: Detailed review – calculation of REEM efficiency from CEM figures

Statement 12: REEM efficiency measure

Please note: We were provided with the draft version of the calculation spreadsheets for REEM and CEM, which were subsequently superseded when Network Rail sent us new accounts on 24th June 2011. No spreadsheets for the updated efficiency calculations have been provided. However, Network Rail has indicated that the new efficiency figures have been calculated with the same principles as in the draft accounts. Our comments in Table are based on the draft versions of the calculation spreadsheets that we were able to review.

Introduction

Statement 12 of the Regulatory Accounts presents the REEM (Real Economic Efficiency Measure) figures for year-end expenditure, together with percentage cost efficiency of against the REEM CP4 baseline.

We set out the figures for the FY10/11 Regulatory Accounts in the table below. Note that this chapter of the report focuses on the cumulative REEM efficiency figures (CP4 baseline vs. year-end) only, as the "in-year" (2010/11) efficiency levels in percentage terms are yet to be finalised.

	Controllable Opex	Maintenance	Renewals	Total (OMR)
2010-11				
Efficiency (£m)	67.2	138.3	242.7	448.1
Efficiency (%)	*tbc*	*tbc*	*tbc*	*tbc*
Cumulative				
Efficiency (£m)	32.9	163.7	423.1	619.6
Efficiency (%)	3.5%	13.3%	16.3%	13.0%

Table 61: REEM efficiency figures (Statement 12)[105]

The REEM is calculated on the basis of the expenditure figures feeding into the CEM (discussed in previous sections of this report), to which a number of adjustments are applied in order to derive the REEM outputs. These adjustments have been agreed between Network Rail and the ORR.

[105] Source: calculation spreadsheet: "stat12 v1.xls"

In this chapter, we review the adjustments applied, to gain an overview of how the REEM outputs for each major cost categories are derived.

REEM Controllable opex expenditure

The CEM/REEM controllable opex figures combine the costs for both Operations and Support costs. The sum of efficiency from these two categories is £32.9m. We set out in the table below the adjustments that are applied to the CEM controllable opex expenditure (baseline and year-end) to derive the REEM outputs.

Line Item	CEM figure (£k)	Adjustments (£k)	REEM figure (£k)	Commentary
Operations costs				
Year-end (FY10/11)				
CEM year-end	396,325			
Adjustment 1		2,288		Staff bonus proportioned by headcount
REEM year-end			398,613	
Baseline				
CEM Total	405,824			
Adjustment 1		6,737		Revised inflation assumption
REEM Total			412,561	
Sub-total: REEM operations efficiency (year-end vs. baseline)			**13,948**	
Support costs				
Year-end (FY10/11)				
CEM year-end	503,904			
Adjustment 1		1,044		Staff bonus proportioned by headcount
REEM year-end			504,948	
Baseline				
CEM baseline	511,169			
Adjustment 1		8,486		Revised inflation assumption
Adjustment 2		-7,350		Disallowed baseline – pensions
Adjustment 3		-10,500		Disallowed baseline – redundancy
Adjustment 4		26,251		Difference in redundancy numbers in P11 full-year forecast and P13 outturn
Adjustment 5		-4,200		CP3 exit adjustment (general)
REEM baseline			523,855	
Sub-total: REEM support efficiency (year-end vs. baseline)			**18,907**	
Total: REEM controllable opex efficiency (year-end vs. baseline)			**32,856**	

Table 62: REEM adjustments - controllable opex[106]

[106] Source: calculation spreadsheet "Total checker p13 REEM.xls"

As indicated in the table above, the efficiency calculation for operations costs of £13.95m combined with support cost efficiency of £18.91m results in a total controllable opex efficiency under the REEM measure of £32.86m.

We discuss the adjustments applied to derive the REEM controllable opex efficiency calculation in further detail below.

Year-end cost adjustments – staff bonuses

Year-end REEM figures are adjusted to account for staff bonus expenses not originally included in the CEM year-end figures. These costs account for a total of £9.57m across all the entire business –and are applied to each cost category on a pro-rata basis, according to total headcount.

For operations, with a headcount of 8,288, and support with a headcount of 3,783, this results in allocated staff bonus costs of £2.29m and £1.04m respectively.

Inflation adjustments to baseline

For the original CEM baseline, Network Rail utilised the full-year RPI inflation rate valid at the start of the Financial Year (i.e. for FY10/11, the March 2010 RPI rate). We understand that this was in order to account for the inflation levels reflected in the staff pay rates, which form the bulk of O&M costs.

However, the REEM requires utilisation of in-year November RPI rate in order to establish the inflation rate to be applied to the CP4 baseline at the end of the given year (i.e. for FY10/11 the valid inflation rate will be the in-year RPI figure valid to end of November 2010).

The resulting adjustments applied on this basis are set out in the table below.

Inflation adjustments	Percentage discounted	Percentage added	Source of adjustment
Discount CEM inflation (FY10/11)	3.00%		March 2010 RPI inflation rate
Discount CEM inflation (FY09/10)	0.28%		Original CEM inflation rate for FY09/10
Add REEM inflation (FY09/10)		0.28%	November 2009 RPI inflation - required by ORR
Add REEM inflation (FY10/11)		4.71%	November 2010 RPI inflation - required by ORR

Table 63: Inflation adjustments (operations & maintenance costs) – CEM to REEM[107]

The impact of the above inflation adjustments on the baseline figures is as follows:

- For operations, this results in an overall baseline increase of £6.74m.

[107] Source: calculation spreadsheet "Total checker p13 REEM.xls"

- For support, this results in an overall baseline increase of £8.49m.

CP3 exit-rate adjustments

The REEM measure is adjusted to reflect a revised CP3 "exit rate" cost. The CP3 exit rate equals the expenditure for final year (FY08/09) of Control Period 3; this represents the baseline annual "pre-efficient" expenditure against which CP4 expenditure is measured to gauge efficiency.

The original CEM exit rate calculation is based on what was a forecast value for FY08/09 expenditure, valid at Period 11 (January 2009). The CEM baseline was fixed on this basis because Network Rail was required at that time to set CEM baseline and efficiency targets before the actual year-end figures were available.

The REEM requires that this baseline figure is adjusted, so that the CP3 exit rates are based on year-end outturn expenditure figures at the end of FY09/10. For controllable opex, an adjustment of -£4.2m is applied to the baseline, in order to reflect the fact that FY09/10 year-end O&M costs were lower than had been forecast at Period 11. The £4.2m figure is derived from a total sum of operations and maintenance cost differential of £8m, which has been split on a 50-50 basis and applied to both the support baseline, and the maintenance baseline (see next section). We set out below, the formula by which the £4.2m is calculated in full:

- O&M exit rate: base differential	£8.0m
- Application of inflation FY09/10 - 10/11 (0.28%, 4.71%)	£8.4m
- 50% allocation to Support costs	£4.2m

Disallowed baseline adjustments

Two baseline adjustments are made to reflect items that the ORR considers not to be applicable for inclusion in the REEM baseline. Firstly, £7.35m of costs relating to pensions have been discounted. This figure is associated with a revised calculation of the impact of pension liabilities, whereby the REEM is required to reflect the cost in terms of the cash impact, as opposed to actuarial valuation of pensions that was factored into the CEM baseline. We understand that the actuarial valuation of pension costs resulted in a higher figure; consequently, a downward adjustment has been implemented to reflect the revised treatment of this cost item in cash terms for the REEM.

Secondly, the ORR has required £10.5m of redundancy costs factored in to the CEM baseline, to offset the potential negative impact of such costs on the CEM efficiency figure, to also be discounted for the purposes of REEM efficiency calculation.

Adjustment due to change in redundancy-related costs

There was a £25m difference between the redundancy numbers assumed in the full-year forecast in P11 2008/09 and the actual outturn in P13. To address the effect of this difference in the REEM baseline, a £26.25m adjustment was applied to the CEM baseline. This can be calculated as £25m lifted by the RPI inflation rate of 0.28% and 4.71% in November 2009 and November 2010 respectively.

REEM Maintenance expenditure

We set out in the table below the adjustments that are applied to the CEM maintenance expenditure figures (baseline and year-end) to derive the REEM outputs.

Line Item	CEM figure (£k)	Adjustments (£k)	REEM figure (£k)	Commentary
Year-end (FY10/11)				
CEM year-end	1,067,055			
Adjustment 1		4,591		Staff bonus proportioned by headcount
REEM year-end			1,071,646	
Baseline				
CEM Total	1,229,474			
Adjustment 1		-4,200		CP3 exit rate adjustment
Adjustment 2		-10,314		Disallowed baseline - traffic
Adjustment 3		20,412		Revised inflation assumption
REEM Total			1,235,371	
Sum efficiency (year-end vs. baseline)			**163,725**	

Table 64: REEM adjustments – maintenance[108]

As indicated in the table above, following adjustment of CEM figures to produce the REEM outputs, the resulting total REEM efficiency calculation is £163.7m.

We discuss the adjustments applied to derive the REEM maintenance efficiency calculation in further detail below.

Year-end cost adjustments

As with controllable opex, maintenance year-end figures are adjusted to account for staff bonus expenses not originally included in the CEM year-end figures. These account for a total of £9.57m across all the entire business – and are applied on a pro-rata basis, according to total headcount. For maintenance, with a headcount of 16,632, this results in allocated staff bonus costs of £4.59m.

[108] Source: calculation spreadsheet "Total checker p13 REEM.xls"

Baseline inflation adjustments

Inflation adjustments have been applied to the maintenance baseline figures on the same basis as for the controllable opex (see Section 0) – with deduction of the original CEM inflation figures for FY10/11 and FY09/10, and addition of the in-year November RPI inflation figures for the consecutive years, as required by the ORR.

When applied to maintenance costs, this increases the baseline figure by £20.4m.

P3 exit-rate adjustments

Exactly the same CP3 exit rate adjustment has been applied to maintenance costs as to the support costs (see Section 0). As discussed above, an overall O&M exit-rate adjustment figure of £8 million has been split 50-50 between support and maintenance costs, resulting in half of the inflated adjustment figure (£8.4m) being applied to maintenance costs. The resulting output is a deduction of £4.2m of cost overall.

Disallowed baseline adjustment for traffic volume increase

An adjustment of -£10.3m has been applied to account for the deduction of an adjustment originally added by Network Rail to account for increased traffic volumes.

Network Rail originally factored in an additional sum of £14m to the CEM, to offset the maintenance cost impact of increased traffic levels within the efficiency baseline. However, as set out in the letter from Charles Robarts (Network Rail) to Paul McMahon (ORR) dated 19th November 2010, it was agreed that this adjustment would be taken out of the REEM baseline, and replaced with a revised calculation of the incremental maintenance cost impact of increased traffic.

A revised formula, based on the multiplication of incremental tonnage by incremental cost rate estimates for track maintenance has been implemented, resulting in the addition of £4.15m.

On this basis, the overall adjustment of -£10.3m is calculated on the following:

- Deduction of original baseline adjustment -£14.0m
- Addition of revised incremental maintenance cost estimation +£4.15m
- → Resulting adjustment (-£9.85m+inflation) -£10.3m

REEM renewals expenditure

REEM renewals expenditure and efficiency overview

We set out in the table below the adjustments that are applied to the CEM renewals expenditure figures (baseline and year-end) to derive the REEM outputs.

Line item	CEM figure (£k)	Adjustments (£k)	REEM figure (£k)	Commentary
Year-end costs				
CEM year-end	2,173,405			
Year-end adjustment		1,073		Staff bonus proportioned by headcount
REEM year-end			2,174,478	
Baseline costs				
CEM baseline	2,583,074			
Sum adjustments		14,462		Sum unit cost and inflation adjustments
REEM baseline			2,597,536	
Sum efficiency (year-end vs. baseline)			**423,058**	

Table 65: REEM adjustments – renewals[109]

Year-end costs As with opex and maintenance costs, year-end renewals figures are adjusted to account for staff bonus expenses not originally included in the CEM. These costs account for a total of £9.57m across all the entire business, and are applied on a pro-rata basis, according to total headcount. For renewals, with a headcount of 3,888, this results in allocated staff bonus costs of £1.07m.

Baseline adjustments overview

Baseline adjustments for the REEM renewals calculation account for a total of £14.46m; we set out in the table below, the adjustment elements, applied to each renewals asset category.

Baseline cost	CEM figure (£k)	Adjustments (£k)	REEM figure (£k)
Track			
CEM baseline - Plain Line (RUC costs)	484,688		
Unit rate adjustment (incl. inflation)		-2,138	
REEM baseline - Plain Line (RUC costs)			482,550

[109] Source: calculation spreadsheet "MasterTemplateRenP11 BP P13 1011 REEM.xls"

CEM baseline - S&C (RUC costs)	232,683		
CP3 exit rate unit cost adjustment (incl. inflation)		-8,232	
REEM baseline - S&C (RUC costs)			224,451
Other direct costs CEM baseline	47,969		
CP3 exit rate adjustment		-6,283	
Other Dir REEM baseline			41,686
REEM baseline (track total)			**748,687**
Signalling			
CEM baseline (RUC costs)	177,772		
Unit rate adjustment (incl. inflation)		-2,682	
REEM baseline (RUC costs)			175,090
Other direct costs CEM baseline	264,344		
Inflation adjustment		5,447	
Other Dir REEM baseline			269,791
REEM baseline (signalling total)			**444,881**
Civils & Structures			
CEM baseline (RUC costs)	277,608		
Inflation adjustment		5,720	
REEM baseline (RUC costs)			283,328
Other Dir CEM baseline	117,236		
Inflation adjustment		2,421	
Other Dir REEM baseline			119,657
REEM baseline (civils total)			**402,986**
Other renewals categories			
CEM baseline	980,773		
Inflation adjustment		20,209	
REEM baseline (other categories total)			**1,000,983**
Total renewals baseline costs			
CEM baseline	**2,583,074**		
Total baseline adjustments		**14,462**	
REEM baseline			**2,597,536**

Table 66: CEM-REEM renewals baseline adjustment

Source: calculation spreadsheet "MasterTemplateRenP11 BP P13 1011 REEM.xls

As shown in the table on the previous page, adjustments applied to derive the REEM baseline comprise the following:

- Inflation adjustments (all renewals cost categories)
- CP3 exit-rate adjustments to unit costs (track and signalling only)

These are discussed in further detail below.

Baseline inflation adjustments For the CEM renewals baseline, Network Rail utilised the full-year RPI inflation rate valid one year previous to the start of the

given Financial Year (i.e. for FY10/11, the March 2009 RPI rate was used). We understand that this was considered by Network Rail to represent most effectively the contract rate increases typically been applied on a long-term basis to renewals contracts, which tend to take effect the following year.

However, consistent with the approach taken for opex and maintenance costs, ORR has required Network Rail to discount these original inflation assumptions and utilise the in-year November RPI inflation rate instead. The resulting adjustments applied on this basis are set out in the table below.

Inflation adjustments	Percentage discounted	Percentage added	Source of adjustment
Discount CEM inflation (FY10/11)	4.45%		March 2009 RPI -reflecting re-fix for FY10/11 contracts
Discount CEM inflation (FY09/10)	-1.50%		March 2008 RPI -reflecting re-fix for FY09/10 contracts
Add REEM inflation (FY09/10)		0.28%	November 2009 RPI inflation - required by ORR
Add REEM inflation (FY10/11)		4.71%	November 2010 RPI inflation - required by ORR

Table 67: Inflation adjustments (operations & maintenance costs) – CEM to REEM[110]

CP3 exit-rate adjustments

Similar to opex and maintenance costs, adjustments have also been applied to the renewals baseline to reflect differences in CP3 exit-rate costs, once again in order to account for outturn year-end cost levels at the end of FY09/10, as opposed to the forecast cost levels utilised for CEM purposes.

For renewals this adjustment is done to the unit cost rates for track and signalling renewals as well as other direct costs for track, which is the -£6,28 million adjustment shown in Table 68. No CP3 exit-rate adjustment was required for the REEM baselines for other direct costs related to signalling and civils. This is because the baseline figures for these costs have been derived from the actual spending during the year based on assumed efficiencies achieved.

The impact of the unit cost exit-rate adjustments is set out in the table below, with adjustments relating to two RUC rates for track renewals, and a single RUC unit cost rate for signalling.

[110] Source: calculation spreadsheet "Total checker p13 REEM.xls"

Expenditure category	CEM exit rate (FY09/10 P11 forecast)	REEM exit rate (FY09/10 year-end)	FY10/11 volume (year-end adjusted baseline)	Total adjustment (u/c exit rate differential x volume)
RUC unit costs: track				
- Plain line unit rates (£k per km)	268.6	267.4	1,804	-2,138
- S&C unit rates (£k per unit)	530.8	512.0	438	-8,232
RUC unit costs: signalling				
- SEU unit rates (£k per SEU)	242.1	238.5	734	-2,682

Table 69: CP3 exit-rate renewals unit cost adjustments [111]

As indicated in the table above, the adjustment applied to the FY10/11 renewals baseline is calculated on the basis of the differential between the forecast and year-end (outturn) unit rate, multiplied by the FY10/11 year-end adjusted baseline, in order to provide a total adjustment figure. The combined impact of the three volume-based adjustments is a total baseline reduction of £13.05m. This reflects the FY09/10 year-end unit costs that were lower than forecast at FY09/10 P11 for all three of the unit cost categories shown.

