

Network Rail and Office of Rail
Regulation

**AO/025: Audit of Renewal
Volumes Data**

Report

REP/01

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Executive Summary

Network Rail and the Office of Rail Regulation (ORR) asked Arup as the Independent Reporter (Part A) to review the reporting of renewal volumes for a number of railway assets. These volumes are monitored by the ORR against Network Rail's Delivery Plans for Control Period 4. They are also an important input to determine Network Rail's efficiency each year. It is therefore important that these volumes are reliable and accurate.

The first review of renewal volumes was carried out last year, which revealed some errors and made some recommendations. This year's review reported here is more extensive in that more jobs have been reviewed and Electrification and Plant (E&P) has been included for the first time.

Network Rail report volumes every Period in a Finance Pack to the ORR and in addition annually in the Annual Return. The focus of this review has been on the accuracy of the volumes reported in the 2011/12 Period 10 Finance Pack to the ORR. The objective was to review a sufficiently large sample of jobs so that the results would be statistically representative of all jobs reported in the Finance Pack.

We met with each of the asset reporting teams to agree an approach to the review. For three of the five assets (Signalling, Telecoms and E&P), this resulted in agreeing to review all the jobs that contributed to the Period 10 Finance Pack, and for the other two (Track and Civils Structures) in a structured sample of approximately 50 jobs to cover different categories of work and route.

Track was found to have a robust reporting process that produced accurate volumes for plain line renewals. Maintenance delivered jobs also have an improved process and were found to report volumes accurately. S&C units have been correctly reported, however the small proportion of plain line renewed with them contained some errors. We therefore judge that the reporting process has a minor shortcoming for these latter jobs (a B grade) but overall volumes were reported accurately (a 1 grade).

Signalling reporting continues to be subject to a well defined Change Control process. However, this year's audit has reviewed project histories in much more detail than last year. Some mistakes were found in the volumes quoted through the various changes of scope of a project's history. Late changes of scope prior to commissioning appear to be particularly susceptible to error. Six of the 10 signalling renewal projects which make up the 2011/2 volumes report had some documentation weaknesses and three of them reported inaccurate volumes. That said, the total volumes reported in Period 10 were within the 1% error band.

Telecoms reporting has suffered this year from losing a key member of staff who has not yet been replaced. Errors were identified in the reporting of several of the jobs, but more significantly in the amalgamation of volumes by sub-category for reporting in the Finance Pack. The procedures for reporting need to be updated and most urgently the vacant post needs to be filled.

The reporting team for **E&P** have put a lot of effort into improving the reporting of diverse sub-assets and new procedures are being introduced. There are still, though, a number of weaknesses for example in the reporting of volumes

delivered by Maintenance and by one of the routes. Reporting errors were found on several jobs.

The reporting of **Civils Structures** jobs has improved this year and no errors were identified in the jobs we sampled. The one area of concern was an error identified by an internal audit carried out by one of the routes. Consideration should therefore be given to extending this audit nationally on a sampled basis which would improve the robustness of the reporting process.

The Confidence Grades for the reported volumes of each asset in the 2011/12 Period 10 Finance Pack are shown below and compared with the grades given last year. No systematic bias has been detected in our audits, with instances found of both under- and over-reporting. The only possible exception is Telecoms where the central compilation of volumes tended to over-state the volumes. The ORR have set a benchmark of A1 for each asset which we believe should be achievable. The definition of the grades is given in Appendix C.

Reliability and Accuracy of renewal volumes reported to ORR

Asset	Last year's Confidence Grade	This year's Confidence Grade
Track	B2	B1
Signalling	B2	B1
Telecoms	B3	C5
E&P	-	C4
Civils Structures	C2	B1

The above grades for this year refer to the actual volumes reported as delivered in the 2011/12 Period 10 Finance Pack. During our meetings with the asset teams we were informed that some of the errors had subsequently been corrected in later periods of the Finance Pack. We also understand that there are additional year-end checking processes. We would therefore expect that the total year volumes reported for 2011/12 will be more accurate than at Period 10.

As a general observation we found different conventions for reporting rationalised assets where the number of new assets is smaller than the number of old replaced. This can arise because of the introduction of new technology or the removal of redundant capacity. In signalling, the number of new assets was reported whereas in Telecoms the number of old assets was reported (though we understand this has been corrected to reporting the new assets in later Finance Packs). We would suggest that this should be standardised.

Finally, it is clear to us that there is a requirement for a checking process of the accuracy of reported volumes for all assets. Many renewal projects have long planning and delivery timescales, some over a number of years, during which time their scope and size can change. Having a process to keep abreast of these changes for forecasts and delivered volumes is important in the future devolved organisation within Network Rail, as is ensuring there are adequate numbers of trained staff to produce reliable and accurate reporting.

We have made a number of recommendations to improve the reliability and accuracy of the renewal volumes reporting. These are listed in Section 10 of the report.

Acknowledgements

We would like to thank all of the Network Rail asset teams for their help and openness during the audits.

1 Introduction

1.1 Background

In 2010, Network Rail published a Delivery Plan that set out their planned renewal volumes for each asset during Control Period 4 (CP4) using revised asset policies. Network Rail publish a report of delivery against this plan in the Annual Return which also is used to assess Network Rail's efficiency each year. Network Rail also provide the Office of Rail Regulation (ORR) with a 4-weekly update of renewal volumes in a Finance Pack for monitoring purposes.

Last year the Independent Reporter carried out an initial audit of the reliability and accuracy of the reported renewal volumes¹. The scope of this study was limited to relatively small samples and electrification renewals were excluded. Some issues were identified in the audit and so this year we have been asked to carry out a larger scale audit.

1.2 Purpose and Scope of Review

The purpose of this review is to provide a view of the reliability and accuracy of reporting renewal volumes, which in turn will feed into the reviews of Network Rail's efficiencies and the Q4 Monitor. Although initially intended to include the Annual Return, it was agreed with Network Rail and ORR that this assessment would be based on the renewal volumes reported in the 2011/12 Period 10 Finance Pack. There were two reasons for this: firstly, the 2012 Annual Return will not be available until August 2012 and so the 2011 version would have to be reviewed which reports volumes for the previous year (2010/11); and secondly the Annual Return reports the same figures as those in the Period 13 Finance Pack. Given the timescales to undertake this review and report by April 2012, it was felt that reviewing the Period 10 Finance Pack would be a good indication to the reliability and accuracy of reported volumes in the 2012 Annual Return.

It should be noted, however, that there are additional checks in compiling the Period 13 Finance Pack and that these have not been reviewed in this report.

The following assets were reviewed:

- Track;
- Signalling;
- Telecoms;
- Electrification & Plant (E&P); and
- Civils Structures (but not Buildings).

Although the focus of the review is the actual renewal volumes delivered, we were also asked in the Inception Meeting to note any observations on the quality of forecasts.

¹ Reported in Audit of Renewals Volume Data, July 2011

1.3 Report Structure

Following this introduction the report is structured as follows:

- Section 2 describes the approach taken in the audit;
- Section 3 reviews progress made against each of the recommendations we made in last year's review;
- Sections 4 to 8 present the findings of the audit for each asset;
- Section 9 presents the Confidence grades for each asset; and
- Section 10 presents our new recommendations for this audit.

The mandate for this audit from Network Rail and ORR is presented in Appendix A of this report.