Key findings and conclusions

At the time of writing, we are of the opinion that from an arithmetical perspective, the REEM has been calculated correctly and in line with Network Rail policy. We have highlighted in Table 30 a number of adjustments (in red) where we are awaiting confirmation as to their origin.

Our observations that relate to the CEM also apply to the REEM where data (or assumptions around data) are relevant to both measures.

[111] Source: calculation spreadsheet "MasterTemplateRenP11 BP P13 1011 REEM.xls"

Appendix D: Detailed review – volume efficiency (Statement 13)

Volume Incentives

The volume incentive payment has been designed to encourage Network Rail to respond to greater than anticipated demand growth through a lump sum payment in the first year of Control Period 5 subject to affordability.

The volume incentive calculations are based on baseline annual growth rates in four capacity metrics including passenger train miles, passenger farebox, freight train miles and freight gross tonne miles. Network Rail is only qualified for volume incentives payments for growth rates above the annual baseline growth in PR08 determination.

Statement 13 of Network Rail's regulatory financial statement forms part of Appendix A. The volume incentive up to 2010/11 calculated by Network Rail is £5.3 million, triggered by growth in passenger train miles.

Baseline Growth Rates and Incentive Rates

According to ORR's PR08 determination, the baseline annual growth figures used for volume incentive calculations are as follows:

2006-07 prices	Incentive rate	Baseline annual growth
Passenger		
Per passenger train mile	69p	0.8%
% of additional revenue	1.5%	4.7% (Real)
Freight		
Per freight train mile	111p	2.3%
Per freight 1000 gross tonne mile	100p	1.6%

The incentive rates used for the calculation of volume incentives in Network Rail's spreadsheets are adjusted to 2010/11 prices by a factor of 1.128, which is based on the ratio of the November 2010 RPI 226.8 to November 2006 RPI 201.1. The RPI figures used are in line with the data published by the Office for National Statistics (ONS).

The incentive rates used by Network Rail in the calculations are therefore:

2010-11 prices	Incentive rate
Passenger	
Per passenger train mile	78p
% of additional revenue	1.5%
Freight	
Per freight train mile	125p
Per freight 1000 gross tonne mile	113p

Source of Data

Passenger traffic volume data

The passenger train mile data that Network Rail used for this calculation has been taken from Paladin, Network Rail's train performance database. The train mile data include all franchised and open access passenger train operators and exclude empty coaching stock.

The passenger train mile data used in this calculation can be traced back to individual train operators for each of the 13 periods in the year. The train mile data attributable to First Scotrail are used for volume incentives calculations for Scotland. Data from all other franchises and open access operators are included for the calculations related to England and Wales.

The passenger revenue data that Network Rail used for volume incentive calculation generally agree to the revenue data that ORR publishes on the National Rail Trends page on its website. However, since only passenger revenue data up to Q3 2010-11 are currently available, Network Rail has used an average of the Q1 to Q3 revenue data as an estimate for Q4 2010-11.

The passenger revenues for Scotland for 2008/09, 2009/10 and 2010/11 have been estimated as 3.88% of the GB total based on the revenue for Scotrail as a proportion of the GB total in year 2008/09 provided by ORR. While the proportion of passenger revenues attributable for England and Wales has been calculated as 96.12% i.e. total GB revenues net of 3.88% attributed to Scotrail for 2008/09, 96.02% has been used for years 2009/10 and 2010/11. Due to this input error, the sum of passenger revenue for Scotland and England and Wales is £6 million less than the total value for GB. However, since the total accrued volume incentive payment has been calculated based on total GB revenue figures provided by ORR, the error may has not had a material impact on the total volume incentive calculation.

Freight traffic volume data

Freight train miles and freight gross tonne miles data for years 2008/09 and 2009/10 used by Network Rail in volume incentives calculations agree to those presented in Annual Return 2010. According to comments inserted to Network Rail's calculation spreadsheet for volume incentives, the freight train miles and freight gross tonne miles for year 2010/11 used for the calculations are based on figure provided by the finance function in Manchester.

All freight traffic data for Scotland have been estimated as 9.60% of the total figure for GB. The proportion of freight traffic attributable for England and Wales has been estimated as 90.40% i.e. total GB freight traffic net of the 9.60% attributed to Scotland. The 9.60% estimate for traffic attributable to Scotland has been provided by the finance function in Manchester.

Although there is a lack of visibility of what these data consist of, since negative growth relative to the baseline has been reported as discussed below and no volume incentive payment has been triggered by these freight metrics, we do not consider that this represents a risk in the context of the FY10/11 volume incentive calculations.

Calculation Process

Network Rail's calculation of volume incentives for GB is summarised in the following table:

Volume Indicator	Year	Actual (million)	Baseline annual growth	Adjustment for Inflation	Baseline (million)	Growth on baseline (million)	Incentive Rate (2010/11 prices)	Incentive payment 2010/11 prices (million)	Annual contribution 2010/11 prices (million)
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Passenger train miles	2008/09 actual	282.7	-	-	282.7	-	-	-	-
	2009/10	294.7	0.80%	-	284.9	9.8	£0.78	£38.1	£38.1
	2010/11	300.1	0.80%	-	287.2	12.9	£0.78	£50.3	£12.2
Passenger revenue	2008/09 actual	£6,004	-	-	£6,004	-	-	-	-
	2009/10	£6,179	4.70%	0.28%	£6,303	-£124	1.50%	£0.00	£0.00
	2010/11	£6,521	4.70%	3.00%	£6,788	-£267	1.50%	£0.00	£0.00
Freight train miles	2008/09 actual	27.19	-	-	27.19	-	-	-	-
	2009/10	24.59	2.30%	-	27.82	-3.2	£1.25	£0.00	£0.00
	2010/11	24.09	2.30%	-	28.46	-4.4	£1.25	£0.00	£0.00
Freight gross tonne miles	2008/09 actual	28,438	-	-	28,438	-	-	-	-
	2009/10	24,036	1.60%	-	28,893	-4857.0	£1.13	£0.00	£0.00
	2010/11	26,062	1.60%	-	29,355	-3293.7	£1.13	£0.00	£0.00

Table 70: Supporting calculations for Volume Incentive payment (Statement 13)

It can be seen from the above table that passenger train miles is the only volume metric that has seen growth above baseline, triggering incentive payment of £50.3 million.

Using the column references in the table above, the incentive payment accrued shown in column (g) have been calculated as (e) × (f) × 5. The Incentive rates in column (f) are in 2010/11 prices as discussed in 12.2, while the growth on baseline in column (e) had been calculated as (a) – (d). The sources for the metrics shown in column (a) have been discussed in 12.3.

The baseline values in column (d) are calculated based on the actual metrics reported in year 2008/09 lifted by the baseline growth figures shown in column

(b), which have been taken from the PR08 determination as discussed in 12.2. The baseline figure for the current year is calculated by adding the baseline annual growth to the baseline figure for the previous year. As an example, the baseline passenger train miles for 2009/10 can be calculated as 282.7 × (1 + 0.8%) = 284.9 and that for 2010/11 can be calculated as 284.9 × (1+ 0.8%) = 287.2.

As the baseline annual growth for passenger revenue of 4.70% quoted from PR08 determination is a real growth rate, inflation rates in column (c) are added to this value to calculate the nominal baseline growth for 2009/10 and 2010/11. The nominal baseline annual growth for passenger revenue in 2009/10 is therefore 4.71% + 0.28% = 4.99%. While the inflation rate of 0.28% that Network Rail uses for 2009/10 is in line with the RPI year-on-year inflation in November 2009 reported by ONS, the inflation rate of 3.00% used by Network Rail for 2010/11 is an assumed value rather than the RPI year-on-year inflation in November 2010 reported by ONS, which was 4.71%. However, since the use of a lower than actual inflation rate has already yielded a negative growth on baseline for passenger revenue in 2010/11 that does not trigger incentive payment, the use of the higher actual inflation figure of 4.71% will still yield a negative growth in this metric and therefore has no effect on the amount of incentive payment accrued to Network Rail.

Since the baselines in column (d) include the cumulative effects of baseline annual growth rates in previous years as discussed, growths on baseline shown in column (e) and in turn, incentive payments shown in column (g) are cumulative values. The annual contributions to the volume incentive payment are shown on column (h).

The volume incentive calculations for Scotland and England & Wales generally follow the same methodology with actual volume metric and baselines adjusted to reflect the split of traffic in these countries as discussed in 12.3.

Key findings and conclusions

By comparing the calculation methodology described above with the one used in a spreadsheet provided by ORR, we found that the Network Rail's calculation of volume incentive agrees to the methodology used by ORR.

As discussed in previous sections, there are a number of concerns regarding the data used by Network Rail in the volume incentive calculations:

- Error in the proportions of passenger revenue allocated to England & Wales for 2009/10 and 2010/11;
- Low visibility of the source of freight traffic data used for the calculations;
- Assumed inflation rate instead of actual inflation rate used in the calculation of nominal baseline annual growth for passenger revenue.

Since passenger train miles is the only volume metric that has triggered incentive payments and is not directly affected by the issues listed above, we do not consider these issues to have material impact on the volume incentive calculations for the current year.

Appendix E: Overview of Track Renewals Workbank Planning and Delivery

Planning of track renewals volume in the workbank

The Principal Renewals and Enhancement Engineer (Track) (PREE(T)) is responsible for managing the track renewals workbank. The compilation of the workbank starts by determining the volume of track renewals work for future years. Strategic Asset Programme Development and results from the annual Peer Review process are consulted during the development of track renewals workbank.

The PREE(T) also establishes the annual workplan. The aim of the annual workplans is to derive the optimum mix of track renewals work to provide a cost effective asset management programme for the years considered. Some of the factors considered in developing the annual workplans include route and asset strategies, track engineering policies and asset condition. The National Renewals and Enhancements Engineer (Track) (NREE(T)) is consulted to confirm that the workplans are compliant with national volume targets.

Prioritisation tools are available to help ranking of work items in development of the track renewals workbank and annual workplans. Some of the factors to be taken into account in the prioritisation process include track category and route usage, Temporary Speed Restriction risk, maintenance accessibility and asset condition scores.

The items in the workbank are under the sole control of the PREE(T) until the outline annual workplan for the specified year in question is formally issued for delivery planning.

Review of track renewals volume in the workbank

All proposed work items for the workbank are subject to inspections by the PREE(T), who amends and reprioritise the reviewed proposals in accordance with national policy as required to ensure consistency with route and asset strategies.

The Director of Track Engineering runs an annual programme of Peer Reviews on the proposed work items across the entire network. Proposals reviewed in this process may be amended in line with national policy, route and asset strategies as necessary and the implications of these changes will be assessed against the national and depot volumes.

Representative samples of proposals are selected across the network for inspection by the PREE(T) and the annual Peer Review respectively. The inspection by the PREE(T) and the annual Peer Review may involve desk-top reviews and site visits to:

- Correlate the details presented;
- Confirm the quality detail and consistency of the proposals;
- Enable consistent interpretation of the condition and possible remedial work;
- Assess the proposals in terms of the route and asset strategy and

- Confirm the scope of the proposed works and the year for implementation.

Deferral of outstanding renewals work and updating of workbank

PREE(T) and Programme Engineering Manager (PEM) are responsible for confirming programmed works have been delivered to time, specification and cost. In the event of work items that are not complete within the initially defined timescale, the PREE(T) will consult the track maintenance engineer and develop an action plan. Some of the possible actions include re-plan of any items that can be delivered in the current year, agreeing a reduced plan and moving the remaining work to a future year.

The preferred arrangement finalised is recorded in change control documentation. The PREE(T) is responsible for updating the renewals workbank and arranging extra maintenance and CAPEX costs associated if outstanding work are deferred to later years.

Reviews of emerging volumes of non-delivered renewals work are performed at the end of Quarters 2 and 3 of the financial year. Revised implementation dates for the outstanding work items are confirmed in these reviews

Authority to Invest

Authority to Invest must be obtained by the sponsor before any commitment is made to provide finance or other resource to a renewals or investment project. Depending on the anticipated final cost (AFC), risk score and asset type, the Authority to Invest may be granted by:

- Network Rail Board (NRB)
- Investment Panel (IP)
- Enhancements and Renewals Investment Panel (ERIP)
- Investment Projects Panel (IPP)
- Information Management Investment Panel (IMIP)
- Signalling, Power & Communications Project Panel (SP&C PP)

There are specific signature requirements for all investment papers submitted for the Authority to Invest. Signatures required typically include:

- Sponsor
- Delivery
- Finance
- Operation & Customer Services
- Maintenance
- National Delivery Service (NDS)

In the event of material delay to delivery or change of scope in projects that have been granted the Authority to Invest, notification with project details and reason is to be sent to the authorising panel for re-authority.

Delivery of Renewals Work and Calculation of Volume Efficiency

Once the Authority to Invest is granted the design and planning works that enable to delivery of the renewals work progress, following the GRIP processes. After the planned renewals works are delivered, the actual renewals volumes are reported to the central Financial Control for the calculation of efficiency measures.

Asset managers are required to submit Investment Variance Analysis reports to Financial Control if the actual renewals work volume delivered differs from the volume set out in Network Rail's CP4 Delivery Plan for that particular year. The Financial Controller, having general knowledge of asset conditions and statuses of renewals works through his attendance in various asset meetings, will make a judgement of what percentage of the reduction of renewals volume delivered can be attributed to volume efficiencies. This judgement forms the basis for the volume efficiency calculation.

Appendix F: Meetings held to date

Date	Location	Attendees name & Division	Purpose of Meeting
25/3/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Jonathan Yates, Mark Morris, Tim Ashwin, Jian Li Network Rail: Rob Evison, Rebecca Mottley, Liam Rattigan, Ashur Toma, Karen Henderson, Colm Gallagher, Richard McCarthy, Richard Henstock	Kick-off meeting with Network Rail
29/3/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Jonathan Yates, Trevor Taylor, Tim Ashwin, Jian Li Network Rail: Rob Evison, Rebecca Mottley, Ashur Toma, Karen Henderson, Dave Wynne	Maintenance cost and MUC review meeting
4/4/2011	Network Rail Office, Kings Place	Arup: Mark Morris, Tim Ashwin Network Rail: Rob Evison, Rebecca Mottley, Stephen Blakey, Colm Gallagher, Richard McCarthy, Robin Hamilton	Renewals cost and CAF review meeting
6/4/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Mark Morris, Tim Ashwin, Jian Li Network Rail: Rob Evison, Rebecca Mottley, Colm Gallagher, Richard Henstock, Mike Murphy, Simon Appleyard	Meeting with Financial Control for signalling
11/4/2011	Network Rail Office, Melton Street	Arup: Alexander Jan, Mark Morris, Tim Ashwin, Jian Li Network Rail: Rob Evison, Rebecca Mottley, Adrian Golumbina. Ram Ramakrishnan, Sue Coverdale, Richard Henstock, Colm Gallagher	Meeting with Track Financial Control and Engineering
12/4/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Mark Morris, Tim Ashwin, Trevor Taylor, Jian Li Network Rail: Rob Evison, Rebecca Mottley, Ian Ramshaw, Liam Rattigan	Meeting on CEM and REEM efficiency measures
13/4/2011	Network Rail Office, Swindon	Arup: Tim Ashwin, Jian Li Network Rail: Rob Evison, Rebecca Mottley, John Moor, Mike Smith	Meeting with Buildings & Civils Financial Control and Engineering
14//4/2011	Network Rail Office, Kings Place	Arup: Tim Ashwin, Jian Li Network Rail: Rob Evison, Rebecca Mottley, Liam Rattigan, Karen Henderson	CEM and REEM baseline and calculation review
18/4/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Mark Morris, Tim Ashwin Network Rail: Rob Evison, Rebecca Mottley, Stephen Blakey, Richard McCarthy, Richard Henstock, Karen Henderson, Bill Davidson, Dave Wynne, Pablo Forteza, Ashur Toma	Arup initial findings presentation

Date	Location	Attendees name & Division	Purpose of Meeting
05/05/2011	Network Rail Office, Kings Place	Arup: Jian Li, Tim Ashwin Network Rail: Rob Evison, Rebecca Mottley, Liam Rattigan	Detailed review of REEM baseline / input adjustments
31/05/2011	Network Rail Office, Kings Place	Arup: Jian Li Network Rail: Liam Rattigan	Asset Management policies
01/06/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Mark Morris Network Rail: John Schofield, Andrew Newby	CEM baseline data
08/06/2011	ORR office, Kemble Street	Arup: Alexander Jan, Mark Morris, Tim Ashwin ORR: Carl Hetherington, Jim Bostock, Gordon Cole Network Rail: Charles Robarts, John Schofield, Andrew Newby, Andrew Ballsdon	Arup review and opinion, next steps
14/06/2011	Network Rail Office, Kings Place	Arup: Francis Sese, Tim Ashwin Network Rail: Andrew Ballsdon, Liam Rattigan, Karen Henderson	Discussion and provision of key efficiency / Reg Accounts source data
20/06/2011	Network Rail Office, Kings Place	Arup: Jian Li, Tim Ashwin Network Rail: Andrew Ballsdon, Liam Rattigan, Karen Henderson	Discussion and provision of key efficiency / Reg Accounts source data
05/07/2011	Network Rail Office, Kings Place	Arup: Jian Li, Tim Ashwin Network Rail: Andrew Ballsdon, Liam Rattigan, Karen Henderson	Updated calculation of Renewals Efficiencies
05/07/2011	Network Rail Office, Melton Street	Arup: Mark Morris, Tim Ashwin Network Rail: James Dean, John Armstrong	Track Positive Management Actions
06/07/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Tim Ashwin Network Rail: Mike Murphy, Simon Appleyard, Andy Smith	Signalling, Power & Communications positive management actions & sustainability
06/07/2011	Network Rail Office, Melton Street	Arup: Mark Morris, Tim Ashwin Network Rail: James Dean, John Armstrong	Track Sustainability

Date	Location	Attendees name & Division	Purpose of Meeting
07/07/2011	Network Rail Office, Melton Street	Arup: Mark Morris, Tim Ashwin Network Rail: John Chappel, Dan Athol, Neil Jones, Tony Wilcock	Buildings & Civils positive management actions & sustainability
12/07/2011	Network Rail Office, Kings Place	Arup: Alexander Jan Network Rail: Charles Robarts, John Schofield	Arup review and opinion
18/07/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Tim Ashwin Network Rail: Charles Robarts, John Schofield, Andrew Ballsdon, Michael Hunt	Arup review and opinion
20/07/2011	Network Rail Office, Kings Place	Arup: John Turzynski, Stefan Sanders (by telephone), Alexander Jan, Tim Ashwin, Network Rail: Patrick Butcher, Charles Robarts, John Schofield, Andrew Ballsdon, Michael Hunt ORR: Paul McMahon, Carl Hetherington, Gordon Cole	Arup review and opinion
20/07/2011	Network Rail Office, Melton Street	Arup: Mark Morris, Tim Ashwin, Network Rail: John Moore, Andrew Ballsdon, Karen Henderson	Civils unit cost 2008/09 baseline
18/08/2011	Network Rail Office, Kings Place	Arup: Alexander Jan, Dan Phillips, Tim Ashwin, Network Rail: Andrew Ballsdon, Karen Bouwman	Meeting to discuss proposals for 2011/12 Regulatory Accounts reporting & review

Appendix G: Assignment Mandate from ORR (21st February 2011)

Regulatory accounts data assurance reporter mandate AO/011

Background

This mandate sets out the requirements for the audit of Network Rail's efficiency, maintenance, renewals, volume incentive and unit cost information to be included in its 2010-11 regulatory accounts.

The reporter will set out a clear approach for assessing the quality and accuracy of the data, looking forward towards using this methodology in subsequent years to ensure consistency. We expect the reporter to make clear recommendations, drawing on previous years' audits and make a judgement on the quality and coverage of the data.

General

1. The reporter will review whether Network Rail's breakdown of the renewals underspend, when compared to the 2010-11 budget and CP4 delivery plan, between deferral and efficiency is reasonable, particularly given that Network Rail's asset policies have been in a state of flux. This audit should identify whether Network Rail's breakdown of efficiencies between scope and unit cost is reasonable. In particular:

(a) verify whether the reporting and data collection systems, procedures and processes are now set up so that the CEM estimate of renewals efficiency is sufficiently accurate[112] and reliable;

(b) verify whether the data used to calculate the unit costs and efficiency measures is accurate, of an appropriate quality and consistent with the purpose of the measures;

(c) verify whether the internal analysis, challenge and reporting of its renewals efficiency measure ensures that the breakdown of efficiencies between scope and unit cost is sufficiently accurate, e.g. Network Rail can adequately explain movements from the previous year; and

(d) will compare Network Rail's approach, data quality, systems and processes to best practice.

2. The reporter will assess the accuracy and reliability of each CAF and MUC unit cost in accordance with its confidence grading system. This will include a review of the quality of the data used to calculate the CAFs and MUCs. This assessment will identify how the quality of data in 2010-11 compares to previous years where appropriate.

112 Accuracy does not include variability due to different levels of performance.

3. The reporter will also assess Network rail's progress with the reporter's previous recommendations.

Regulatory financial statements

General

The reporter will review whether Network Rail's explanation in its director's review and in the commentary on the regulatory financial statements of the variances between actual efficiency and unit costs and those assumed in its 2010-11 budget, CP4 delivery plan, and ORR's PR08 determination is reasonable.

Table 8b (parts (1) and (2).

The reporter will review table 8b of the regulatory financial statements for Great Britain, England & Wales and Scotland to confirm whether:

1. the breakdown of spend by asset category by MDU is consistent with the remainder of the Regulatory Accounts;
2. the amounts of spend by MDU agrees to the underlying accounting records and have been correctly extracted; and
3. where costs or headcounts have been allocated that this allocation has been made on a reasonable basis and any other estimate used is reasonable;
4. the headcount has been correctly extracted from the underlying records and that any estimates used are reasonable;
5. the sub-totals and totals in the table down cast and cross cast;
6. the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts; and
7. Network Rail's narrative on the table is reasonable and agree the details set out in the commentary to the underlying accounting records or other supporting documentation.

Table 9b

The reporter will review table 9b of the regulatory financial statements for Great Britain, England & Wales and Scotland to confirm whether:

1. the breakdown of spend by asset category by total is consistent with the remainder of the regulatory accounts;
2. the amounts of spend by asset type agree to the underlying accounting records and have been correctly extracted;
3. where costs have been allocated between categories that this allocation has been made on a reasonable basis and any other estimate used is reasonable;
4. the sub-totals and totals in the table down cast and cross cast; and
5. the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts; and

6. Network Rail's narrative on the table is reasonable and agrees to the details set out in the commentary to the underlying accounting records or other supporting documentation.

Table 12

The reporter will review table 12 of the regulatory financial statements for Great Britain, England & Wales and Scotland to confirm whether:

1. Network Rail's calculation of its real economic efficiency measure is in accordance with its policy and is reasonable. This should include an assessment of whether the data used to calculate the measures is accurate, of a sufficient quality and consistent with the purpose of the measures;
2. the amounts of income and expenditure used in the efficiency calculation agree to the underlying accounting records and have been correctly extracted;
3. the baselines used are the ones agreed by ORR;
4. where income or costs have been allocated that this allocation has been made on a reasonable basis and any other estimate used is reasonable;
5. the sub-totals and totals in the table down cast and cross cast;
6. the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts; and
7. Network Rail's narrative on the table is reasonable and agrees to the details set out in the commentary to the underlying accounting records or other supporting documentation.

Table 13

The reporter will review table 13 of the regulatory financial statements for Great Britain, England & Wales and Scotland to confirm whether:

1. Network Rail's calculation of its performance on the volume incentive is in accordance with the PR08 determination. This should include an assessment of whether the data used to calculate the measures is accurate, of a sufficient quality and consistent with the purpose of the measures;
2. where income or costs have been allocated that this allocation has been made on a reasonable basis and any other estimate used is reasonable;
3. the sub-totals and totals in the table down cast and cross cast;
4. the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts; and
5. Network Rail's narrative on the table is reasonable and agrees to the details set out in the commentary to the underlying accounting records or other supporting documentation.

Table 14-17 (and other unit costs not shown in the published table)

The reporter will review tables 14-17 of the regulatory financial statements for Great Britain, England & Wales and Scotland and all the other unit costs in the CAF and MUC to confirm whether:

(a) the unit costs have been calculated in accordance with the company's unit cost handbook;

(b) the information to calculate the unit costs has been correctly extracted from the underlying accounting records and that any estimates used are reasonable;

(c) where applicable the sub-totals and totals in the table down cast and cross cast;

(d) where applicable the disaggregated amounts for England and Wales and Scotland add up to the Great Britain amounts; and

(e) Network Rail's narrative on the table is reasonable and agrees to the details set out in the commentary to the underlying accounting records or other supporting documentation.

Deliverables:

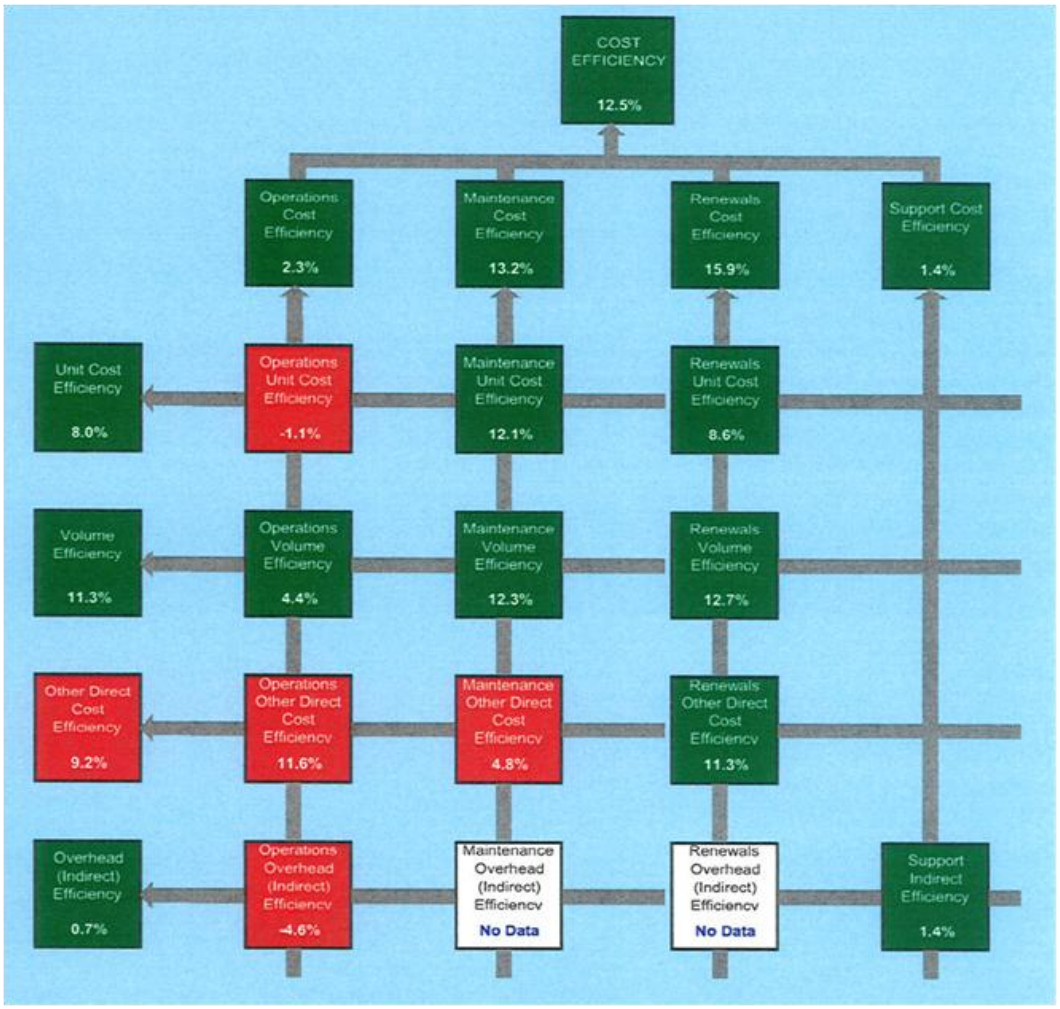
- Initial report – this will include paragraph 1 from the general section and the initial review of table 12 based on P12 data.
- Final report – this will cover the entire mandate.

Delivery dates [subsequently amended]**:**

- Draft initial report on scope 1 issued by Thursday, 7 April
- Final initial report on scope 1 issued by Thursday, 21 April
- Draft report issued by Friday, 8 June
- Final report issued by Friday, 30 June

Appendix H: CEM Cost Efficiency Heat Map

We provide below an extract from the CEM Efficiency "Heat Map" showing the unit cost, volume, and other direct cost efficiencies for each major cost category feeding into the overall CEM efficiency measure.[113]



[113] Source: "Cost_Efficiency_Heat_Map GB draft P13 - civils adj.pdf"

Appendix I: Documents Reviewed

Ref.	Document title / description	File name / details	Date received
E. General Efficiency, metrics, CEM, REEM			
E1	Calculation spreadsheets for CEM (FY 2010/11 Period 12)	p12 CEM files.zip including: • MasterTemplateOPS P12.xls • MasterTemplateRenP12.xls • MtceCEPeriod 12 Template.xls • Support Master Template p12.xls	Email 31 March 2011
E2	Calculation spreadsheets for REEM (FY 2010/11 Period 12)	P12 REEM files.zip including: • Civils CEM_Rebaseline_P12 REEM.xls • MasterTemplateOPS P12 REEM.xls • MtceCEPeriod 12 Template REEM.xls • P12-11 CEM Signalling REEM.xls • P12-11 Track Renewals v2 REEM.xls • Support Master Template p12 REEM.xls • Total checker p12 REEM.xls	Email 31 March 2011
E3	Cost Efficiency Heat Maps (FY 2010/11 P12) for GB, England & Wales and Scotland	Cost_Efficiency_Heat_Map GB draft P12 - civils adj.pdf Cost_Efficiency_Heat_Map Scot draft P12.pdf Cost_Efficiency_Heat_Map draft E&W p12 - civils adj.pdf	Email 31 March 2011
E4	Network Rail internal manual for KPIs and efficiency measures including high-level descriptions of the rationale, definition, calculation etc.	KPIManual.doc	Email 31 March 2011
E5	REEM/CEM Presentation given at the initial kick-off meeting on 25th March 2011 by Liam Rattigan	REEM CEM for Arup Mar11.ppt	Email 31 March 2011 (13:08)

Ref.	Document title / description	File name / details	Date received
E6	Network Rail's responses to recommendations from mandate 5 robustness of unit cost framework only.	NR Response to Arup - update 17-08-10.pdf	Email 03 September 2010
E7	Network Rail's tracker on Arup's previous recommendations on MUC, CAF, CEM and FVA. Includes all recommendations from mandate 5 robustness of unit cost framework and mandate 3 MUC/CAF audit	240302 Part A Recommendations tracker_ARUP.xlsx	Email 31 March 2011
E8	ORR Annual efficiency and finance assessment of Network Rail 2009-10	http://www.rail-reg.gov.uk/upload/pdf/nr_efficiency_assessment_0910.pdf	ORR website
E9	ORR letter from Bill Emery to Network Rail (David Higgins) defininging and quantifying "success" in terms of key metrics / parameters for NR for CP4.	http://www.rail-reg.gov.uk/upload/pdf/nr-cp4-success-010311.pdf	ORR website
E10	Presentation slides explaining CEM and REEM efficiency measure, given by Patrick Butcher to NR Board Members on 6th October 2010.	Members presentation - efficienciesfinal.pptx	Email 8 April 2011
E11	Network Rail Financial Report Period 12 2010/11	P12 Finance Pack.xlsx	Email 8 April 2011
E12	Presentation slides from the meeting on renewals unit costs and CEM given by Richard Henstock on 6th April.	Renewals ARUP (2).ppt	Email 8 April 2011
E13	Worked example of overhead recovery, CEM and CAF (in Excel)	Efficiency Overhead recoveries CAF CEM.xls	
E14	Network Rail Transformation Programme - presentation given to Arup team on 6th August 2010.	6_Aug_10_Transformation_Prog_Presentation.pdf	Provided to Arup as part of the IR Mandate 007 (Buildings and Civils Asset Policy review)
E15	Control Period 4 Delivery Plan update 2010		Downloaded from Network Rail website

Ref.	Document title / description	File name / details	Date received
E16	Network Rail Annual Return 2010		Downloaded from Network Rail website
E17	Network Rail Asset Management Strategy		Downloaded from Network Rail website
E18	Network Rail CP4 Delivery Plan		Downloaded from Network Rail website
E19	Sample Route Asset Management Plan (RAMP) - Strategic Route Section g.05 Peterborough to Doncaster		Provided to Arup as part of the IR Mandate 007 (Buildings and Civils Asset Policy review)
E20	Delcap Investment Expenditure Report capturing all capital items booked through the balance sheet WIP accounts in the GL (actual vs. budget) (P13 and YTD figures).	Delcap_P13.xlsx	Email 12 April 2011
E21	Investment Regulations CP4 setting out investment authorisation requirements and procedures	Investment Regulations.pdf	Email 12 April 2011
E22	KPI documentation documenting presenting NR KPIs	Zip folder (KPI Documentation.zip) containing: - List of KPI definitions and info (Corporate KPI dictionary.xls) - KPI measuring and monitoring info (KPI MBR matrix.xls) - KPI Manual.doc	Email 12 April 2011
E23	NR Accounting Regulations documentation	Zip folder (Accounting Regulations.zip) containing: - PA01 Project Financial Control.doc - PA02 Project Accounting Scenario.doc - PA03 Reporting of contract claims.doc - PA05 Labour Recoveries.doc	Email 12 April 2011
E24	Guidance notes for the 2011 Delivery Plan update process	2011 Business Plan Guidance.doc	Email 15 April 2011 16:43