2 Approach to Audit

The audit was split into two stages. During Stage One the Reporter Team met each of the asset teams to understand the number and nature of renewal jobs reported (partially or fully) in 2011/12 up to Period 10. Based on this information we proposed a sampling strategy which would provide us with statistically significant results from which to draw conclusions on all the jobs within each asset.

The resulting sample sizes which were agreed with Network Rail and ORR are shown in the table below. As well as reviewing jobs with reported renewal volumes, we also included some jobs having zero volumes to understand their nature and composition and to confirm they had no volumes.

Table 2.1: Sample sizes for Audit

Asset Category	Population of jobs in 2011/12 P10 Finance Pack	Sample Size	%	Jobs reported as Zero Volume	
				Population in 2011/12 Finance Pack	Sample Size
Signalling	13	11	85%		
E&P	32	32	100%	31	10
Track	1,067	50	4.7%		
Telecoms	36	36	100%	Approx 15	5
Civils	542	Up to 50	9%	Thousands ²	10
Total	1,690	181	10.7%		

As can be seen from the table, we agreed to review all the jobs reported in the Finance Pack for E&P and Telecoms. We also agreed to review all Signalling renewal schemes and sample one of the three Level Crossing renewals. Track and Civils have much larger numbers of jobs, so we agreed to review samples of 50 jobs for each asset, structured in such a way that different routes and type of job were included. More details on the sampling methodology can be found in our Stage One report provided in Appendix D.

Following agreement of the above samples, Stage Two involved the Reporter team meeting with each asset reporting team to check their sampled jobs. Supporting data was taken away by the Reporter team and subsequently reviewed, with any outstanding queries referred to the asset team for close out. Based on this information, the Reporter team have provided a Confidence Grade to each asset.

² Projects less than £50k are not included in the counts; inspections (120k in number) and interventions (13k) have no volume activity.

3 Review of Previous Recommendations

Number	Recommendation	Data Champion	Due Date	Progress
2011REN01	ORR to agree with Network Rail a clear reporting specification and format for all renewals volumes to be regularly reported, and to agree the definitions for terms such as 'budget', 'plan' and 'forecast' which are used extensively in reports. To include consideration of track renewals (Maintenance) that are funded by opex.	ORR	October 2011	<p>ORR sent a template specification for Network Rail to complete at the end of each year. They have also specified requirements in the Annual Return specification. Year end is a key time when ORR assess Network Rail's efficiency – so this is the most important set of information they receive.</p> <p>ORR also agreed with Network Rail that it will provide quarterly commentary against variances in the Finance Pack, which was included in Period 10.</p> <p>However, specific definitions for 'budget', 'forecast' or inclusion / separation of enhancement volumes have not yet been agreed. ORR are currently making some major changes to how they monitor Network Rail renewals, so will be agreeing definitions with Network Rail.</p> <p>Ongoing</p>
2011REN02	<p>NR to review its management processes & standards for recording and reporting volumes data to ensure that they:</p> <ul style="list-style-type: none"> Are comprehensively documented; Are up to date and consistent; Cover both the functional and cross functional reporting requirements; and Are adequately checked. 	Each Discipline Data Champion	November 2011	<p>Track (Maintenance) have issued a new process document (called AMP) that records the volumes at various stages of the job including the delivery on completion. Track (IP) were compliant before and no changes have been made.</p> <p>Signalling - it is the intention to now report Minor Works. A budget for 2012/13 of £600m has been agreed. Volume reporting will not be in the standard currency of SEUs. Procedure documentation is being assembled currently, for launch in April 2012.</p> <p>Telecoms had not issued a revised reporting standard at the time of the audit.</p> <p>Civils – Documentation shortcomings have been reviewed and Maintenance are now included in the change control process.</p> <p>Ongoing for Signalling and Telecoms</p>
2011REN03	ORR to confirm that the current arrangements, in which Enhancements volumes are not recorded in Period or annual returns, meet requirements	Matt Wikeley	October 2011	<p>This will be included in the discussions on renewal reporting definitions from recommendation 2011REN01.</p> <p>Ongoing</p>

2011REN04	Civils to consider formalising the arrangements for independent verification of work volumes, to build upon the perceived success of the special exercise undertaken in 2010.	Civils Data Champion	September 2011	<p>Route Asset Managers have in general been appointed for B&C Assets within the Routes, with responsibility for accuracy of data contained within their business plans.</p> <p>The Asset management organisation is expected to be published soon with recruitment to posts commencing shortly after.</p> <p>Routes will take full control of their business plans from 1 April 2012.</p> <p>It is likely that discussions on all aspects of managing volumes will commence as soon as the key personnel involved are established.</p> <p>Ongoing</p>
2011REN05	Network Rail to strengthen the reporting hierarchy to address any disconnect between functional reporting and the Finance-led collation of the Period pack.	Each Asset Data Champion	September 2011	<p>Track provide commentaries along with the periodic reported volumes to the Finance team.</p> <p>Signalling and Civils - reviewed and arrangements found to be satisfactory.</p> <p>There are outstanding issues for Telecoms.</p> <p>Closed and replaced by new recommendations.</p>
2011REN06	ORR to confirm that the current methodology for recording volumes in B&C – the asset dimensions prior to remediation – is acceptable and appropriate.	ORR	September 2011	<p>ORR are broadly content with the way NR have developed their cost and volume reporting for the Civils portfolio and have received 2 or 3 reports in the agreed format which now include explanation for any significant changes from plan. Some clarity on the area included for footbridges was needed i.e. does it include the staircases as well as the span – but that is a minor point.</p> <p>ORR note these are early days in the new reporting, and will be more confident that the new system has bedded down when they have received a year's worth of reports.</p> <p>ORR will next review volume reporting of operational property.</p> <p>Ongoing</p>
2011REN07	All recording and reporting processes used should be documented, and sufficient numbers of staff should be trained in them to cover periods of holiday, staff illness, etc., and to ensure business continuity.	Each Discipline Data Champion	November 2011	<p>This was not really an issue for Track.</p> <p>Signalling - further staff have been trained in the reporting processes – was 2, now equals 4.</p> <p>Civils – interim arrangements are in place but these will be significantly affected by devolution changes.</p> <p>Telecoms – some deficiencies in the documentation remain and a key staff vacancy needs to be filled urgently.</p> <p>Closed and replaced by new recommendations for Telecoms.</p>
2011REN08	Network Rail to use a clear	Network	July 2011	The Finance Pack now contains Period number in the heading of renewal

	version control for their reporting documents and to show the date of publication.	Rail		volumes reporting. The 2011 Annual Return show the date of publication. Closed
2011REN09	Network Rail to carry out further checks on the accuracy of Maintenance job records, and to consider what improvements to processes are needed.	Relevant Data Champion	September 2011	The new AMP process has improved the sign off of volumes delivered as recorded in the AMP 14 Certificate. As well as feeding into the periodic reporting, these certificates are also used to update ELLIPSE and GEOGIS databases and so help to ensure consistency. The central team now also hold periodic reviews with the Delivery Units which they report as improving the quality of volume reporting. N/A to Signalling – no work undertaken by the maintenance function Civils – Maintenance now included in change control process. N/A to Telecoms. Closed