Ref.	Document title / description	File name / details	Date received
E25	CEM calculation spreadsheet for track renewals efficiency with explaination of source input data and calculations	Details of CEM calcs.xls	Email 15 April 2011 17:10
E26	1) letter sent to ORR explaining adjustments made to the REEM baseline "Are you now able to agree that the approach for adjusting the baseline to include an additional £28 million for maintenance T&Cs and to amend the traffic adjustment to £3 million in 2009/10 rising to £9.5 million in 2013/14?" 2)-9) REEM and CEEM calculation spreadsheets with P13 data	Data for Arup 15apr.zip including: 1) Letter to Paul McMahon re TCS 121110.pdf 2) Master TemplatesOPS P13.xls 3) MasterTemplateRenP11 BP P13 1011 REEM.xls 4) MasterTemplateRenP13 - civils adj.xls 5) P13-11 CEM Signalling REEM.xls 6) P13-11 Track Renewals v2 REEM.xls 7) Support Master Template p13.xls 8) Total checker p13 REEM.xls 9) Track Renewals BP P13 1011 REEM.xls	Email 15 April 2011 18:37
E27	CEM heat map 2010/11 P13	"Cost_Efficiency_Heat_Map GB draft P13 - civils adj.pdf", plus short Email explaining reasons for the variances in high level efficiency metrics.	Email 19 April 2011
E28	CEM calculation spreadsheet for civils renewals efficiency with explaination of source input data and calculations	Civils CEM_P13.xls	Email 19 April 2011
E29	Calculation spreadsheet containing signalling renewals efficiency metrics	P13-11 CEM Signalling.xls	Email 19 April 2011
E30	CEM calculation spreadsheet containing civls renewals efficiency metrics	Copy of Civils CEM_Rebaseline_P13 civils adj.xlsx	Email 19 April 2011
E31	Track Asset Management (Renewals) End to End Process Application Guide	1 - TAM(R) E2E Define Manual Version 1.doc	Email 19 April 2011
E32	Letter from ORR to Network Rail commenting on Asset Policies	ORR conclusions on asset policies 010610.pdf	Email on 20 April 2011

Ref.	Document title / description	File name / details	Date received
E33	Zip file containing calculation spreadsheets for the Regulated Asset Base (RAB) calculation.	RAB 19Apr for Arup.zip	Email 20 April 2011
E34	Presentation slides documenting the financial benefits from Transformation Projects relating to track renewals productivity / efficiency	NEW Template - Transformation Benefit Validation - AM02 EID01 EID02 EID03 - 2009 - 2011 combined.pptx	Email 20 April 2011
E35	Investment Panel paper (Transformation Steering Group), documenting proposed implementation of Route Asset Management Plans (AMPs) for signalling, telecoms, civils, operational property and electrification & plant renewals and the associated financial benefits (8 September 2009)	Investment Proposal - AM02 (Submitted version 1 0).doc	Email 20 April 2011
E36	Investment Panel paper EID01, documenting proposals for implementing measures within the GRIP process to improve efficiency of the Standard Plain Line Track Delivery (16 June 2009)	EID01_Standard Plain Line_IP-v11.doc	Email 20 April 2011
E37	Investment Panel paper EID02 (Transformation Steering Group), documenting proposed planning improvements to GRIP 1-5 process for High Output and Medium Output (HO/MOBC) to raise productivity levels, and associated financial benefits.	EID02_High output V6-1.doc	Email 20 April 2011
E38	Email setting out the actual and discounted cost savings resulting from projects AM02, EID01, EID02 and EID03	Copy of Email (Subject: "FW: Transformation - Track") sent from Patterson Kurtis to Reynolds Michael on 19th April 2011	Email 20 April 2011
E39	Excel spreadsheet setting out the input figures for the FY10/11 REEM efficiency calculation from all renewals asset categories.	REEM renewals high level calc.xlsx	Email 26 April 2011

Ref.	Document title / description	File name / details	Date received
E40	Excel spreadsheet setting out the original 2009 Delivery Plan and revised 2010 & 2011 Delivery Plan volumes for signalling renewals, including separation of Crossrail-related "accelerated" volumes from other renewals.	Revised signalling volumes April 2011.xlsx	Email 26 April 2011
E41	REEM calculation sheet for FY 09/10	FY0910 REEM calc.xls	Email 20 April 2011 13:40
E42	Draft Statement 12 for 2010/11	stat12 v1.xls	Email 20 April 2011 13:40
E43	2011/12 route track Business Plan. Savings and efficiencies included.	1112 Track Business Plan Cost and Volume FINAL 191110	Email 20 April 2011 13:40
E44	Maintenance cost efficiency calculation spreadsheet for P13 CEM and REEM calculations	MtceCEPeriod 13 Template v3.xls	Email 03 May 2011
E45	updated version of REEM calculation sheet that includes the worksheet "Actual _ REEM from model'	Total checker p13 REEM.xls	Email 04 May 2011
E46	spreadsheet forming part of the REEM calculation process	Total checker p13 - civils adj.xls	Email 4 May 2011 12:04
E47	spreadsheet forming part of the REEM calculation process	Total checker CR model 3sep with scot ew sent to ORR.xls	Email 4 May 2011 12:04
E48	A presentation for maintenance efficiency. Includes track and non-track incident count, maintenance work backlog, maintenance headcount and maintenance initiatives.	Maintenance Efficiency.ppt	Email 4 May 2011 17:56
E49	One of the series of spreadsheets used for Renewals CEM calculation	MasterTemplateRenP13.xls	Email 5 May 2011 17:33
E50	Spreadsheet used for track renewals CEM calculations, contains input for baseline figures	P13-11 Track Renewals v2.xls	Email 11 May 2011 17:11

Ref.	Document title / description	File name / details	Date received
E51	One of the series of spreadsheets used for CEM/REEM calculation	Total checker diff BL & ORR infl.xls	Email 11 May 2011 17:11
E52	P/L with bonus costs data used for adjusting actual cost for REEM calculation	Group_P13.xls	Email 11 May 2011 17:11
E53	spreadsheet containing headcount data used in apportioning bonus costs across maintenance, operations, renewals, support functions etc.	headcount retrive yony.xls	Email 11 May 2011 17:11
E54	Key Business Prorities 2010/11. Response to Issues log item A57 "NR to provide key deliverables schedule now included in the periodic Finance Board Pack as evidence of auditable efficiency improvement plans / measures being implemented to deliver efficiencies (reference: Arup recommendation 2010.CEM 9)"	Key Deliverables Sch 1011.xls	Email 11 May 2011 17:11
E55	Spreadsheet file includes two sheets: 1) REEEM figure for Scotland (DRAFT) 2) in-year efficiency % for GB, E&W and Scotland (DRAFT)	P13 high level REEM s E&W.XLS	Email 27 May 2011 08:01
E56	Word document containing DRAFT statement 8b and Statement 12 and partial commentaries ("to be refined")	Statement 8b & 12.doc	Email 27 May 2011 08:01
E57	REEM calculation spreadsheets for Scotland	REEM SE&W.zip	Email 27 May 2011 08:01
E58	REEM calculation spreadsheets for E&W	REEM SE&W part 2.zip	Email 27 May 2011 08:04
E59	Full draft Regulatory Accounts statements	Reg Stats 7junam.doc	Email 7th June 2011
E60	ORR document "High Level Approach to Renewals Efficiencies" setting ut suggested key steps for fulfilment of renewals efficiencies, together with NR commentary on	ORR-#417438-v1-Approach_to_renewals_efficiencies (2).DOC	Email 8th June 2011

Ref.	Document title / description	File name / details	Date received
	achievement of efficiencies and expenditure profile over CP4.		
E61	Overview of REEM efficiency calculation, provided by NR as appendix to commentary under E60.	Appendix REEM calculations.xls	Email 8th June 2011
E62	Notes from ORR from meeting held on 8th June at One Kemble Street.	ORR-#417709-v1-renewals_efficiency_meeting_-_minute.DOC	Email 10th June 2011
E63	Overview of renewals expenditure deferrals to CP5	CP5 rollover.xls	File provided to Arup at meeting on 14th June 2011
E64	Overview of CP4 renewals cost adjustments between 2010 and 2011 Delivery Plans	DP11 vs DP10.xls	File provided to Arup at meeting on 14th June 2011
E65	Financial Variance Analysis spreadsheet showing variation in renewals expenditure across all categories between FY10/11 budget and FY10/11 year-end (actual) expenditure levels.	P13-11 Group reporting variance template YA v YB.xls	File provided to Arup at meeting on 14th June 2011
E66	Spreadsheet showing variations between PR08 CP4 renewals efficiency determination and FY10/11 Delivery Plan CP4 expenditure determinations	PR08 vs dp10 for arup.xls	File provided to Arup at meeting on 14th June 2011
E67	Spreadsheet providing a breakdown of expenditure variance in track renewals delivered by AM between FY10/11 budget and year-end figures, with commentary	Variance AM TRACK.xls	File provided to Arup at meeting on 14th June 2011
E68	Spreadsheet providing a breakdown of expenditure variance in IT renewals between FY10/11 budget and year-end figures, with commentary	Variance IM.xls	File provided to Arup at meeting on 14th June 2011
E69	Spreadsheet providing a breakdown of expenditure variance in renewals delivered by IP buildings between FY10/11 budget and year-end figures, with commentary	Variance IP BUILDINGS.xls	File provided to Arup at meeting on 14th June 2011
E70	Spreadsheet providing a breakdown of expenditure variance in signalling renewals between FY10/11 budget and year-end	Variance IP SIGNALLING.xls	File provided to Arup at meeting on 14th June 2011

Ref.	Document title / description	File name / details	Date received
	figures, with commentary		
E71	Electronic copy of letter from Patrick Butcher to Alexander Jan (16th June 2011) regarding Arup's review of the 2010/11 regulatory accounts.	Alexander Jan.Arup.16.06.2011.pdf	Emailed copy of letter sent to Arup on 16th June 2011
E72	Spreadsheet setting out FY 10/11 renewals capex projected at Period 10 (basis of FY 10/11 figures feeding into Delivery Plan Update 2010)	Delcap_P10.xlsx	Email 20 June 2011
E73	Letter from Charles Robarts (NR) to Alexander Jan (Arup) (24 June 2011) introducing further information relating to track, SPC and civils asset renewals efficiencies being provided by NR.	CJR letter to Arup re 10-11 efficiency 240611.doc	Email 24 June 2011
E74	Document explaining the method by which renewals efficiency for CEM and REEM measures is calculated, with worked examples and full FY 10/11 year-end figures.	nr renewal effy expl 1 0.pdf	Email 24 June 2011
E75	Document setting out positive management actions undertaken to achieve efficiencies for Track, SPC and Civils assets including tables quantifying efficiency impact of actions for each asset group.	nr renewal effy analysis 24jun11.pdf	Email 24 June 2011
E76	Document setting out how NR is managing buildings and civils assets taking into account asset policies, planned workbanks, actual delivery and emerging outputs.	Building and Civils Efficiency Review 24 June 2011 part 1 (2).doc	Email 24 June 2011
E77	B&C part 2.zip containing: - Evidence 8: Justification for Civil Engineering (structures) policy for SBPu setting out information and asset characteristics for different civils asset categories. - Evidence 9: Sample change control spreadsheet for civils projects setting out nature of change, authority required and	B&C part 2.zip containing: - Evidence 8 - Civils Asset Policy – SBPu - Evidence 9 - Example Civils change control for Period 3 - Evidence 10 - Civils 10/11 Business Plan - Evidence 11 - Example Civils Investment paper. - Evidence 12 – Extract from Change Log – Deferrals	Email 24 June 2011

Ref.	Document title / description	File name / details	Date received
	cost (or non-cost) impact - Evidence 10: Civls Business Plan spreadsheet showing baseline and budget costs and variance for >1600 civils projects costs year by year for CP4. - Evidence 11: Civils Investment Paper - spreadsheet setting out details of sample civils project including cost projections - Evidence 12: Spreadsheet listing deferrals in civils and buildings project and reasons for it.		
E78	Track Asset Management Efficiency Statement setting out basis of asset data and approach by which track volumes are determined and prioritised in accordance with asset policy and efficiencies resulting from this.	Track Asset Management Efficiency Statement.doc	Email 24 June 2011
E79	SP&C Volumes Efficiency Analysis for CP4 - review of activity levels for Signalling, Telecoms and Electrification & Plant, explanation of volume movements, and sustainability impact	SPC Volume movement explanation v4 (2).doc	Email 24 June 2011
E80	SP&C Volumes Efficiency Analysis- Appendix setting out actual (FY09/1) and projected (remaining CP4) Asset Stewardship Indicator values for SPC asset categories	Appendix 12 SPC CP4 ASI Forecasts (2).xls	Email 24 June 2011
E81	Review by Richard Spoors Associates of Network Rail's new track asset policies via technical analysis and site visits, April 2010	Attachment 1 Efficiencies (2).pdf	Email 24 June 2011
E82	Appendices relating to electrification and plant, containing: 1) Table from Annual Return setting out variances in Delivery Plan vs. Actual electrification and plant volumes, and reasons for variances. 2) Spreadsheet setting out variance in electrification and plant renewals volumes between 2010 and 2011 Delivery Plan updates, and stating reasons for variance.	E&P Appendices.zip containing: 1) Electrification Appendix 10 EP Annual Return (7 June 2011).doc 2) Electrification Appendix 11 EP 2010 - 2011 DPu Variance Summary.xls 3) Electrification Appendix 9 EP SBPu - 2010 DPu EP Business Plan Volumes.ppt	Email 24 June 2011

Ref.	Document title / description	File name / details	Date received
	3) Tables setting out variant in in electrification and plant renewals volumes between 2009 SBP, 2009 Delivery Plan and 2010 Delivery Plan update, and stating reasons for variance between 2009 DP and 2010 DPU.		
E83	Signalling Appendices zip file containing: 1) Document setting out 2010-11 signalling renewals volumes for 23 x schemes, with reasons given for variances between DP10 and actual volumes 2) Signalling Business Plan spreadsheet showing costs for >950 signalling projects costs by year from 2008/09 and previously through CP4 to 2015/16 and beyond. 3) Signalling Business Plan spreadsheet showing costs for >950 signalling projects costs by year from 2008/09 and previously through CP4 to 2015/16 and beyond. 4) Document setting out differences between 2010 and 2011 Delivery Plan signalling renewals volumes for 23 x schemes	Signalling Appendices.zip containing: 1) Signalling Appendix 1 2010-11 volumes changes explanation.xls 2) Signalling Appendix 2 10-11 P1 Signalling Business Plan.xls 3) Signalling Appendix 3 11-12 P1 Signalling Business Plan.xls 4) Signalling Appendix 4 CP4 Volumes change reconciliation.xls	Email 24 June 2011
E84	Telecoms appendices zip file containing: 1) Table from Annual Return 2011 setting out variances in Actual telecom renewals volumes vs. 2010 Delivery Plan Update 2) Telecoms Business Plan from FY09/10 P13 showing costs for >400 telecoms projects costs by year prior to, through and beyond CP4 and variance vs. CP4 targets. 3) Telecoms Business Plan from FY10/11 P13 showing costs for >400 telecoms projects costs by year prior to, through and beyond CP4 and variance vs. CP4 targets. 4) Table setting out differences in telecoms renewal volumes between Delivery Plan Updates 2010, 2011 and current (FY 2010/11 year-end).	Telecoms appendices.zip containing: 1) Appendix 5 - Telecoms DPu10 - Annual Return 2011.doc 2) Copy of Appendix 6 Telecoms Business Plan CP4 v0910 P13b.xls 3) Copy of Appendix 7 Telecoms Control Period Impact Report CP4 v1011 P13a.xls 4) Appendix 8 - Telecoms DPu10 - DPu11 - now.doc	Email 24 June 2011

Ref.	Document title / description	File name / details	Date received
E85	Excel spreadsheet containing updated headline REEM and CEM calculations with breakdown for unit cost-based and non-unit cost based assets.	CEM REEM summary by assetv6.xlsx	Email 5th July 2011
E86	Track Positive Management Action Worksheet - spreadsheet setting out detailed workings of track unit cost based efficiencies, breakdown and explanation of key elements of cost savings figures in the underlying calculations.	0809 Cost Vol From MBR to GL JA Edit v1 18.xls	Email 5th July 2011
E87	Excel spreadsheet containing updated headline REEM and CEM calculations with breakdown for unit cost-based and by non-unit cost based assets by individual asset type.	CEM REEM Summary by Assetv3.xls	Email 8th July 2011
E88	Investment Papers.zip containin Investment Papers for the following projects: • 118827 Leicester PSB • 107074 Medway valley crossing • 117800 East Suffolk • 106683 LNE DOO • 103862 Territory CIS renewals	Investment Papers.zip containing: - ~$7074 Medway Valley Level Crossing Renewals.doc - ~$lecoms LNE 106683 LNE DOO CCTV Renewals 09-10.doc - 103862 Arriva ERIP Submission V1.doc - 107074 Medway Valley Level Crossing Renewals.doc - N&E 118827 ERIP Leicester PSB V0.9.pdf - NP 117800 IP SP&C East Suffolk V1.5.pdf - Telecoms LNE 106683 LNE DOO CCTV Renewals 09-10.doc	Email 12th July 2011
E89	Change Paper documentation setting out reduction in AFC in respect of the "107663 Wimbledon Clapham Jn" signalling renewals project	. - 107663 Wimbledon Clapham JCn TD&TDM Change Paper.doc - 107663 Wimbledon Clapham Jcn TD&TDM Signalling Budget Change 6 3 App 2 and App 3 _V13.xls	Email 12th July 2011
E90	Excel spreadsheets containing updated headline REEM and CEM calculations broken down for England & Wales / Scotland	CEM REEM summary by assetv6EW.xls CEM REEM summary by assetv6scotland.xls	Email 12th July 2011
E91	Excel spreadsheet containing original REEM and CEM calculation figures provided prior to 24th June (as analysed in previous Arup's initial draft audit report) in same breakdown as E86.	CEM REEM Summary by Assetv3 old.xls	Email 12th July 2011

Ref.	Document title / description	File name / details	Date received
E92	Excel spreadsheet setting out revised CP4 volume baseline and actual applied to re-stated signalling renewals volume efficiency calculation.	Signalling vols cp4 summaryv2.xls	Email 13th July 2011
E93	RWI & Work Type Definitions NR/CIV/B&C/Vol Issue 1 document containing guidelines for the reporting of renewals RWI volumes.	NR-BC-Civ-Vol Issue1 (2).pdf	Email 15th July 2011
E94	Original efficiency calculation figures in the same format as CEM REEM Summary by Assetv3.xls	CEM REEM Summary by Assetv3 original.xls	Email 12th July 2011
E95	NR Buildings & Civils - RWI & work type definition: instructions & guidance	NR-BC-Civ-Vol Issue1.pdf	Email 21st July 2011
E96	Civils unit cost spreadsheets containing FY08/09 project costs from which civils CAF baseline unit costs are derived including input cost data and adjustments.	0809 baseline calculation.xls CP3 0809 Volume Report v1.xls CP3 0809 Volume Report v2.xls	Email 21st July 2011
E97	Spreadsheet containing renewals capex feeding into the RAB from FY2009/10	Copy of Rolling RAB P13 12apr - ren extract.xls	Email 21st July 2011
E98	Statement from NR relating to delivery of track renewals over the remainder of CP4.	ARUP efficiency final.doc	Email 22nd July 2011
E99	Rolling stock certificate of compatibility for high output HOBCS track machine.	NRAP_874_018 s.pdf	Email 22nd July 2011
E100	Rolling stock certificate of compatibility for high output HOTRS track machine.	NRAP_874_020_t.pdf	Email 22nd July 2011
E101	Spreadsheet containing track renewals workbank	Copy of MI Hub Workbank 1213 - 1314.xls	Email 22nd July 2011
M. Maintenance costs, MUC			
M1	Sample maintenance timesheet (signalling activities) from Ellipse system	SandT TIMESHEET.pdf	Email 04 April 2011

Ref.	Document title / description	File name / details	Date received
M2	Sample work order for track maintenance activity (MNT 022) from Ellipse system	Ellipse Work Order.pdf	Email 04 April 2011
M3	List of maintenance cost centres (incl. brief description, route, DU, discipline and direct vs. indirect categories	A24 Maintenance Cost Centre Chart 1112 2bcWDM final.xls	Email 04 April 2011
M4	MUC Unit Cost Process Handbook - Version 1 (03.03.2011)	A24 MUC Process Document V1.pdf	Email 04 April 2011
M5	Summary MUC data quality spreadsheet showing incoming MUC data quality at MDU level in relation to 7 x quality metrics (Metrics A-G) from Period 12 Week 1.	A26 MUC data quality metrics - P12.xls	Email 04 April 2011
M6	FRM 702 Maintenance - v.11.1: updated catalogue of MNT codes and constituent Ellipse standard job numbers	A28 frm702_version_11.1.doc	Email 04 April 2011
M7	Email to NR colleagues on 22 November 2010 documenting MUC data quality league tables for Period 8.	Email message (FW Maintenance Unit Cost League Table - P8.msg) with following attachments: - Presentation on MUC League Table (MUC League Table.ppt) - Excel table showing P8 MDU performance and best practice against data quality metrics - Email correspondence relating to MUC data quality from Neil Edmunds (Non-Labour Exception Report -Western.msg)	Email 04 April 2011
M8	Email to NR colleagues on 14 February 2011 documenting MUC data quality league tables P11 and P11 YTD.	Email message (FW P11 MUC League Table.msg) with following attachments: - Presentations on MUC League Table and best practice from NR MDUs (MUC League Table (3).ppt, Best practice from Edinburg Glasgow Brighton and Croydon.pptx) - Excel table showing P11 and YTD P11 MDU performance and best practice against data quality metrics (Copy of MUC League Table P11.xls)	Email 04 April 2011

Ref.	Document title / description	File name / details	Date received
		- Email correspondence relating to MUC data quality and best practice (FW: Ellipse Error report.msg, MUC Best Practice.msg, Sussex MUC analysis.msg)	
M9	Sample MUC input data from Ellipse system (Period 12 Week 3)	- "Ellipse" Folder containing Ellipse maintenance records by route (Excel files) - Ellipse activity volumes by Standard Job and MNT code (MDU & route basis) P12 YTD showing planned, actual & variance (Actual vs(1). Annual Plan %28Interim Solution%29.xls) - Sample Ellipse work volume & hours data (Clapham / Woking / Eastleigh IMDMs (Ellipse.xlsx)	Email 04 April 2011
M10	Sample MUC input data from Oracle system (Period 12 Week 3)	- Oracle time and cost report P12 YTD by MDU and MNT code (OTL report.xls)	Email 04 April 2011
M11	Sample MUC input data from BMIS system (Period 12 Week 3)	- "BMIS" Folder containing BMIS cost data (.txt files)	Email 04 April 2011
M12	MUC data from Period 12, Week 3	- Excel spreadsheet containing input fields (for Ellipse / Oracle / BMIS input data) and calculation macro for MUC figures (MUC_Macro_File_V11_Route_2009_06_08_OTL_added v4.0.xls) - "Graphical Files" Folder containing graphical overview of MUC costs between regions by MNT code (Excel graphic files) - Excel file with full P12 week 3 MUC output data from calculation macro (Macro output P12 wk3.xls)	Email 04 April 2011

Ref.	Document title / description	File name / details	Date received
M13	MUC Presentation given at the initial audit meeting on 1st April 2011 by David Wynne	A31 Unit Costs - ORR - 24 03 11.pptx	Email 04 April 2011
M14	Email setting out total maintenance spend including breakdown of non-MUC costs	ARUP Information Requests_MUC.msg	Email 04 April 2011
M15	Spreadsheet showing Network Rail's internal allocation of Confidence Gradings to MUC figures (for each MNT value)	Complete MUC Rating 10-11.xlsx	Email to ORR on 4th March 2011
M16	MUC 10/11 vs 08/09 Yearly Analysis	MUC 0809 vs. 1011 yearly analysis.pdf	Hard copy received from in meeting 14 April 2011
M17	pie chart showing maintenance costs not covered by unit cost framework	Non MUCable Costs.pdf	Email 3 May 2011 08:35
M18	Maintenance Improvement Update - desriptions of a number of new machineries and tools introduced for maintenance activities and their potential benefits.	MI Portfolio Apr 2011.ppt	Email 3 May 2011 08:35
M19	MUC data week 1 and week 3 actuals for P1 – P11	MUC Acts 10-11.zip	Email 17 May 11:52
M20	MUC data for P12 week 1 and P13 week 3	Macro output P12 wk1.xls Macro output P13 wk3.xls	Email 17 May 11:52
M21	Inspection and maintenance of permanent way - inspection (sets out minimum requirements for track inspection)	NR_L2_TRK_001_A01.pdf	Email 18 May 2011 15:19
M22	Inspection and maintenance of permanent way - geometry and gauge clearance	NR_L2_TRK_001_C01.pdf	Email 18 May 2011 15:19
M23	Ellipse work management handbook - mandated business rules for use of ellipse	NR_L3_MTC_MG0176_02 (2).pdf	Email 18 May 2011 15:19

Ref.	Document title / description	File name / details	Date received
M24	Ellipse work management handbook - ellipse data requirements for WAIFs	NR_L3_MTC_MG0176_03	Email 18 May 2011 15:19
M25	Spreadsheet comparing MNT costs to baseline (08/09) costs	Yearly MUC Analysis.xls	Email 25 may 2011 17:08
M26	Commentary on baseline changes for some MNT costs	Re-Baseline maint costs p13.xls	Email 25 may 2011 17:08
M27	MUC summary, broken down to route level, Forecast 08/09 vs BP 08/09 vs BP09/10 (Business Plan Submissions for 09/10)	Board Submission MUC Consolidation _changes (4).xls	Email 25 may 2011 17:08
M28	MUC summary for Western Route, broken down to DU level, Forecast 08/09 vs BP 08/09 vs BP09/10 (Route's submission of their 2009/10 Business Plan)	Summary sheet revised v2_Western .xls	Email 25 may 2011 17:08
M29	• Statement 14A MUC - numbers only, no formulas	stat14 - MUC.xls	Email 31 May 2011 12:10
M30	Statement 8b source cost data from Hyperion reporting system for maintenance expenditure by MDU	Maintenance Data Back-up 8B total spend 1011.xls	Email 15th June 2011
M31	Statement 8b source cost data from Hyperion reporting system for maintenance headcount by MDU	1011 Back-up 8b Average Headcount.xls	Email 15th June 2011
M32	Final (subject to NR board approval) reg. accounts statements 8b and 14 including breakdown by England & Wales and Scotland	Extract of Reg Accs Statements.doc	Email 15th June 2011
M33	Spreadsheet setting out adjustments applied to maintenance year-end and baseline CEM figures for calculation of REEM	Summary rec of CEM REEM maint BL Act.xls	Email 15th June 2011
M34	Spreadsheet setting out source data for MUC figures feeding into Statement 14	Summary info Stmt 14_2.xlsx	Email 15th June 2011
R. Renewals costs, CAF			

Ref.	Document title / description	File name / details	Date received
R1	1) Documents showing process for cost estimating, CAF and Unit Cost Modelling 2) Work Instruction for planning and management of estimating workload and resources. 3) A screenshot of the MS Project file showing asset types and individual project information including Start date, finish date, duration, resource names etc. with a programme chart 4) A blank excel template with column headings Asset, Territory, GRIP Stage, Project Name, Estimate Start, Estimate Finish, etc 5) Screenshot of the extract from Estimate Management Plan for Thameslink Programme - includes individual work tasks, expected value, planned and actual start/finish dates, resources etc. 6) blank text files	Procedure.zip includes: 1a) Estimating Process Workflow FINAL.xls 1b) Procedure - Cost Estimating (PD).doc 1c) Glossary of Estimating Terms (GN).doc 2) Work Instruction 1 - Forward Planning (WI).doc 3) MS Project Resource Management Plan (WE).pdf 4) MS Excel Workplan Template (TE).xls 5) Asset Estimate Workload Plan (WE).pdf 6a) NEED P3E Plan extract.txt 6b) NEED Asset & Summary Examples.txt	Email 04 April 2011 (FW: Audit Documentation: 1 of 4)

Ref.	Document title / description	File name / details	Date received
R7	1) Work Instruction on how to initiate an estimate 2) Signed copy of "Provision of Cost Estimates from Third Party Consultants" Version 2 dated 15.3.2010, sets out the requirements for remitting and production of cost estimates by third party consultants 3) Unsigned copy of "Provision of Cost Estimates from Third Party Consultants" version 1.1 dated 11.02.2010, sets out the requirements for remitting and production of cost estimates by third party consultants 4) Estimate Remit Template 5) blank text file 6) Estimate request form with worked example; estimate document register; Input Quality Indicators, Estimate level explanation (expected accuracy of estimates for each GRIP stage) 7) Instruction on using the Central Estimate ID system	Wi 2 - Estimate Initiation.zip includes: 1) Work Instruction 2 - Estimate Initiation (WI).doc 2) Remitting Estimate Provision by 3rd Parties (GN).pdf 3) Remitting Estimate Provision by 3rd Parties (GN).doc 4) Remit for Estimate Provision by 3rd Parties (TE).doc 5) NEED RIB template.txt 6) Estimate Registration Form & Document Register (TE & WE).xls 7) Completing the Central ID Register (GN).doc	Email 04 April 2011 (FW: Audit Documentation: 1 of 4)
R14	1) Work Instruction on how to carry out production of Estimates 2) A checklist for checks on estimates and questions for estimate inputs and outputs 3) Calculator for the escalation/inflation rates used in estimates 4) A worked example for the calculation of inflation used for project estimates 5) guidance note forming part of the “toolkit” in providing specific supplementary guidance on an element of the associated Work Instruction on the subject of inflation	WI 3 - Estimate Production.zip include: 1) WI 3 - Estimate Production (WI).doc 2) Sponsor-Customer Estimate Checklist (GN).doc 3) Escalation Calculator Tool.XLS 4) Calculation of Inflation (WE).pdf 5) Calculation of Inflation (GN).doc	Email 04 April 2011 (FW: Audit Documentation: 1 of 4)

Ref.	Document title / description	File name / details	Date received
	calculations		
R19	1) Work Instruction on how to carry out reviews of estimates 2) Template for the Independent Estimate Review document with instructions for the reviewer on how to complete each section 3) A yes/no checklist for the high level estimate review 4) Guidance Note for procedure relating to estimate review and sign off	WI 4 - Estimate Review.zip: 1) WI 4 - Estimate Review.doc 2) Independent Estimate Review Template (TE).doc 3) High Level Estimate Review Template (TE).dot 4) Estimate review and sign off (GN).doc	Email 04 April 2011 (FW: Audit Documentation: 1 of 4)

Ref.	Document title / description	File name / details	Date received
R23	1) Work Instruction on how to do cost feedback 2) Unit Cost Modelling hierarchy, list of RWI codes, indirect cost codes, detailed breakdown of asset cost items 3) links to the pdf screenshot examples of National CAF Templates for Buildins, Civils, Enhancements, Power, Telecoms, Signals 4) Map showing Routes and Strategic Routes 5) Excel sheels defining cost hierarchy for signalling, what's included and what's excluded etc. 6) classification for line side building, station, station facilities etc. 7) Map showing classification of routes 8) National CAF template excel sheet 9) Instructions for completing the National CAF template, with screenshots and step-by-step guides 10) project level CAF tracker with graphs showing baseline, expected and actual CAF coverage across Periods; CAF Project Profile Reports Submitted Log 11) Guidance Note project cost and associated contextual/technical factors using the National CAF reporting template 12) Work Instruction how to report project unit costs and associated contextual/technical factors. 13) Work Instruction on processing and analysis of reported project unit costs and associated contextual/technical factors 14) Change Request Form for investment projects used for recording proposed changes to the reports, fields in the CAF template, unit price, cost group etc. 15) Work Instruction on how to do change control of elements of the Cost Analysis Framework 16) Work Instruction on the process for reporting and collection of project unit costs and associated technical/contextual factors under CAF 17) A printout of the graphs generated by the CAF tracker spreadsheet	Wi 5 - Cost Feedback.zip: 1) WI 5 Cost Feedback (WI) FINAL v1.0.doc 2) UCM CBS Hierarchy.xls 3) Template Example.xls linking to - • Template Example Building.pdf • Template Example Civils.pdf • Template Example E&P.pdf • Template Example Enhancements.pdf • Template Example Signalling.pdf • Template Example Telecomms.pdf 4) Strategic Routes Overview.pdf 5) Signalling Cost Allocations & Norms.xls 6) Railway Estates Classifications.pdf 7) Network Rail Classification of Routes.pdf 8) National CAF Template.xls 9) National CAF Template Completion Guide.pdf 10) CAf Tracker (project level).xls 11) CAF Template User Guide (GN).pdf 12) CAF Project Profile Reports Production (WI).pdf 13) CAF Data Processing & Analysis (WI).pdf 14) CAF Change Request Form (TE).doc 15) CAF Change Control Process (WI).pdf 16) CAF Application & Reporting Process (WI).pdf 17) CAF Actuals Summary.pdf	Email 04 April 2011 (FW: Audit Documentation: 2 of 4)