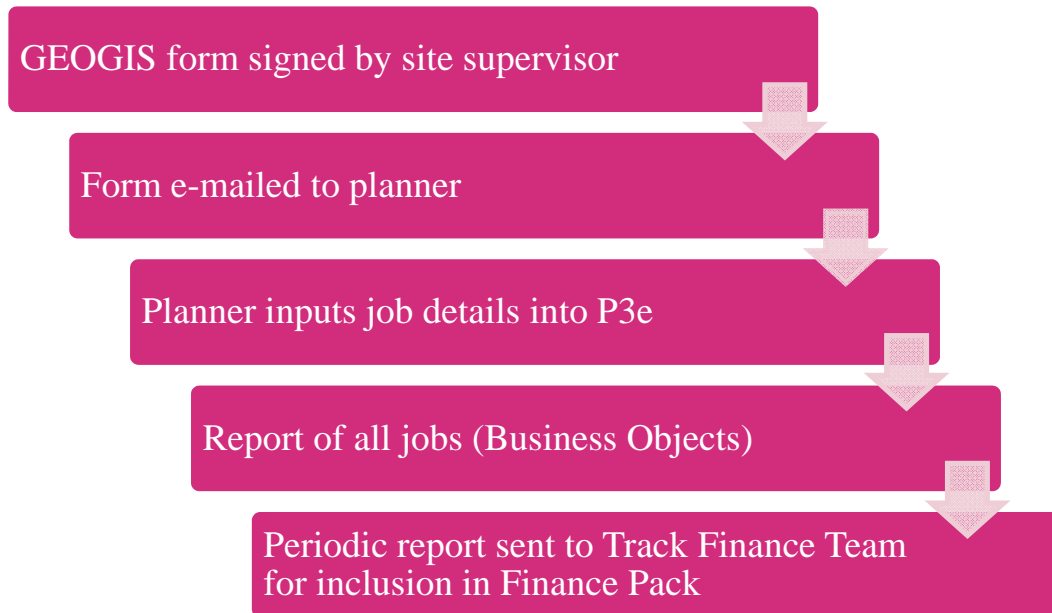
4 Track

4.1 Reporting Process

Track renewal volumes are reported separately by the Investment Projects (IP) and Maintenance Functions to the central Track finance team on a periodic basis. The figures are compiled and then sent on for inclusion in the Finance Pack. In the 2010/11 Period 10 track volumes reported, 90% of plain line and 86% of Switch & Crossing (S&C) renewals were delivered by IP with the remainder delivered by Maintenance.

4.1.1 IP

The reporting of renewal volumes is shown below.



On completion of a job, the site supervisor fills in and signs a GEOGIS input form that records the length of plain line renewals undertaken by rails / sleepers / ballast in miles and yards. There are different forms for different jobs so that for S&C renewals, details of the type of job are recorded (e.g. turnout, fixed diamond). The forms are generated using an Excel spreadsheet tool which has a User Guide to help ensure consistent and accurate recording. The forms are very clear and an example for a Plain Line Renewal is shown in Figure 4.1

Figure 4.1: Extract of a GEOGIS Input Form for Plain Line Renewal

GEOGIS Input Form Project Complete Renewal - Plain Line (Revised July 2011) v3.3

STATUS: FINAL GEOGIS ELR: ECM5 TRACK ID: 1200

N.R. UID: 131008 SITE NAME: Ferryhill SHEET: 1 of 1

ELECTRIFICATION: L - Overhead Line DATE WORK COMPLETED: 03/07/2011 YR: 2011 PD: 04

RAIL (back to low mileage)

Rail Leg	Track Type	Rail Section	Weight	New / Serv Rail	Alloy	Year Rolled	Check Rail	Conductor Rail	Conductor Year	From (low miles)		To (high miles)		Date Installed	Yr	Pd
										Miles	Yards	Miles	Yards			
Both	C - CWR	F - Flat Bottom	K - BS113A Flatbottom	N - New Rail	G - Med Mang.BS11:unknown	2009	N - None	N - None		57	1743	67	1757	03/07/11	2011	04
Both	C - CWR	F - Flat Bottom	S - UIC 60 Flatbottom	N - New Rail	G - Med Mang.BS11:unknown	2010	N - None	N - None		57	1757	58	1266	03/07/11	2011	04
Both	C - CWR	F - Flat Bottom	S - UIC 60 Flatbottom	N - New Rail	G - Med Mang.BS11:unknown	2010	N - None	N - None		58	1266	58	1445	26/06/11	2011	04
Both	C - CWR	T - Transition rail	T - Transition Rail	N - New Rail	G - Med Mang.BS11:unknown	2011	N - None	N - None		58	1445	58	1464	26/06/11	2011	04

SLEEPERS

Sleeper Type	Baseplates	Fixing	New / Serv	Fastening	Spacing / 60'	Tampability	From (low miles)		To (high miles)		Date Installed	Yr	Pd
							Miles	Yards	Miles	Yards			
T - Timber Sleeper/Bearer	PAN - Pandrol	S - Screwed	N - New	P - Pandrol Fastening	28	T - Plain Line tamp	57	1751	57	1753	03/07/11	2011	04
W560 - W560 Steel	Not Applicable	H - Hook in	N - New	F - Fastclip	28	T - Plain Line tamp	57	1753	58	1266	03/07/11	2011	04
W560 - W560 Steel	Not Applicable	H - Hook in	N - New	F - Fastclip	28	T - Plain Line tamp	58	1266	58	1460	26/06/11	2011	04

BALLAST TREATMENT

Method	From (low miles)		To (high miles)		Date Installed	Yr	Pd
	Miles	Yards	Miles	Yards			
S - Scarify	57	1751	58	1266	03/07/11	2011	04
S - Scarify	58	1266	58	1460	26/06/11	2011	04

ABANDONMENT

Asset	From (low miles)		To (high miles)		Date Removed	Yr	Pd
	Miles	Yards	Miles	Yards			

DRAINAGE (for Project use)

Type	New / Like-for-Like / Removed	Material	Position	From (low miles)		To (high miles)		Date Installed	Yr	Pd
				Miles	Yards	Miles	Yards			

Prepared by: _____ Reviewed by Network Rail

When the job is input into Primavera P3e, the plain lines volumes are automatically converted into composite km from the constituent rail, sleepers and ballast miles and yards. The S&C renewals are similarly converted to the Equivalent Units based on the type of work undertaken.

The planned renewal volumes to be delivered by IP in 2011/12 were signed off the previous in January / February 2011. Any changes are then subject to formal change control.

4.1.2 Maintenance

The reporting of track renewals undertaken by Maintenance follows a similarly staged process but uses different systems. The reporting is covered by the Network Rail Asset Management Plan Standard NR/L3/EBM/089 issued on the 6th June 2009. On completion of a job, the delivery unit completes an AMP14 Completion Certificate which summarises the amount of work done. An example is shown below. It contains much less information than the GEOGIS form used by IP.

Figure 4.2: Extract of an AMP14 Certificate



Ref:	NR/L3/EBM/089/AMP014
Issue:	1
Date:	06 June 2009

Construction Completion Certificate

1. LOCATION				
Project Unique ID		M3E000		
Site Name		KILLINGWORTH		
ELR	Track ID	From	To	
ECM 7	1100	5M 1628 YDS	7M 0 YDS	
2. DECLARATION				
Further to the issue of the notification of asset change certificate dated: <u>20/2/12</u> , the new / renewed assets within the locations detailed above are accepted as being installed, and the site of works is now deemed substantially complete.				
The issue of this certificate signifies the completion of core work activity, and the project works contractor is hereby notified of their requirement to complete all outstanding site works and procedures, in preparation for the issue of a taking over certificate.				
Effective date of this construction completion certificate is: <u>20/2/12</u> .				
Name	Title	Representing	Signature	Date

This form is then sent to a planner who inputs details of the delivered volumes into Oracle Projects, the database containing all Maintenance jobs. The conversion from miles and yards to composite km and S&C Equivalent Units is undertaken by hand. As we found in the audit, in some cases the AMP14 does not contain enough information for this exercise, in which case the planner has to consult the AMP12 and 13 Forms.

The central team produce a report of all jobs from Oracle Projects. This is then discussed in a telephone conference every Period with the Delivery Units to go through each job. This is reported to be a useful process for checking the quality of the information on each job.

Last year we observed that in some jobs more plain line was renewed than had been pre-agreed with the Route Asset Manager (RAM). This extra re-railing was not reported in the Finance Pack. We understand that the Head of Asset Management (Track) has agreed that this can now be reported if the RAM signs it off after the job is completed.

The planned renewal volumes to be delivered by Maintenance in 2011/12 were signed off in February 2011. Any changes are then subject to formal change control.

4.2 Sample Size

The requested sample size for the audit is shown below along with the actual numbers reviewed in brackets. Overall we requested 31 plain line and 5 S&C jobs from IP and actually reviewed 32 and 11 respectively. From Maintenance we requested 12 plain line and 2 S&C jobs and reviewed the same numbers. This gave a total of 44 Plain Line and 13 S&C sampled jobs.

Table 4.1: Proposed (and Actual) Track Sample Sizes for Plain Line and Switch & Crossings

Category	Plain Line			S&C		
	Count	Volume (ckm)	No. Sample jobs	Count	Volume (EqU)	No. Sample jobs
AmeyCOLAS High Output						
LNE	25	52	1 (2)	0	0	0
LNW	86	106	3 (2)	0	0	0
Western	54	243	5 (2)	0	0	0
AmeyCOLAS						
LNW	40	65	2 (2)	8	23	1 (1)
Western	54	106	3 (5)	12	52	1 (3)
Babcock Rail						
LNE	91	240	6 (8)	12	50	1 (3)
LNW	53	139	3 (4)	7	38	1 (2)
Scotland	53	111	3 (0)	6	26	0
Balfour Beatty						
SE	82	188	5 (7)	15	56	1 (2)
Maintenance	413	161	12 (12)	56	18	2 (2)
PL Associated with S&C	-	20	0			
Total	951	1,430	43 (44)	116	262	7 (13)

4.3 Review of Renewal Jobs

4.3.1 IP – Plain Line

A summary of the review of the plain line renewal projects is shown in Table 4.2 below. This compares the composite volume of rail, sleepers and ballast recorded on the GEOGIS input forms with the corresponding volume reported in P3e.

Table 4.2: Comparison of plain line renewal composite volumes (meters)

Project	Description	Route	Contractor	GEOGIS	P3e	Difference
24797	Copenhagen Tunnel	LNE	Babcock	1643	1643	0.0%
26653	Scunthorpe		Babcock	1066	1066	0.0%
27521A	Thirsk A		Amey COLAS High Output	3432	3429	-0.1%
121024	Langley		Babcock	3210	3204	-0.2%
121045	Hornsmill		Babcock	2310	2247	-2.7%
125056	Westborough		Amey COLAS High Output	3536	3541	0.1%
131008	Ferryhill		Babcock	4041	4059	0.4%
132010	Thirsk		Babcock	889	889	0.0%
135034	Hillam to Milford Jn		Babcock	2051	2051	0.0%
137014	Bradley Jn		Babcock	2373	2373	0.0%
110082	Bescot Middle	LNW	Amey COLAS	910	910	0.0%
23170211	Three Arches		Amey COLAS High Output	1756	1748	-0.5%
24370411	Tile Hill		Amey COLAS High Output	918	918	0.0%
32100413	Kirkconnel 3		Babcock	1771	1769	-0.1%
32101012	Lugton Signal Box Dn		Babcock	885	885	0.0%
22700211	Dallam		Babcock	2286	2281	-0.2%
FHR4110084	Mill Hill		Babcock	3058	3042	-0.5%
PBJ2100047	Hamstead		Amey COLAS	689	689	0.0%
41301011	Whittlesea	SE	Balfour	2288	2272	-0.7%
41600210	Great Chesterford		Balfour	9476	9479	0.0%
41600711	Sawston		Balfour	364	364	0.0%
41600810	Meldreth		Balfour	2371	2365	-0.3%
44300711	Ascot - Bagshot		Balfour	13407	13738	2.5%
44400710	The Hatches		Balfour	469	469	0.0%
44500610	Grateley Up2		Balfour	2399	2398	0.0%
51300910	Milton	W	Amey COLAS	2197	2197	0.0%
51485611	Thatcham Up		Amey COLAS High Output	5525	5525	0.0%
51486111	Burbage Down		Amey COLAS High Output	17325	17323	0.0%
52202211	Montpelier		Amey COLAS	1223	1212	-0.9%
52211112	Hallen Moor		Amey COLAS	765	765	0.0%
52302011	Exeter St James Down		Amey COLAS	1629	1629	0.0%
53100311	Ludlow		Amey COLAS	4271	4617	8.1%
	Total			100533	101097	0.6%

There are a few small discrepancies. Network Rail have advised that in previous years one analyst has checked the accuracy of reported volumes for all projects in Period 13 to improve the overall accuracy of the year end numbers. The above results suggest that it would be beneficial to undertake the same check again this year to correct small errors.

4.3.2 IP – Switch and Crossings (S&C)

S&C renewals also include some neighbouring plain line renewal. In the table below we summarise the comparison of the S&C units and plain line composite meters recorded on the GEOGIS input forms with the volumes reported in P3e.

Table 4.3: Comparison of S&C and plain line renewal composite volumes (meters)

Job	Description	Route	Contractor	S&C units			Plain Line (cm)		
				GEOGIS	P3e	Difference	GEOGIS	P3e	Difference
22892a	Worksop East	LNE	Babcock Rail	3	3	0.0%	610	625	2.5%
23145	Ferrybridge		Babcock Rail	1	1	0.0%	279	275	-1.4%
26275	Knottingley West		Babcock Rail	17	17	0.0%	2000	2000	0.0%
21590111	Farington Jn	LNW	Babcock Rail	4	4	0.0%	686	669	-2.5%
32490110	Hyndland		Babcock Rail	5.5	5.5	0.0%	548	442	-19.3%
118625	West London Jn		Amey COLAS	2	2	0.0%	594	829	39.6%
41590111	Ilford	SE	Balfour Beatty	4	4	0.0%	218	247	13.3%
42390210	Margate		Balfour Beatty	1.5	1.5	0.0%	339	436	28.6%
52190210	Barnwood	W	Amey COLAS	8	9.67	20.9%	2361	1916	-18.8%
51390110	Whitehill		Amey COLAS	4	4	0.0%	1032	848	-17.8%
51390112	Swindon East		Amey COLAS	3	3	0.0%	1172	1418	21.0%
	Total			53	54.67	3.2%	9839	9705	-1.4%

There are detailed rules about how to calculate the number of S&C units renewed, and it is not always easy to apply these rules on the details provided on the GEOGIS forms alone. We went through many of the above projects with Network Rail to confirm that the numbers reported in P3e were indeed correct. The one project shown with a difference in the table above – Barnwood – was correctly reported in P3e and there was an error in the GEOGIS forms. All S&C units were therefore correctly reported.