Ref.	Document title / description	File name / details	Date received
R40	"The purpose of this Work Instruction is to provide a clear and concise understanding of how to carry out effective, professional, and consistent cost analysis and benchmarking in support of estimating."	WI 6 - Data Analysis & Benchmarking (WI).zip: WI 6 - Data Analysis & Benchmarking (WI).doc	Email 04 April 2011 (FW: Audit Documentation: 2 of 4)
R41	National CAF template excel sheet "version 2.0"	National CAF Template v2.0a sukhi.xls	Email 04 April 2011 (FW: Audit Documentation: 3 of 4)
R42	National CAF template excel sheet	National CAF Template.xls	Email 04 April 2011 (FW: Audit Documentation: 3 of 4)
R43	CAF Project Profile Reports Submitted Log by projects - with status and reasons	CAFs Received Log.xls	Email 04 April 2011 (FW: Audit Documentation: 4 of 4)
R44	CAF tracker spreadsheet with data up to P12	10P12 CAF Tracker.zip: P12 CAF Tracker.xls	Email 04 April 2011 (FW: Audit Documentation: 4 of 4)
R45	Email (NR) regarding target values for proportion of renewals unit costs to be captured within CAF unit cost framework and costs external to the CAF framework.	Email (subject: FW: Unit cost meeting actions)	Email on 14 March 2011
R46	Estimating Service Bulletin - Issue 1 (Winter 2010/11)	NetworkRailA3 (6) (2).pdf	Email 05 April 2011
R47	Estimating Service - Document Suite: overview of cost estimating and CAF process documentation, data templates and guidelines.	11 04 04 Estimating Service Document Suite.doc	Email 07 April 2011
R48	Presentation slides on Cost Analysis Framework presented at meeting on 4th April 2011	11 04 04 ORR Presentation Final.ppt	Email 07 April 2011
R49	NR B&C Business Planning Process and Guidelines	Asset Management_BC_Guidelines v1 2 (30 10 09).doc	Provided to Arup as part of the IR Mandate 007 (Buildings and Civils Asset Policy review)

Ref.	Document title / description	File name / details	Date received
R50	Renewals Workbank Management for track assets	L2TRK60011.pdf	Provided to Arup as part of the IR Mandate 007 (Buildings and Civils Asset Policy review)
R51	Transformation Programme – Visible & Agile Workbank Planning (VAWP) Strategy & Targets	VAWP STRATEGY ISSUE V001.1.doc	Provided to Arup as part of the IR Mandate 007 (Buildings and Civils Asset Policy review)
R52	CAF tracker spreadsheet with data up to P13	P13 CAF Tracker (FINAL).xls	Email 12 April 2011
R53	Civils and Structures Planned budget and volumes for CP4 taken as of 2010/11 P11	Civils CP4 budget and volume 1011 P11.pdf	Hard copy in meeting 13 April 2011
R54	Civils Renewals Baseline, budget and actual volumes	Civils renewals budget and actual.pdf	Hard copy in meeting 13 April 2011
R55	Breakdown of current CAF unit cost coverage across different asset groups and commentary on present and future coverage levels.	UC Volume Mix.xlsx	Email 20 April 2011
R56	• Statement 9a (not in audit scope): renewals spends as shown on board report, broken down to route levels • renewals efficiency calculation spreadsheet for scotland • renewals efficiency calculation spreadsheet for GB (dupicate file - already received previously) • Version of Statement 9b with Signalling, Telecoms, Electrification and P & M 2010/11 spends only - figures different from those in the main Statement 9b file. • Statement 9b - GB, E&W and S • Capex spend by route - YTD actuals, forecast and budget	Stmt 9b backup.zip including: • Copy of Workings FY10-11-Stmt 9b.xls • MasterTemplateRen P13 - Scotland - adj track baseline.xls • MasterTemplateRenP13.xls • SPC RFS requirements (version 1) (2).xls • Statement 9b.xls • Total CAPEX.xls	Email 20 May 2011 13:29
R57	Track renewals spending breakdown to project level	P13-11 Track Balance sheet In Yr WIP by Route.xls	Email 20 May 2011 11:11

Ref.	Document title / description	File name / details	Date received
R58	• Brighton TME Ramp Review meeting notes (records decisions/proposals made on the timing for individual track renewals projects) • Dartford TME Ramp Review meeting notes (records decisions/proposals made on the timing for individual track renewals projects) • a presentation that introduces the track RAMPs • RAMP review spreadsheet recording proposed track renewals work for Kent and Sussex. Includes proposed year of work, priority scores etc. • RAMP review spreadsheet recording proposed track renewals work for Kent and Sussex. Includes proposed year of work, priority scores etc., 2011 update • RAMP review spreadsheet recording proposed track renewals work for Midland & Continental. Includes proposed year of work, priority scores etc., 2011 update • a presentation that introduces the track RAMPs • Plain line renewals problem statements - Tonbridge • Summary of Plain line renewals problem statements - Tonbridge	RAMP CD including files: • Brighton TME Ramp Review 23-3-11.doc • Dartford TME Ramp Review 15-2-11.doc • Detailed Introduction to Route Asset Management Jan10.zip • K&S RAMP Volumes 2010 .xls • Kent and Sussex RAMP Review Output 2011 updated.xls • M&C RAMP Volumes 2010 V3 290610 with CP4 dates.xls • Sheffield University 2011 Asset Management Track.ppt • Tonbridge PL Proposal for Track Refurbishment SUMMARY.pdf • Tonbridge PL Proposal for Track Refurbishment.pdf	CD received
R59	• Spreadsheet with Civils CAF data • DRAFT Statement 14B(1) and 14B(2), Civils data only • DRAFT Statement 15 - Civils Renewals Unit Costs only • Blank Statement 16 • DRAFT Statement 17B - Civils data only	Civils Stmts 14,15,17.zip including: • Civils Annual Return Working Document.xls • Unit costs requirements - Civils Final Version inf.xls	Email 27 May 2011 12:11
R60	• DRAFT Statement 14B(1) and 14B(2), Track data only - 2010/11 RWI costs as % of asset spend missing • DRAFT Statement 16, 2009/10 data only, all 2010/11 numbers missing, some supporting calculation sheets in	Track Regulatory Financial Return.xls	Email 27 May 2011 17:46

Ref.	Document title / description	File name / details	Date received
	hidden worksheets		
R61	CAF coverage tracker summay P13 with breakdown to asset categories	P13 CAF Tracker (FINAL) - 1 Summary.zip contains: • P13 CAF Tracker (FINAL) - 1 Summary.xls	Email 31 May 2011 17:07
R62	Spreadsheet containing signalling CAF renewals unit costs feeding into Statement 15 of the Regulatory Accounts.	stat15signalling.xls	Email 13th July 2011
V. Volume Incentive			
V1	Excel file for Statement 13	10_11 reg accounts table for volume incentive.xls	Email 9 May 2011 14:35
V2	Spreadsheet for volume incentives calculations	Volume Incentive for 10_11.xls	Email 9 May 2011 14:35
V3	Volume incentive calculation spreadsheet from ORR	ORR-#372747-v1-Volume_incentive_calculations_for_Network_Rail.XLS	Email 12 May 2011 11:15

Appendix K: Methodology

K1.1 A risk-based approach

Underlying our proposed methodology will be a risk-based approach, through which a continual focus is retained on the relevance and implications of key outputs within the Regulatory Accounts for the planning and regulation of Network Rail's business activities, and the inherent risk from an audit perspective that they represent.

The level of risk assessed for the respective data elements will inform our testing and auditing approach, with areas of data for which there is perceived to be a high level of audit risk subject more detailed auditing and scrutiny. Critical aspects that are likely to inform our judgement include potential lack of visibility of key data calculations, undocumented or unsubstantiated judgements or analysis within the formulation process, sub-optimal levels of data integrity and completeness, or distortion of overall results.

We will provide recommendations to mitigate potential risks, and to realise improvements in the quality and robustness of data provided within the respective areas of the Regulatory Accounts. This will draw on best practice, by recommending tangible measures to mitigate risk and improve data quality and process performance going forward.

An overview of our risk-based audit approach is provided on the next page.

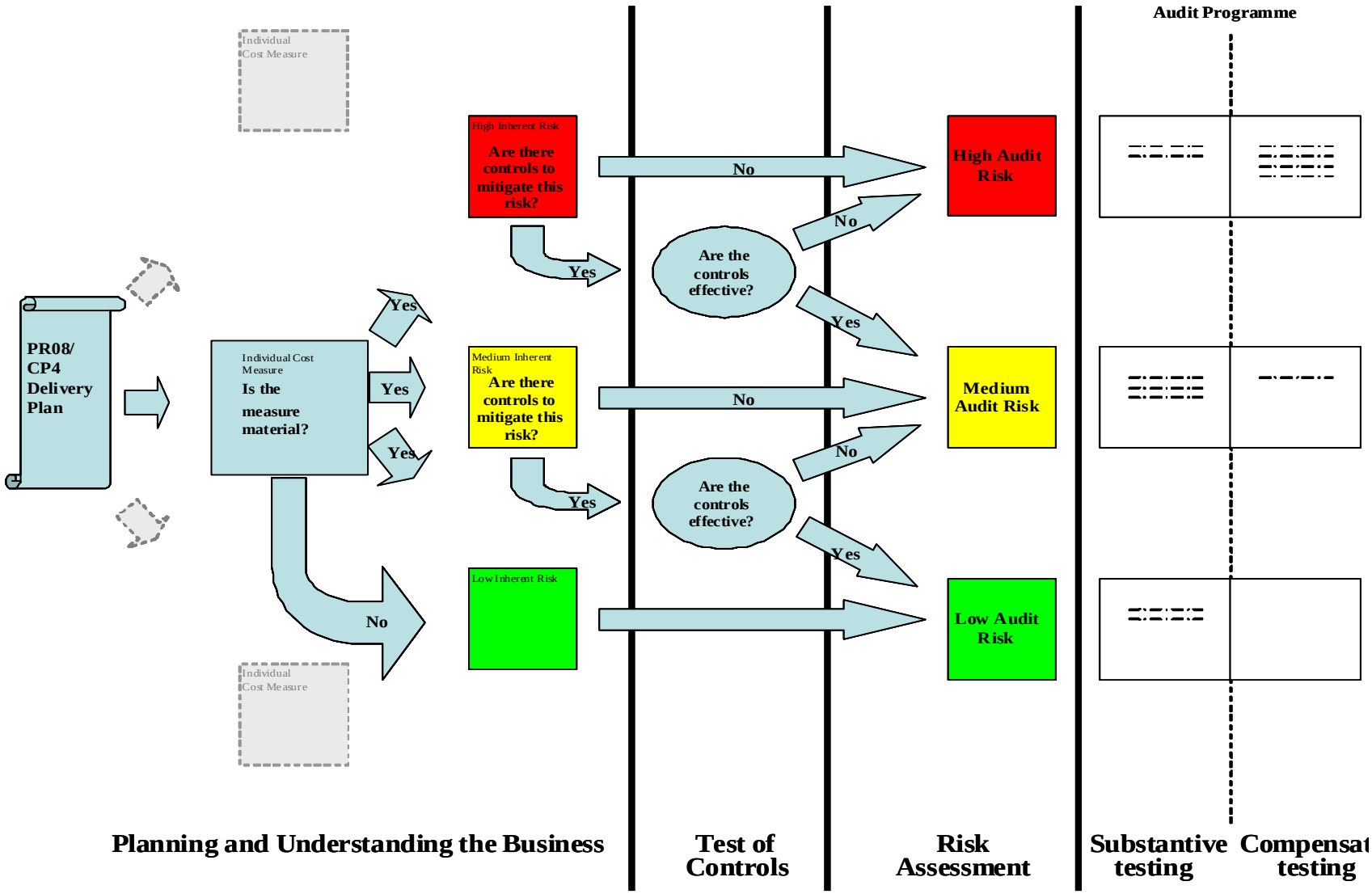


Figure G.1: Risk-based audit approach

K1.2 Process assurance

Process governance

We will undertake a review of process governance, interviewing individuals accountable for relevant aspects of the cost and efficiency data, assessing the corporate policies and processes through which the account data is derived and reported, and reviewing supporting documentation, guidelines and data systems.

For each key element of the Regulatory Accounts reviewed, we will evaluate:

- The extent to which defined governance processes are in place and effective.
- The level of transparency and consistency across the different governance processes.
- The degree of ownership and accountability, and alignment of incentives.

Reporting systems & controls

We will review the reporting systems and controls through which cost and efficiency source data is sourced and collated, and through which key outputs are calculated. This will include a review of IT systems and processes, manual data collection and reporting procedures and the analytical processes and controls.

The aim will be to gain an overview of the key interfaces and dependencies underlying the respective data elements, and to map out the overall flow of information to appreciate how critical components upon which regulatory outputs are based fit together.

Treatment of renewals deferrals

We will scrutinise Network Rail's statements relating to the deferral of renewals activities, and the mechanism by which efficiencies are identified and declared.

We will assess the robustness and level of certainty of underlying evidence; and consider how far the "booking" of efficiencies in the present accounts is justified in light of any residual uncertainty in relation to future cost impacts from the given deferrals. This will take intoaccount the findings from Arup's previous Reporter assignments, including our audit of MUC and CAF unit costs (Mandate AO/003, September 2010), which identified concerns with the methodology by which efficiencies were declared for asset areas such as track. Also Network Rail's relevant internal reporting and analysis processes and any changes or developments introduced to them since our previous reviews were undertaken.

It will be critical to understand how both maintenance levels of the asset in question and the timing of future renewals are accounted for in the deferrals accounting process, as recommended in Arup's previous reports on the unit cost framework (Mandate AO/005, May 2010: see for example Section 5.27 – 5.29, 3.60).

K1.3 Data audit

Data evidence base / rationale

Our review of the evidence base and rationale for the key high-level cost and efficiency outputs within the Regulatory Accounts will be based on the investigation of the robustness of underlying data and information and the logic and rationale from which the given outputs are derived. This process will entail:

- Review of the form and function of input data, and the main results produced.
- Analysis of the mechanism by which the high level figures are formulated, including:
  - analysis of the formulae by which the data are combined and factored into high-level figures; and
  - assessment of the manual inputs into the formulation process, taking into account the extent to which subjective decisions / judgements, and the extent to which subjective processes are clearly governed and documented.
- Identification of the key underlying policies and assumptions driving the data process, including:
  - the extent to which these are consistent with, and reflected in, documented policies at the company level; and
  - the level to which clear and consistent evidence is in place to support the overall approach and rationale.

This will be an interactive process, which will involve the following:

- firsthand review of relevant documentation and files, including sample input data sheets, calculation macros, process maps, policy documents, manuals etc.
- Where relevant, an engineering-led review of the appropriateness and robustness of technical parameters from which specific expenditure-related decisions, such as the deferral of renewals activities, are derived.
- Ongoing correspondence, discussions and Q&A with relevant Network Rail personnel.
- Review of previous studies and analyses relating to the respective data areas.

We will also coordinate this part of our study with the official auditing work undertaken by NR's auditors (PWC). We will draw upon relevant findings and outputs as appropriate to support our own assurance review, ensuring our approach builds upon audit work already done in an efficient manner and minimising potential duplication.

Data output validation

This will entail the detailed checking and validation of selected data within the Regulatory Accounts. An assessment of data quality and robustness for each key data element informing the relevant cost and efficiency outputs will be undertaken to an appropriate level of granularity. This will include the detailed audit and the assignment of a confidence grading to each individual category of MUC and CAF unit cost data.

The approach taken, as well as the level of testing and scrutiny applied to the respective data elements, will depend on both the level of risk associated with the data, and the extent to which effective controls are deemed to be in place.

Where our process assurance review concludes that effective controls are in place, a process of substantive testing will be carried out, involving selected audit of sample data through established control channels. Our assessment of data quality and robustness will be established on this basis.

Where we assess that control measures for a given dataset are inadequate, incomplete or absent, we will undertake compensating testing to assess data. We will aim to review as much of the area "population", in as much detail as is necessary to provide the required assurance. Compensating approaches might include:

- Assessment against best practice and established standards (e.g. other railways' approaches to measuring and delivering efficiencies).
- Benchmarking against other companies (e.g. against other regulated industries in the United Kingdom).
- Detailed review of financial calculations, models and assumptions.

Appendix L: MUC Accuracy Grading Methodology and Detailed Results

We set out below the methodology by which our analysis of MUC data accuracy under the data quality Confidence Grading process has been established, together with the full set of results for all MUC unit costs.

We have received data from Ellipse, BMIS and OTL, which is the source data that feeds in to the MUC Macro spreadsheet that in turn calculates the Maintenance Unit Costs. We have used this source data to independently calculate the Unit Cost and compared this to the MUC Macro output. We found that there was a high level of correlation between our calculated Unit Costs and the MUC Macro unit costs with only 3% of the calculated unit costs differing from the MUC Macro unit costs by more than 1% at delivery unit level. We believe that this small difference will be due to the mapping that we have used to allocate cost centres to delivery units where work is done by one area on behalf of another. We have not investigated this discrepancy further as we believe it would take a disproportionate amount of time to fully resolve this difference and for the purposes of this report, the above findings are sufficient to satisfy us that there is a negligible impact upon accuracy associated with the processing of data from source systems into the MUC figure.

In addition to the above analysis, we have also performed an analysis of all of the MUC Macro Output files produced during week 1 and week 3 of each period during 2010/11. Whilst this analysis does not give a definitive answer as to whether the MUCs are accurate or not, it does provide us with an indication of accuracy and gives us a level of confidence in our findings. The following is an explanation of the measures that have been used to give an indication of accuracy:

- **Variance**

  The variance of a measure is usually a good indicator of accuracy. However, in this case there are a number of factors which will impact on the variance of the individual MUCs. Network Rail has indicated that there will be differences in methods of working between areas that will make one area more efficient and therefore increase variance. Structural factors such as track access and geography may make working in one area more efficient than working in another area and therefore increase variance; a number of Standard Jobs with widely differing unit costs can contribute to one MUC figure, therefore the Standard Job composition of the work undertaken each period can contribute to variance. In order to account for working methods and structural variations we have compared variance to the baseline year. For each period, we have taken the Year To Date (YTD) Unit Cost and found the difference between this and the baseline year YTD Unit Cost for each MNT Code for each Route. This has then been expressed in terms of a percentage of the baseline unit cost. If this difference is the same as or less than the baseline unit cost, we have allocated a category of x1. If the difference is double we have allocated a category of x2; 3 times is x3; 4 times is x4; between 5 and 10 times the baseline unit cost is x5 and over 10 times the baseline unit cost is x10. We recognise that some of this difference may be due to increased efficiencies compared to the baseline year but would consider such large changes to be

rare (a unit cost would have to have more than halved to appear in category x2) and also consistent across periods. For each MNT Code we have then taken the number of times each category has been allocated and multiplied it by a weighting factor. As there are 10 routes and 13 periods, there will be 130 results per MNT Code. We have then weighted each category; x1 is weighted 1, x2 is weighted 2 etc. and calculated a score for each MNT Code. The most accurate MNT Codes will score 0 (130 is the minimum score possible so this is taken off the total) and the most inaccurate score would be 1130 (maximum possible is 1300 – 130). An accuracy score of 0 will be allocated an accuracy category of 1; a score less than 1130*5%=56.5 will score 2, less than 1130*10% = 113 will score 3 and over this will score 4. The above process has also been carried out on the Period Unit Cost as well as the YTD Unit Cost.

- **Costs With No Units**

  This indicator looks at the Week 3 figures and identifies those that, within each Delivery Unit within a period, have a cost associated with them but no volume of work recorded. The total of these costs per MNT Code is then compared to the total P13 YTD cost to give a percentage. If this percentage is less than or equal to 1% it is allocated an accuracy category of 1, >=5% scores 2, >=10% scores 3 and greater than 10% scores 4.

- **Units With No Costs**

  This is the same as the above indicator but identifies where there is work recorded with no cost and expresses the percentage in terms of the P13 YTD volume of work carried out.

- **5% Error Non-correction**

  The MUC Macro is calculated at Week 1 and Week 3 of a period in order to give people opportunity to correct errors and allow for late data entries to be made. Recognising that this correction is a manual process we feel that it is appropriate to make an assumption that for every 20 corrections there may be 1 which is missed. Therefore, in order to assess the impact on accuracy of this assumption, we have identified the difference between the Week 3 and Week 1 volumes of work carried out and costs recorded for each period during the year. We have then totalled these differences to give a total volume and cost correction for each MNT Code during the year. We have then taken 5% of these total corrections and added them to the P13 Wk3 YTD costs and volumes to give an estimated corrected figure. A new corrected unit cost was then calculated and the percentage change between this and the original unit cost was calculated. If the percentage change is <= 1% an accuracy score of 1 has been allocated; <=5% scores 2, <=10% scores 3 and greater than 10% scores 4.

The average of the above indicators is then calculated. As the accuracy categories are based on the premise that a score over the accuracy limit results in the next category being allocated, this average is then rounded up to give an indicated accuracy score per MNT Code as shown in the table below.

Project	Period Variance	YTD Variance	Costs With No Units	Units With No Costs	5% Error Correction	Accuracy Score
MNT001	2	2	1	1	2	2
MNT002	2	1	1	1	1	2
MNT003	2	1	1	1	1	2
MNT004	2	1	2	2	3	2
MNT005	4	2	4	1	4	3
MNT006	2	1	1	2	1	2
MNT007	4	3	4	1	2	3
MNT008	2	1	4	1	2	2
MNT009	4	4	4	3	1	4
MNT010	2	1	3	2	1	2
MNT011	2	2	2	1	3	2
MNT012	4	4	4	2	2	4
MNT013	1	1	1	1	1	1
MNT014	4	4	3	1	1	3
MNT015	2	2	2	2	1	2
MNT016	3	1	4	2	1	3
MNT017	2	2	2	3	4	3
MNT019	1	1	1	1	1	1
MNT020	2	1	1	1	1	2
MNT021	2	2	1	1	1	2
MNT022	4	4	1	1	1	3
MNT024	4	4	4	1	1	3
MNT025	3	1	4	3	1	3
MNT026	4	3	4	2	1	3
MNT027	1	1	1	1	1	1
MNT028	4	4	4	1	1	3
MNT029	2	2	2	2	1	2
MNT030	4	3	4	3	1	3
MNT050	1	1	1	1	1	1
MNT051	2	2	1	1	1	2
MNT052	1	1	1	1	1	1
MNT053	4	4	1	1	1	3
MNT054	4	4	1	1	2	3
MNT056	1	1	1	2	1	2
MNT057	2	1	1	2	1	2
MNT058	2	2	1	2	1	2
MNT070	2	2	2	2	4	3
MNT071	2	2	1	2	1	2
MNT072	2	2	1	1	1	2
MNT073	2	2	2	1	4	3
MNT074	3	2	1	1	4	3

Project	Period Variance	YTD Variance	Costs With No Units	Units With No Costs	5% Error Correction	Accuracy Score
MNT075	2	2	1	1	1	2
MNT076	2	1	3	2	4	3
MNT077	2	2	2	4	1	3
MNT078	4	4	4	3	1	4
MNT079	2	2	2	4	1	3
MNT080	4	4	4	4	1	4
MNT081	3	2	2	4	1	3
MNT082	4	4	4	4	2	4
MNTPOS	4	4	4	1	0	3

Appendix M: Arup summary of evidence base provided by Network Rail for renewals efficiencies

M1.1 Track renewals efficiencies

Positive management actions

Unit cost efficiency

Network Rail claimed unit cost efficiencies for plain line and S&C of £12.4m and £36.3m respectively for the 2010/11CEM efficiency calculation (see Section 3.3).

Network Rail presented an overview of positive management actions driving efficiencies by providing the reconciliation between the 08/09 track unit rates and the actual 10/11 REEM rate. The rates presented were combined rates for IM and maintenance teams. Key factors (adjustments, management actions etc.) driving the difference between 08/09 and 10/11 unit rates were broken down and explained. These are summarised under the headings set out below:

Indirect costs

Network Rail indicated that indirect costs in relation to track (plain line and S&C) have fallen by circa £20m in 2010/11. No direct evidence has been provided to support this statement although there is clear evidence of a substantial head count reduction in the organisation over the period. This saving has been counterbalanced by "under-recovery" of indirect costs due to a reduction in volume. Network Rail state that volume increases in the remaining years of CP4 will eliminate this adverse affect.

Indirect costs for S&C are generally higher than plain line. This is due to the higher design cost and the fact that S&C are more complex.

The split of indirect costs allocated to P/L and S&C is now more consistent with the total spending on P/L vs. S&C compared to 08/09. A higher percentage of indirect costs are allocated to S&C now.

Indirect costs are 'fixed' to some extent as they are not reduced as soon as work volume is reduced. In some cases the overhead base is kept the same/not ramped down immediately to accommodate the workbank for future year.

It is noted that Network Rail policy with regard to indirect costs has changed in 10/11 to "improve the alignment of indirect spend across delivery programs". This has resulted in a decrease in track indirect costs and an increase in S&C indirect costs. No further information was provided on the realignment of indirect costs across programs.

Procurement improvements

In the Positive Management Actions document provided, Network Rail attributed efficiencies of £19m and £29m for plain line and S&C renewals respectively to the category of "site costs" - which relate to improved procurement practices in the following areas:

- Visibility of workload
- Contract strategy
- Increased use of competition
- Use of contract unit rates

Visibility of workload in the infrastructure market is an extremely important factor in obtaining the best prices from the market. Contractors can offer significant savings if a known volume of work exists. Savings are also made in the tendering process as contractors resources are focused on a single procurement exercise rather than multiple reactive tenders.

Many infrastructure clients have responded to the changing market and recession by moving away from open book or cost reimbursable contracts. Such contracts present a completely different risk profile and risk allocation between client and contractor compared to traditional forms. [114]

This approach has been mirrored by Network Rail as evidenced by the reduction of framework contractors, improved workbank visibility, use of competitive tendering on fixed rates and the increased use of Design and Build contracts to reduce post-contract overheads. We review the renegotiation of track renewals further below.

It is notable that this approach also mirrors several of the improvement objectives of the IUK Cost Review (December 2010) as shown in ***Figure 5*** below.

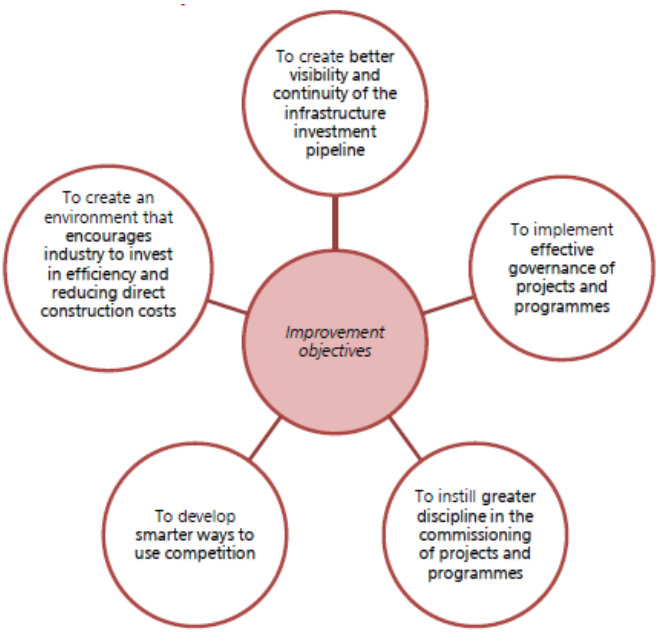


Figure 5: IUK improvement objectives in delivering infrastructure efficiency

[114] BAA has been at the forefront of procurement practices post-Egan and has notably moved away from the open book partnering approach that underpinned the Heathrow T5 project. The company has reverted to competitive tendering on its Complex and Commodity Build frameworks, used the NEC as its principal form of contract and increased the number of projects procured using Design and Build.

Source: Infrastructure UK Cost Review: Main Report (HM Treasury December 2010)

The improvements in procurement described above were however partially offset by increases in materials costs ("Rail, Sleeper, Ballast, Haulage"), driven primarily by increases in procurement costs for rail.

Renegotiation of track renewals contracts

Contracts in 08/09 were based on reimbursable costs + contractor margin. Therefore, there might have been incentives for contractors to incur more costs to increase profits. The true costs for renewals projects also could not be controlled and monitored effectively as they were not known until work had been done. It is also difficult to compare contract prices between 08/09 and 10/11 on a like-for-like basis, as there was no 'standard rate' in old contracts

Contracts are now based on standard rates. Required volume of work is shown to contractors and standard rates are agreed before work begins. Volume data are taken from MBR pack, which pulls data out of P3. Since contractors are now paid by volume of work done, which is recorded in the same system from which volume for efficiency calculations are taken, NR reckons they have high level of certainty with actual renewals volume (Contractors scrutinise volume figures closely).

In summary whilst cost savings were presented at summary level only we are satisfied that the savings of £19m for plain line actual costs of £406m (<5%) are reasonable based on the positive management actions detailed; however, cost savings of £29m for S&C actual costs of £148m (20%) are very high for such a change in such a short period of time and in audit terms require further investigation.

Maintenance costs

An overview was also provided of cost efficiencies for track renewals work delivered by the maintenance function of Network Rail. S&C costs are the main beneficiaries of maintenance-related efficiency with £6m of savings identified in 10/11. Positive management actions include the completion of the 2a reorganisation, driving greater efficiency from the supply chain, fixing of OTL rates, improved productivity and the introduction of improved management processes on overtime. Network Rail indicated that it has benefitted in overall terms from substantially lower cost rates for S&C work undertaken by the maintenance function, compared to costs for work delivered by IM – mainly due to the fact that maintenance team delivery has been focused upon undertaking generally lighter and less complex work and partial renewals.

Sustainability

The following section provides an overview of the evidence provided by Network Rail with regard to the sustainability of their asset management approach for track renewals. The purpose of this section is to detail the reasons for the high levels of volume efficiency claimed by Network Rail and to identify the evidence presented that supports the efficiencies claimed in 2010/11.

Volume efficiency calculation

Network Rail is calculating volume efficiency in the CEM metric for plain line and S&C renewals of £66.3 m and £48.4 m respectively in 2010/11 (see Section 3.3). These figures feed into the REEM calculation of efficiency presented in Statement 12 of the Regulatory Accounts.

Network Rail has attributed the achievement of the volume efficiency to the introduction of the new track asset management policy in 2010. This policy change in policy has reduced the volume requirement compared to the CP4 determination as greater priority is given to more critical route sections and a greater focus on refurbishment (see following table), and the policy has been approved by the ORR.

Renewal type	CP4 determination	2010 Delivery Plan
Plain line ckm	10,956	9,455
S&C equivalent units	2,249	1,781

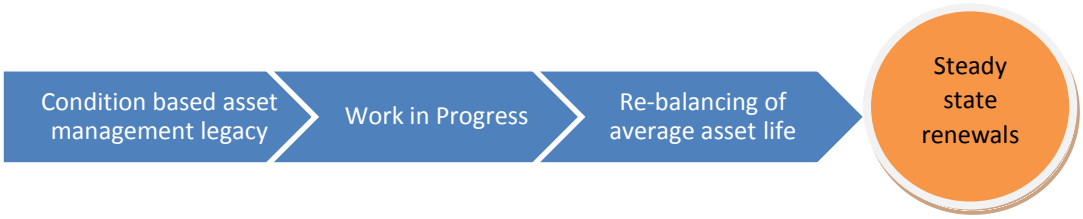
Notably, in spite of high level of variability between planned and actual delivery volumes in the early years of CP4, the justification presented by Network Rail for the volume saving in 2010/11 has not changed and nor has the information provided to support the prioritisation of the work undertaken in the period.**Impact of track asset policy change**

Historically, Network Rail operated a condition based approach to managing track assets. Track Maintenance Engineers (TMEs) were responsible for inspecting track and prioritising the work required based on a condition based assessment of the asset. The impact of this non-prioritised approach was to steadily increase the average life of the assets beyond what was required resulting in low levels of cost efficiency.The track asset management policy implemented in 2010 established a new approach focusing on the individual requirements of each Strategic Route Section (SRS). Network Rail produce a “top down” model that categorises and prioritises each sub-section of the SRS. The model reflects an *ideal* scenario of the renewals required to sustainably maintain the asset to the correct average asset life on a prioritised basis.

The “top down” assessment effectively caps the renewals the SRS can undertake in the period. This is tested by the production of the Route Asset Management Plan (RAMP). The RAMP constitutes the “bottom up” plan for the SRS. Over time it is envisaged that this approach will rebalance the average life of track assets.

The RAMP is informed by condition reports, supervisor patrol notes, the renewals workbank and Ellipse. There is therefore a large amount of data and knowledge that is fed into the production of the RAMP. We note the indication from Network Rail that improving the RAMPs to more clearly articulate the decision making process for SRS renewals is a low priority activity, even though we consider that this has implications in terms of evaluating whether efficiencies are verifiable.

At this early stage of the implementation of the new policy it is clear that the actual volumes delivered in the period vary significantly from year to year. This is due to the historic legacy of condition based asset management and work that is currently in process. This is summarised pictorially below:



Because of the significant length of time required to re-balance average asset life, a legacy of condition based asset management, it will only be during CP5 and beyond that the impact of the revised asset policy will become known. This will manifest itself as a more consistent level of renewals by category type in each SRS.

The assessment of sustainability can only be considered in the long term as top down planning will not correlate to the bottom up planning process for some time to come.

The risks that exist to not achieving a sustainable outcome relate to non-delivery of track volumes. However, it would take a number of years of major non-delivery before it could be said that this action was having a significant impact on the long term sustainability objectives of Network Rail.