The rules for calculating the neighbouring plain line renewal volumes are more complicated than for sole plain line renewals. The general principle is to calculate the total yardage renewed minus the length of the S&C unit. The S&C unit itself is usually calculated from switch fronts to last long bearer. This plain line volume is recorded on GEOGIS Plain Line forms whereas details of the S&C are recorded on separate S&C forms.

However, Network Rail's Standard NR/L3/INI/TK0040 Issue 2 section 4.5.2 states that the actual volume installed can vary to include ramps (transitional work beyond the specified job length as required by Company Standards) and minor construction practicalities.

Section 4.5.3 also makes a distinction between associated and unassociated plain line renewals. Associated plain line is required for the construction of the S&C units and should not be reported as a job length for the purpose of determining the plain line category unit cost rates. Unassociated plain line is not required for the construction of the S&C units and should be reported for determining unit cost rates. We have been advised by Network Rail that all plain line (associated and unassociated) should be reported as renewal volumes.

In calculating the plain line renewals for the above projects, we have therefore simply added up the renewals listed in the plain line GEOGIS forms. This assumes that the length of the S&C units has been excluded from these records. It can be seen from the table that this has resulted in quite a wide range of variability from the volumes reported in P3e.

We had a follow-up meeting with the Principal Programme Manager for Track to understand the reasons for these discrepancies. Subsequent investigations by Network Rail have advised the following:

Table 4.4: Network Rail investigations into discrepancies of plain line renewal volumes

Job	Finding
Worksop East	A check of P3e shows that it now matches GEOGIS.
Ferrybridge	A check of P3e shows that it now matches GEOGIS.
Farington Jn	A planner error was found and will be corrected by adding 6 yards to P3e as per GEOGIS form.
Hyndland	Under review by Network Rail
West London Jn	Planner entered wrong values for ballast and sleepers in P3e. P3e now corrected to 594 composite meters.
Ilford	The ballast was over-reported in P3e (69 yards versus 44 yards). This has now been corrected to give 218 composite meters which agrees with GEOGIS.
Margate	Under review by Network Rail
Barnwood	Under review by Network Rail
Whitehall	Under review by Network Rail
Swindon East	Under review by Network Rail

4.3.3 IP - Reconciliation with Period 10 Finance Pack

As a final check, we compared a download from P3e of all 2011/12 plain line and S&C renewal projects up to Period 10 with volumes reported in the Finance Pack. These two reports matched exactly and confirmed that the Finance Pack accurately reported the volumes in P3e.

4.3.4 Maintenance

For each Maintenance job, the volume recorded on the AMP14 Completion Certificate was checked against what was reported in Oracle Projects. Any potential differences were then investigated by checking the scope of the job in the AMP12 and 13 certificates. All were reported consistently except for two minor discrepancies:

Task M9A002 – Dorn Rerailing

The AMP14 certificate contained a typographical error resulting in a volume of 1,063m plain line renewal instead of 1,061m. However the 1,061m was correctly reported in Oracle Projects which fed through to the Finance Pack.

Task M3E000 – Killingworth Rerailing

The AMP14 certificate correctly reported the volume delivered and installed 8no 216m rails whereas Oracle Projects reported the original remit for the job. In this case Oracle Projects is incorrect and will be corrected in Period 13. However, the difference is small with the reported 1,728m needing to be corrected to 1,730m.

4.4 Observations

Checking the figures in Oracle Projects against the AMP14 Certificates for Maintenance jobs is more difficult than checking the IP jobs against the GEOGIS

Completion certificates. The latter contain more information and usually provide enough information to make a full comparison. However, the AMP14 Certificates do not contain information such as whether only one of the rails is being replaced or the nature of the renewal of a Switch & Crossing (partial or full). It is therefore more straightforward to report IP volumes than Maintenance job volumes.

It is also worth noting that the conversion from yards to meters for reporting is manual for Maintenance jobs but calculated automatically for IP jobs. Although no errors were identified in the audit, it would be worth considering automating the process for Maintenance jobs.

4.5 Conclusions

The process for recording the Track IP plain line projects is robust and accurate to within 1%. This represents over 98% of all plain line renewals.

The picture for S&C renewal projects is less clear. The number of S&C units renewed is reported accurately. However, the reporting of the accompanying plain line volume appears to be less accurate. Some coding errors into P3e have been identified. It would be worth checking why these jobs are more prone to error than the plain line jobs, for example whether the rules for reporting associated and unassociated plain line are causing confusion.

The sampled Maintenance jobs were reported accurately with only one job having a very small error.

5 Signalling

5.1 Reporting Process

Network Rail's data champion described the signalling investment and data cycle, and confirmed that this is the same as last year but with one change. The quality of the Ellipse asset register is considered to have significantly improved (now felt perhaps to be about 95% accurate). Network Rail have therefore introduced a new automated process for calculating SEUs in the SSADS reporting database from the constituent assets recorded in Ellipse. This removes the manual errors in calculating SEUs (such as the instance we found in last year's audit). This will happen when a scheme is commissioned and signed off as complete, about 18 months after it has been installed. However, this does mean that the SEUs reported as delivered this year will still be dependent on the manual count.

The Delivery Plan is set in Period 8 or 9 of the previous year. Last year it was then updated for subsequent changes and agreed with ORR after the issue of the Delivery Plan. The Plan in the Finance Pack is the Period 1 forecast. This is effectively the budget for the year and does not change. The Forecast for the year is updated period by period to reflect changes agreed in the Change Control process.

5.2 Sample Size

In accord with the recommendations of the sampling report, the review covered:-

- All signalling projects reporting volumes into the Period 10, 2011/12 Finance Pack; and
- 1 of the 3 Level Crossing schemes, also reporting volumes into the Period 10, 2011/12 Finance Pack.

5.3 Review of Renewal Jobs

The Period 10, 2011/12 Finance Pack shows the following volumes for Signalling:-

Table 5.1: Signalling Renewal Volumes in P10, 2011/12 Finance Pack

	Year to Date			Full Year				Comment
	Actual	Plan	Variance	FYF	Plan	Var	% Var	
Conventional SEUs	948	938	(10)	1041	1031	(10)	(10)	See Note 1
ERTMS SEUs	-	0	-	-	0	-	-	
Accelerated Renewals	211	165	(46)	211	165	(46)	(28)	See Note 2
Level Crossings								See Note 3

Note 1: Year to Date (YTD) Variance due to slippage of Newport from 2010/11 to 2011/12, Full Year Forecast (FYF) variance due to slippage of Newport from 2010/11 to 2011/12 offset by slippage of Ely/Norwich modular to Sept 2012 (2011/12 to 2012/13). Only one scheme left to commission this year, Salisbury to Exeter in P12 and P13.

Note 2: Scheme commissioned in P10 (Slough IECC Relock and Recontrol). Volume increase due to the inclusion of recontrol element to TVSC, in scope of project.

Note 3: 5 x SEU are associated with Level Crossing renewals as follows:-

- Winning LC1 1 x SEU - Delivered P5
- Holmes Jcn & Brinksworth St LC 1 x SEU - Delivered P8/9
- Cutsyke LC 1 x SEU - Delivered P10
- Mill Green & Cherry Holt LC 1 x SEU - Delivered P10
- Doncaster North LC 1 x SEU - Delivered P10

The table below summarises the schemes reviewed and a description of each one follows.