Delivery volumes

With regard to robustness of delivery volumes, Network Rail acknowledged that significantly higher volumes would need to be delivered for the remainder of the Control Period. Network Rail indicated significantly lower volumes had been delivered for 10/11, due to teams being cautious about work expenditure at the first year of implementing new asset management policy, with the objective of avoiding early overspend and 'chasing tail' on volumes.

Reductions in planned volumes were also in part attributed to the non-availability of a high-output track renewals machine, and poor weather conditions. Nevertheless, the forward looking projection of track renewals volume entails a significant increase in renewals of Category 1 and 2 tracks – which over the first two years of the Control Period has, on average, been delivered at less than half the volume projected for delivery going forward.

In summary, Network Rail provided a clear overview of their track asset management policy and the implications for annual volume delivery. The reasons for high volume variability in the period were described and the likelihood being that this would continue to be a trend during the remainder of CP4. The detail provided in the RAMPs was identified as an area that could be improved to increase the independent assessment of volume efficiency. This was considered to be a low priority improvement area by Network Rail based on their confidence in the underlying data contributing to the RAMPs (e.g. patrol notes, condition reports and the Ellipse system).

Appendix N: Best Practice in cost and efficiency accounting

Introduction

In this chapter, we have brought together our findings to date with respect to some of the key processes around how Network Rail integrates and processes data generated by the wider business into the finance function for the production of efficiency measures. As requested in the mandate, we have referred to what we understand is good practice from elsewhere.

Best Practice in Efficiency Reporting and Calculation

Our observations on Network Rail's practices in the areas of efficiency reporting and associated data processing and analysis by the finance function are summarised below.

Efficiency Reporting

Efficiency reporting best practice (based on Ofwat guidelines)	Observations
Efficiencies should result from positive management action (for example, specific technological innovations, specific improvements in internal planning, design or purchasing arrangements, etc)	Network Rail has provided us with management estimates of efficiency gained as a result of specific positive management actions taken to improve efficiency across classes of assets. These are particularly relevant in relation to unit cost reduction. Network Rail has been able to describe at some length the management narrative relating to positive management actions. We recognise that in many cases, managers have been able to give specific examples of management actions that are likely to have genuinely improved Network Rail's renewal efficiency. We believe however, that there is a degree of uncertainty surrounding the extent to which actions highlighted are actually responsible for efficiencies Network Rail is reporting. This uncertainty is in our opinion, driven largely by the lack of a bottom up, auditable trail of information that relates planned activities to their impact on outcomes.

Efficiency reporting best practice (based on Ofwat guidelines)	Observations
There should be no loss in output achievement	Actual renewals volume delivered for track, civils and signalling have been lower than volumes cited in Network Rail's Delivery Plan in general. The reductions in renewals volume are due to slippage and deferral of work. Declared volume efficiencies within the Control Period are normalised through a re-baselining process so that if the volume in the earlier years of the Control Period is higher or lower than the baseline, the volume efficiency "claimed" remains at the same percentage. A risk must therefore exist, that it will only be possible to know towards the end the Control Period whether the (efficient) baseline will have been delivered or indeed be deliverable – if risk is around under delivery of volumes. Although baseline spending figures have been adjusted to the actual volume of work delivered to ensure deferred work will not be included in volume efficiency calculations, it is not yet evident to us, how the delivery of the deferred work by the end of CP4 can be ensured with any degree of certainty. If it is not delivered, there is a risk of future loss of output in CP5 and beyond.
No customers should be exposed to greater levels of risk or lower levels of security	Although renewals work re-prioritisation and deferral decisions made at asset management team meetings have been documented by Network Rail, we have not been able to find auditable evidence of the rationale and justifications behind these renewals decisions. We have found limited evidence of an adequate system of check and balances that centrally challenges asset manager's renewals decisions to ensure the pursuit of volume efficiencies will not cause uncertainty around future asset condition and therefore "security of supply" (ie availability) of the railway over the longer term

Efficiency reporting best practice (based on Ofwat guidelines)	Observations
Efficiencies reported should be part of a least total cost solution.	Asset condition modelling tools such as VTISM are used to aid track renewals/maintenance decisions but they do not necessarily consider the whole-life financial implications for each asset management scenario directly. We have not been provided with much evidence of whole-life cost approaches being considered in asset managers' renewals volume decision processes in other asset categories such as signalling and civils to inform and substantiate efficiencies being declared. There is arguably, a lack of an adequate central mechanism that challenges and tests renewals underspend and ensures asset managers are making genuinely efficient renewals decisions based on whole-life cost considerations.

Table 71: Best practice efficiency reporting based on Ofwat guidelines

Whilst the fact that insufficient auditable evidence for the decision process and managements actions taken related to reported efficiency figures could be found does not mean that Network Rail's is not making real efficiency gains, it does create uncertainty over the confidence that can be had in the reported efficiency figures.

Adopting best (or improved) practices in efficiency reporting would ensure the integrity of efficiency reporting throughout the Network Rail. It also ensures that the reported efficiencies are more likely to reflect a true representation of the real efficiency with the associated benefit of enhancing confidence in the internal asset management and financial decision making processes.

Calculation Processes and Spreadsheets relating the generation of the CEM, REEM and related efficiency measures

From our interview with staff from the central Financial Control function, it was apparent that the spreadsheet system used for calculating the efficiency measures are very complicated. It would appear that only the person who is responsible for the maintenance of these spreadsheets has a clear understanding of the internal workings of the spreadsheet system. Although concentrating the responsibility for efficiency calculations in one individual within the organisation can minimise the risks of spreadsheet data misinterpretation, it arguably does not form an adequate system to allow for straightforward checks and balances.

The complex and opaque nature of some spreadsheets used to calculate the CEM (and REEM) make it less likely human error will be identified. Efficient sharing of information within Network Rail may also be hindered.

The fact that only one person within Financial Control seems to be familiar with the workings of these calculation spreadsheets also shows that there is high 'key man' risks in the process. There is a real risk that accurate efficiency calculations could be undertaken with the current set of spreadsheets should the key person responsible for the maintenance of these spreadsheets not be available.

Whilst not underestimating the very considerable, skill, knowledge and ability of the individual responsible for these spreadsheets to run them, we do think that their re-casting to reflect some of the best practice ideas noted below would be of very considerable benefit.

The table below summarises our thoughts around best practice and related observations with respect to current Network Rail practice.

Best Practice	Observations on Network Rail Practice
Separation of inputs, calculations and outputs - Ideally each should be separated and suitably labelled in the model for identification and reporting purposes	Calculation sheets in spreadsheet files have generally been named as input schedules, adjustments, worksheets and master worksheets according to the primary purposes that they serve. However inputs, calculations and outputs within each of these sheets are not labelled clearly. The lack of clear labels makes it difficult to follow the calculation logic within these sheets. The relationships among cells on the worksheet can only be established by tracing through the formulae and references contained in the cells.
Consistency of formulae across rows and down columns and across worksheets - Use one consistent formula across each row of calculations. This improves the consistency, reliability and ease of maintenance of the model	Formulae across rows and down columns are generally consistent. However, there are some cases where the source of data in a particular cell within a column is completely different from the rest in the same column. An example of this can be found in the sheet that calculates the baseline and actual delivered figures for REEM.While it is clear that the REEM baselines for Operation, Maintenance and Support have been calculated from the CEM baselines by applying a number of adjustments that are listed in a separate sheet in the same spreadsheet file, the calculation cell for the renewals REEM baseline, links to an entire series of spreadsheets that have apparently been compiled to perform renewals efficiency calculations for the REEM specifically.

Best Practice	Observations on Network Rail Practice
Integrity of formulae - All calculations should be coded to represent exactly what they purport to represent, i.e. no quasi inputs and no balancing figures.	Baseline numbers and inflation adjustments are often combined into one formula in the one single cell so that there is no clear indication of what the baseline number means and what the inflation rates used correspond to. There are also cases where formulae in certain spreadsheet cells consist of purely numbers added to and subtracted from each other with no references to other cells. The sources of the numbers used in these formulae are not known and therefore the audit of such formulae is not possible.
Simplicity in model development - avoid dynamic (formulae) references to external worksheets. External referencing may be a cause of error as data in the source files and the links may be incorrectly updated and this may affect the results in the Model. It is generally preferable to remove all external referencing and to bring any necessary input data directly into the model itself	We acknowledge that external referencing of multiple spreadsheets may be unavoidable given the multiple sources from which the CEM and REEM calculations draw data from and the number of adjustments needed to reach the final efficiency figures. While the linkage and data referencing among the spreadsheets are mostly sound, we believe that the system of spreadsheets could be re-organised and integrated to simplify the flow of data and linkage among them, which are currently rather convoluted and opaque. The interdependence between some spreadsheets and the lack of commentaries and descriptions also makes it difficult to follow the logic of the calculations performed. We consider that the current structure of trails of data processing among the system of spreadsheets not only make external auditing difficult, but may also form an obstacle for effective internal analysis and challenge of the efficiency reporting processes.

Table 72: Best practice associated with spreadsheet systems and processes for calculating financial measures (such as the CEM, REEM etc)

Appendix O: Alterations to CEM and REEM renewals efficiency calculations (May – June 2011)

We compare in the tables below the original CEM and REEM input figures reviewed by Arup prior to the completion of our initial draft report (v.2) on 8th May 2011, and the updated calculation figures subsequently provided on 24th June 2011. Please note that the majority of the chapters in this report – including Chapters 3 - 4 focussing on the calculation of renewals efficiency – have been updated on the basis of the 24th June figures.

(Tables provided in separate document)

Appendix P – calculations of the estimated impact of areas of uncertainty

We summarise in the tables below our assessment of the potential impact of the three key areas of uncertainty identified by Arup's analysis of the input formulae and underlying evidence base feeding into the REEM efficiency analysis.

Uncertainty 1: year-end reported renewals volumes

Arup recently completed a mandate reviewing the renewals volumes reported by Network Rail (mandate AO/031).

This report applied the following accuracy gradings under the Confidence Grading system to the reported volume figures for utilised within the CEM/REEM efficiency calculation:

- for track renewals an accuracy grading of "1" was assigned representing an uncertainty level of +/-1%; and
- for signalling and civils renewals an accuracy grading of "2" was assigned representing an uncertainty level of +/-5%.

Our uncertainty analysis has applied a negative uncertainty to the year-end reported volumes for the respective renewals categories (i.e. assessing the total impact if all reported year-end volumes were adjusted downwards by 1% for track / 5% for signalling and civils).

Due to the method by which unit cost value is calculated (= total year-end expenditure for the given category, divided by volume), a lower volume will inversely increase the unit cost value on the following basis:

- 1% volume reduction → 1.01% unit cost increase
- 5% volume reduction → 5.26% unit cost increase

We have therefore assessed the impact of volume uncertainty on this basis, applying the increase in unit cost to the unit cost efficiency calculation.

The results of applying the unit cost increases set out above on total efficiency is set out in the table below.

Unit cost category	Original efficiency amount (REEM) (£m)	Volume un-certainty	Revised year-end volume (-5%)	Revised year-end unit cost (£k)	Revised efficiency amount (£m)	Change (revised vs. original effcy.) (£m)
Plain Line renewal (km)	£ 10.6 m	+/-1%	1,542	263.29	£ 6.4 m	-£ 4.2 m
S&C Renewal (units)	£ 29.9 m	+/-1%	344	430.24	£ 28.1 m	-£ 1.8 m
Conventional re-signalling (SEUs)	£ 32.1 m	+/-5%	665	202.79	£ 25.0 m	-£ 7.1 m
Civils (all unit cost categories)	£ 35.0 m	+/-5%			£ 22.0 m	-£ 13.0 m
Total	**£ 107.5 m**				**£ 81.5 m**	**-£ 26.0 m**

As indicated in the table above, the impact of applying the reduction in year-end volumes results in a total unit cost efficiency **reduction of £26.0m**. This represents:

- 6.0% of REEM Renewals efficiency of £432m; and
- 4.1% of the Total REEM OMR efficiency of £629m.

Uncertainty 2: track volume uncertainty

Arup has identified uncertainty with regard to Network Rail's fulfillment of required delivery volumes of Plain Line track for the remainder of the control period, following lower than planned volumes for the first two years of the Control Period.

To reflect future uncertainty, Arup has applied a negative adjustment to the total volume efficiency figure. Comparing the original volume delivery profile set out in the 2010 Delivery Plan update with the amended profile set out in the 2011 Delivery Plan update, we take the additional track km now required for FY 2011/12 to FY 2013/14 compared to the original DPU 2010 volumes; the total value of the additional track km is calculated by multiplying the addition (DPU 2011) track km by the year-end unit cost value as a proxy. We then assess the impact of a potential shortfall, by multiplying the shortfall (km) by the year-end unit cost. The resulting impact (i.e. volume shortfall (km) x unit cost) for each of the 3 remaining years of CP4 is totaled, and an average annual value for the three years calculated. (Please see Annex below for the full workings of this calculation).

The results are shown below. In terms of the percentage shortfall in additional DPU11 volumes, we have applied the following:

- Value of a 5% shortfall in additional volume required (FY11/12 – 13/14);
- Value of a 10% shortfall in additional volume required (FY11/12 – 13/14); and
- Value of a 25% shortfall in additional volume required (FY11/12 – 13/14);

The results are set out in the table below.

Original efficiency calculation	Annualized shortfall impact	Revised PL volume efficiency (£m)
Plain Line volume efficiency	£ 0.0 m	£ 66.1 m
Shortfall in 5% of additional volume	£ 0.9 m	£ 65.2 m
Shortfall in 10% of additional volume	£ 1.8 m	£ 64.3 m
Shortfall in 25% of additional volume	£ 4.5 m	£ 61.6 m

As indicated in the table above, the annualized impact of the shortfalls in additional volume requirements for the remainder of CP4 represents a value of **between £0.9m and £4.5m.** When related to the FY10/11 track volume efficiency this represents:

- Between 0.2% and 1.0% of REEM Renewals efficiency of £423m; and
- Between 0.1% and 0.7% of the Total OMR efficiency of £620m.

Uncertainty 3: civils sustainability uncertainty

We consider that there is a degree of uncertainty with regard to the nature and scope of civils renewals activities required for the remainder of CP4. This is because of the level of instability in both cost and volume terms between successive delivery plans to date, and the fact that civils asset policies are still to be fully agreed and endorsed by ORR.

Network Rail's present unit cost efficiency calculations, by which cost reductions vs. baseline for each asset category are reflected in full (i.e. 100%) as unit cost efficiencies (see Section3.5.5), mean that no degree of uncertainty is reflected in the figures. We consider there is a potential risk that more costly work or higher volumes may be required at least to some degree, once the new asset policies are finalised and embedded within NR's organisation. This risk is associated not only with improved understanding of asset condition, but also in relation to the volume and type of renewals activity going forward on a whole-life-cost basis, relative to performance / output requirements (see also Arup's mandate AO/007 review of NR asst policy, stewardship and management of structures).

Until the policy is finalised, and evidence presented of definitive understanding of asset condition, we estimate a degree of uncertainty relating to up to 20% of the declared efficiency is applicable.

We set out below our application of uncertainty to the civils unit cost efficiency calculation;

- 5% reduction to the declared civils unit cost efficiency;
- 10% reduction to the declared civils unit cost efficiency; and
- 20% reduction to the declared civils unit cost efficiency.

The results and associated uncertainty range are set out in the table below.

Civils renewals - unit cost efficiency	Total unit cost efficiency (£m)	Total unit cost efficiency (%)	Unit cost efficiency variance (£m)
1. Original REEM calculation	35.0	12.4%	
2. Negative sensitivity - 5% reduction in efficiency calculation	33.2	11.8%	**-1.7**
3. Negative sensitivity - 10% reduction in efficiency calculation	31.5	11.2%	**-3.5**
4. Negative sensitivity - 20% reduction in efficiency calculation	28.0	9.9%	**-7.0**

As indicated in the table above, the impact of the negative uncertainty applied is a reduction of **between £1.7m and £7.0m** on an annualized basis in civils renewals efficiency. This represents:

- Between 0.4% and 1.6% of REEM Renewals efficiency of £423m; and
- Between 0.2% and 1.1% of the Total OMR efficiency of £620m.

Annex: summary of track renewals uncertainty calculation working (Uncertainty 2)

Calculation	2011/12	2012/13	2013/14	Average (2011/12 - 2013/14)
DP 2010 Plain Line (km)	1958	1895	1915	
DP 2011 Plain Line (km)	2074	1987	1913	
Difference (km)	116	92	-2	
Difference (£m est.)*	**£ 30.2 m**	**£ 24.0 m**	**-£ 0.5 m**	**£ 17.9 m**
Shortfall in 5% of additional volume	£1.51	£1.20	-£0.03	**£ 0.9 m**
Shortfall in 10% of additional volume	£3.02	£2.40	-£0.05	**£ 1.8 m**
Shortfall in 25% of additional volume	£7.56	£6.00	-£0.13	**£ 4.5 m**

* - Difference (£m) = units difference x unit cost value