Table 5.2: Signalling and Level Crossing renewal schemes reviewed from P10 2011/12 Finance Pack

Job	Description	Route	Contractor	S&C units			Plain Line (cm)		
				GEOGIS	P3e	Difference	GEOGIS	P3e	Difference
22892a	Workshop East	LNE	Babcock Rail	3	3	0.0%	610	625	2.5%
23145	Ferrybridge		Babcock Rail	1	1	0.0%	279	275	-1.4%
26275	Knottingley West		Babcock Rail	17	17	0.0%	2000	2000	0.0%
21590111	Farington Jn	LNW	Babcock Rail	4	4	0.0%	686	669	-2.5%
32490110	Hyndland		Babcock Rail	5.5	5.5	0.0%	548	442	-19.3%
118625	West London Jn		Amey COLAS	2	2	0.0%	594	829	39.6%
41590111	Ilford	SE	Balfour Beatty	4	4	0.0%	218	247	13.3%
42390210	Margate		Balfour Beatty	1.5	1.5	0.0%	339	436	28.6%
52190210	Barnwood	W	Amey COLAS	8	9.67	20.9%	2361	1916	-18.8%
51390110	Whitehill		Amey COLAS	4	4	0.0%	1032	848	-17.8%
51390112	Swindon East		Amey COLAS	3	3	0.0%	1172	1418	21.0%
	Total			53	54.67	3.2%	9839	9705	-1.4%

Newport

The April 2004 authority submission identified 827 SEU like-for-like renewals but recognised efficiency and rationalisation requirements and opportunities at this early stage. GRIP 4 authority in 2006 identified rationalisation, and changes to scope for a revised SEU count of 550 – split into 3 delivery phases – 1(a), 1(b) and 2. Further re-scoping and value engineering reduced Phase 1 to 375 SEUs of which 157 SEUs in Phase 1(a) were commissioned in 2010/11. The remaining

218 SEUs were commissioned in P2 2011/12 and are confirmed as included in the P10 Finance Pack numbers.

Stocks Lane & Causeway Level Crossings

The 2 x LXEU's were confirmed in Investment documentation and confirmed as included in P10 Finance Pack numbers.

Southampton Area Interlockings

October 2009 GRIP 8 authority approved an SEU count of 351, for which recorded volume of 45% of the total at 158 was delivered in P1 2011/12, and volumes are correctly recorded in P10 Finance Pack. A check of SSADS confirms 351 SEUs.

Robin Hood Line

This scheme is relocking and recontrol of the Robin Hood Line (Kirby Summit box) into East Midlands Control Centre. Investment papers show 62 SEUs, but this is erroneous, and appears to double count the actual volume of equipment on the route; the job actually treated 31 SEUs twice (relock and recontrol), not 62 SEUs. However, the error is further compounded in that SSADS records actual current volume as 30 SEUs, not 31, and this is confirmed as correct.

Reportable volume for recontrol is 5% of the total SEU count; and for relocking is 45%. Reported volume for this scheme was 1.55 SEU (5% of 31), for some reason omitting the relocking element. The correct total should have been 15 SEUs (50% (5+45) of 30). The "volumes delivered" records have now been corrected, but how these two errors occurred could not be explained– total SEU count for location, and renewals volumes for relocking. Reported volume now corrected from 1.5 to 15 SEUs.

Moorthorpe Interlocking

The 2 x Relay interlockings are replaced with a single SSI installation. The original April 2005 scheme had Moorthorpe authorised in a group of LNE interlockings which required renewal, but was separated out for individual development because of the particular issues around scope. A November 2008 reauthorisation lifted the SEU count from 46 to 55 as a result of the elimination of a 3-aspect "island" on a 4-aspect route. The project was delivered in May 2011 and volume of 55 SEUs correctly reported in P3.

Great Chesterford Wire Degradation

The initial volume in the original 2004 remit was 88 SEUs. This volume is also clearly stated in the June 2007 GRIP 3/4 re-authority. It is not clear why the Appendix B schedule to the June 2007 re-authority describes the volume as 70 SEUs, against which the efficiency calculation is made. The error is further compounded in the GRIP 5-8 re-authority in July 2009, when the SEU volume is quoted as 67 with no change of scope, and the Appendix Efficiency Scorecard clearly stating 67 SEU as the original, baseline and current SEU count.

The 67 v 88 discrepancy was picked up in the Independent Reporter Renewal Volumes Audit in 2011, and this resulted in a letter from the Network Rail data champion to Project Panel seeking to regularise the position.

The volume claimed for rewiring is 45% of the SEU count at the location, therefore the volume reported correctly in 2011/12 is 45% of 88 SEU = 39.6

Salisbury – Exeter Signalling Renewal

This rapid development scheme has complex volume numbers throughout; the reason given is that accelerated development means less certainty and predictability at each stage. GRIP 1-3 authority in February 2009 quotes a volume of 145 SEUs, re-authority in August 2009 with scope change quotes an original volume of 148, increased by a net 14 to 162 (for Axminster Loop and reductions at Chard). Finally, the GRIP 5-8 re-authority request in December 2011 quotes a volume for renewal of 105 SEUs (92 full renewal and 13 recontrol in respect of Honiton Interlocking). This gives a reportable volume of $92 + (13 \times 0.05)$ which is $92 + 0.65$, so the total reportable volume is 93 SEUs. Network Rail confirm that the volume in the Business Plan is 93. The SEU count in SSADS correctly shows 92.

Leicester – Recontrol and Relock

The July 2010 Authority paper covered the accelerated development of the proposal for interlocking renewal and transfer of control to East Midlands Control Centre. An associated element - to absorb Croft signal box (relock and recontrol) has subsequently been re-phased to a future year.

2011/12 planned volume is only the recontrol element. The authority volume shows 484, and is consistent with the Business Plan volume ($484 \times 5\% = 24.2$ SEUs). However, a SSADS SEU count of the affected locations shows 490 SEUs. The volume claim difference is fortuitously small (24.2 v. $24.5 - 5\%$ of 490). Network Rail has investigated and confirm that 490 is correct.

Slough – relock and recontrol into Thames Valley Signalling Centre (TVSC)

GRIP 4-8 authority was received in June 2010 for renewal of the interlocking in the Slough PSB area, and transfer of control to TVSC. 764 SEUs are in the plan. Volumes convention is:-

- SSI – SSI = 22.6%
- Relock = 5%

Therefore volumes delivered = $764 \times 27.6\% = 211$ SEUs. This was correctly reported in the Finance Pack and recorded correctly in SSADS.

East Kent Resignalling

This is another long timescale scheme with fluctuating numbers between 2004 and 2011. Final volumes show 325 SEUs in both 2009 re-authority papers, of which 321 SEUs were delivered in 2011/12 (4 SEUs were delivered in the previous year). SSADS records 323 SEUs total for the resignalled area, which is a discrepancy of 2 SEUs. On further investigation, it was confirmed that on handback of the scheme drawings the total count was 322 – the delivered volume in 2011/12 was therefore 318, with 4 SEUs the previous year. As a result 3 SEUs were over-reported.

Water Orton – Resignalling

Similar to other projects described above, this was a long timescale project with multiple iterations of scope. The most recent investment paper identifies a 70 SEU reduction overall on the original scheme (373 down to 303) but does not detail the subsequent re-scoping (3-4 aspect signals on the Nuneaton route and 2-3 aspect on the Sutton Park route) which added a further 33 SEUs – 336 total – which agrees with the SSADS database and volumes planned to be delivered. 126 SEUs were delivered and correctly reported in P9 2011/12 and 210 SEUs are planned for the following year.

5.4 Observations

The renewal volumes reported are the number of SEUs that are installed. Often they will be less than the number removed because of rationalisation undertaken and the removal of redundant capacity. This is a benefit in producing a more efficient railway for which Network Rail are not measured or credited.

When asked if there had been any impact on data collation and reporting of renewals volumes following devolution, Network Rail's data champion confirmed that there had been none so far, and there would not be in this current financial year. However, the arrangements for the future are still to be confirmed.

5.5 Conclusions

From the 10 signalling jobs reviewed:

- 7 were reported correctly in the Period 10 Financial Pack;
- Robin Hood was reported as delivering 1.55 SEUs instead of 15.0 (-90% error);
- Leicester was reported as 24.2 instead of 24.5 SEUs (-1% error); and
- East Kent over-reported at 321 instead of 318 SEUs (+1% error).

Overall, the total renewal volumes reported as delivered in the Period 10 Finance Pack was 948 SEUs instead of 959 SEUs (-1.2% error). In addition 211 SEUs were correctly reported as Accelerated Renewals from the Slough relock and recontrol project. Overall then there was an under-reporting of volumes by 0.9%.

The Level Crossing job reviewed was correctly reported.

For some schemes it was difficult to trace how the scope had changed, and even more difficult to track how proposed volume had changed, during the years within the various investment papers submitted for change authorisation. The audit trail through investment documentation was poor in 6 of the 10 jobs reviewed, in that there were errors in some of the SEU counts. This is partly a consequence of the long lead times and staff changes during the life of a project. We also acknowledge that SEUs are artificial units and are not physically recognisable which can make the process of counting units more difficult. However, we note that 3 of the 6 schemes had reporting errors and so we would argue that poor documentation imports risks to the reporting process. One scheme had a short summary explaining how the scope had changed, and we would recommend a simple form is introduced summarising the volume and cost history of a scheme (with a brief explanation of changes).

As an observation, we also note that with long lead times it is extremely unlikely that a new scheme will arise unexpectedly and then be delivered during the same year. However, it is possible that existing schemes might slip. There is therefore more of a risk that Network Rail will under-deliver than over-deliver forecast volumes in any given year.

6 Telecoms

6.1 Reporting Process

The reporting process is set out in two procedures. The first is NR/ARM/M32PR, The Reporting of Telecoms Renewals Volumes which contains the process for how to report. This is supported by NR/ARM/M32DF, Definitions for the Reporting of Telecoms Renewals Volumes, which contains the descriptions of each category and exactly what constitutes a unit.

The reporting is carried out centrally and all the figures reported are now provided by the Telecoms asset team. The Finance Pack now reflects only those numbers provided by the Head of Telecom [Asset, Design & Delivery Management]. Telecoms have recently gone through a period of restructuring. Unlike other areas of the asset management team where posts and activities have been devolved to the Routes, Telecoms has actually centralised. The vast majority of work is delivered by the Asset Management delivery team. Only a very small proportion of work is delivered by maintenance.

The work is monitored through several excel spreadsheets: the central business plan, the Decision Support Tool (DST) and the P3e volumes report. The DST is the key source of information for the Finance Pack. This has a central spreadsheet but it is populated by the 10 out-based Route Teams. P3e is not routinely used by the Telecoms asset team to monitor project delivery. Any changes to volumes, scope, costs etc, are managed through the Change Control Process and records kept of any alterations authorised. However, the Asset Management delivery team do input to P3 which enabled a check to be made against actualised data.

Jobs tend to take 12-15 months from planning to commission with a further 3 months for close out. A large scheme might take up to 3 years.

The Baseline renewal volume is set in the preceding October (i.e. around 6 months before the start of the year) when the delivery plan is finalised against which actual deliveries are measured. This differs from other assets, for example Track and Civils both set their baseline in Period 12 (around February) the year before.

During the detailed checks it emerged that a budget review process removed volumes after the baseline had been set using a risk management overlay. This was carried out by the previous management structure prior to restructuring and the current management team were not involved. There was little visibility of this process being recorded and it created mis-matches in plans and actuals when reviewing specific jobs.

The Reporting Specialist within Telecoms moved to another role last year and has not yet been fully replaced. This has led to problems with the reporting process and this was acknowledged by the Acting Head of Telecom [Asset, Design & Delivery Management]. Two posts have been created but both are currently vacant. This does continue to reflect the issue highlighted last year that these processes are too dependent on key individuals.

The Acting Head of Telecom [Asset, Design & Delivery Management] was very open during the review meeting that there were shortcomings within the process that produced the P10 report and that steps were in hand to correct them.

6.2 Sample Size

The expected reporting volumes for inclusion in the Period 10 Finance Pack were used as the basis to calculate the number of jobs to review. Given the relatively small number of jobs, every job either included in the baseline or delivered as an actual was reviewed. This meant that the Reporter Team reviewed jobs that were planned but for various reasons did not deliver, and those jobs that reported volumes even though they were not in the baseline.

In total this meant that 45 separate volume reports were reviewed in detail but since several jobs cover more than one type of volume (e.g. a typical station renewal may include CIS monitors, PA speakers and clocks) the actual number of jobs reviewed was 29. A review of zero volume jobs was also undertaken to confirm these were correctly discounted from volume reporting.

6.3 Review of Renewal Jobs

Each of the jobs reported on the Excel spreadsheet as delivering renewals by P10 or within the baseline for the same timespan was checked. Checks were done against the job records, P3e for the volumes actualised by the project managers and against the change records where volumes delivered differed from the plan. This was undertaken by using the master records in the business plan which summarise the project history. The Excel spreadsheet has the expected rate of delivery of volumes against which to compare actuals by period. This gave a useful check against the volumes reported in P3e.

The following categories of volumes are reported by Telecoms, with a brief definition of the reporting unit.

Table 6.1: Telecoms reported volumes

Sub-asset	Reporting Unit
Customer Information Systems (CIS)	number of monitors
PA systems	number of speakers
CCTV	number of cameras
Clocks	Number of clocks
Large Concentrators	Single unit if > 127 lines
Small Concentrators	Single unit if less than or equal to 127 lines
DOO systems	number of 4-car formation stops
Public Emergency Telephones (PETs)	number of units fitted at level crossings
Voice Recorders	number of voice recorder units

As already stated some projects cover more than one category so for ease of description are considered for each element as a whole rather than separately. The individual job number is given and the volumes renewed or planned described. Our findings are summarised in the table below showing the volumes in the 2011/12 baseline plan, and the volumes reported as delivered by Period 10 in the Telecoms central spreadsheet compared with those volumes recorded in P3e. More details on each job are provided after the table.

Table 6.2: Summary of Audit of Telecoms jobs

Project	2011/12 Baseline	Renewals in Telecoms spreadsheet by P10	Renewals in P3e by P10	Difference
112230	-	105 CIS 228 PA	105 228	0 0
106671	-	36 CIS	35 (but should be 36?)	+1 ?
106695	301 CIS 768 PA 164 CCTV	102 324 99	123 461 113	-21 -137 -14
MLNE0075	(reactive renewal)	2 CIS	n/a	-
100813	-	39 CIS 213 PA 81 CCTV 9 clocks	39 213 81 9	0 0 0 0
106689	157 PA	0	0	0
112239	140 PA	0	0	0
106615	371 PA	393	393	0
112217	324 PA	0	0	0
118834	125 PA	125 replaced	77 installed	NR report replaced
106640	-	900 PA	927	-27
118836	12 CCTV 2 DOO	0 0	0 0	0 0
119461	72 clocks	0	0	0
112245	1 large conc. 19 small conc.	0 14	0 14	0 0
118837	2 large conc. (duplicate error)	1	1	0
DDA13	1 large conc.	0	0	0
103875	1 large conc.	0	0	0
106656	1 large conc.	0	0	0
112254	1 large conc.	0	0	0
LSE0052	1 large conc.	0	0	0
112231	7 small conc. 1 PETS	0 0	0 0	0 0
118844	5 small conc.	0	0	0
112257	3 small conc.	0	0	0
106683	83 DOO	83	82	+1
118836	2 DOO (but not reportable)	0	0	0
112256	34 DOO	34	34	0
106664	-	8 PETS	8	0
112250	Not checked	0 CIS	14	-14
LSC0114	1 large conc.	1 1 Voice Recorder	1 1 Voice Recorder	0 0

6.3.1 CIS Schemes

112230

No volumes in the baseline, but delivered 105 CIS units and 228 PA units.

Actual volumes reported correctly in Finance Pack but this job was not in the Plan (it was instead in the 12/13 plan). The job was risk assessed out of the baseline as unlikely to be delivered and put into 2012/13. However, the project team did deliver the volumes this financial year.

106671

No volumes in the baseline, but 35 units were in the 2010/11 plan. Network Rail has actually delivered 36 units this year. No record of this change was made at change control panel. It is likely that the additional unit will be because the TOC asked for an additional screen at the station. It was stated that this sort of request does not always lead to re-authority being sought.

The central database DST records showed the job as having 41 units planned and had not been updated (it should be updated at project completion). The reported numbers are verbally received rather than using the P3e actualisation field.

106695

Baseline was 301 CIS units, 768 PA units and 164 CCTV units. The actual deliveries reported to P10 were 102 CIS, 324 PA and 99 CCTV. However, the volumes within P3e numbers did not match the reported volumes and these showed an additional 21 CIS, 137 PA and 14 CCTV units that were delivered in P10 but not reported in the P10 Finance Pack. The sponsor for this project reports that P3e is wrong in this case although we have not seen any documentary evidence to support this. NR have confirmed that this anomaly has been corrected.

MLNE 0075

Zero units in the baseline. Two monitors were delivered by the maintenance team due to obsolescence of station screens. These were not reported through P3e as maintenance do not use the same system.

100813

Baseline was 0, but 39 CIS units, 213 PA units, 81 CCTV units and 9 Clocks have been delivered. This job slipped from last year. The reported volumes match P3e.

6.3.2 PA

106689

157 PA units were in the baseline. The project has slipped and no deliveries have been declared. This matches P3e.

112239

140 PA units were in the baseline. The project has slipped and as a result been merged with project 119795 with a revised delivery of March 2013. P3e agrees.

112244

140 PA units in the baseline, the job has slipped awaiting planning consent with no volumes delivered this year. P3e agrees.

106615

371 PA units were in the baseline. 393 units were reported in Period 4, which P3e agrees. The job was authorised for 378 units according to the change history and the additional units delivered did not go through change control panel. It appears likely that the project manager would have managed this design change locally.

112217

324 PA units in the baseline, but zero delivered. P3e confirms no deliveries but the project now has 921 units to be installed. Change control records show the increase in the project size was authorised and confirms the slippage.

118834

125 PA units were in the baseline and 125 units declared as delivered. P3e records 77 units installed. The explanation is that 125 old speakers were removed but replaced by 77 'intelligent' speakers. NR reported the units replaced rather than installed. This process is not formalised internally or agreed with ORR. (Note that this is the opposite convention to signalling which reports the SEUs installed even if smaller than the number that have been replaced.) NR have subsequently reduced the reported volume to 77 units.

106640

Zero PA units in the baseline, but 900 reported as delivered in Period 1. Job slipped from 2010/11. However, P3e records that the full job (1166 units) was delivered in 2010/11. A check against last year's Annual Return shows that 239 were reported last year with 900 this year. This leaves 27 units unexplained. This was confirmed as an error in the two counts.

6.3.3 CCTV**118836**

12 CCTV units plus 2 DOO units were in the baseline. The units were taken out of the reported volumes because it is not a station or a DOO CCTV installation (instead for guards). The scope has been merged into another job.

6.3.4 Clocks**119461**

The baseline was 72 clocks to be installed. The actual delivered by P10 was zero. P3e forecasts 45 to be delivered by P13.

6.3.5 Large Concentrators

112245

1 large concentrator and 19 small concentrators were in the baseline but the job partially slipped into next year.

14 small concentrators were delivered by P10, although P3e and the reported volumes differ on which periods they were delivered. Change control has reduced the small concentrators from 19 to 17 and the large concentrator was moved to another project. However it reduced it from 2 to 0 and it is unclear why the baseline had 1 rather than 2 in it.

118837

One large concentrator was in the baseline and one was delivered in P10. Nothing reported in P3e as it was delivered as part of a major resignalling scheme.

The line was duplicated in the plan and therefore baseline total was for 2 large concentrators in error.

DDA13

The baseline had one large concentrator. The project has been delayed by issues with the fixed telecoms network since 2004 and still has not been delivered. No volumes claimed or recorded in P3e. It is forecast now for 2012/13 delivery.

103875

There was one large concentrator in the baseline. The job has slipped into next year with no volumes reported. This slippage was change controlled.

106656

There was one large concentrator in the baseline. Programme has slipped until commissioning of another site until July 2012. No volumes reported.

112254

One large concentrator was in the base but it has also slipped until next year. Change control process showed the job slipping from 2010/11 into 2012/13 so it was not clear why this job was in the base. The current concentrator was life extended.

LSE0052

One large concentrator planned but due to life extension will be replaced in August 2012.

LSC0114

One large concentrator planned in the baseline and one unit was reported. This was confirmed in P3e. Also one voice recorder was claimed and one confirmed as delivered in P3e.

6.3.6 Small Concentrators

112231

Seven small concentrators plus 1 PETs unit were in the baseline. The one PETs unit had been 'risk reduced' down from 4 although this was not documented. The concentrators were due to deliver in August 2011 but P3e records late delivery in Period 11. The PETs delivered 4 units in P11 as per the original plan.

118844

Five units planned in Period 10 in the baseline. The job has slipped to August 2012 and therefore no volumes have been reported.

112257

Three units were in the base but the job delivered early in 2010/11 Period 13 and the volumes were therefore reported last year.

6.3.7 DOO

106683

83 DOO units in the baseline all planned for Period 1. 82 units were claimed in Period 4 with one unit claimed in P9. P3e does not record the single unit in P9 as being actualised.

118836

Two DOO units were planned but removed from the volumes report as not strictly DOO system: they were installed on the Merseyrail system for use by guards.

112256

34 DOO units were planned in the baseline and 34 units claimed in Period 8. P3e confirms this.

6.3.8 PETs

106664

Zero PETS units in the baseline but 8 units claimed in Period 4. P3e confirms this. The job slipped from last year.

A check of P3e revealed a job at Liverpool Lime Street which delivered 14 CIS units (and 2 refurbished clocks which do not count as renewals) not recorded elsewhere and not included in the declared volumes.

6.4 Zero Volume Renewal Jobs

The Reporter team reviewed the list of jobs reported as delivering zero volumes by Telecoms. There are a large number of jobs undertaken by Telecoms that do not currently require any reporting. These cover a wide range of areas such as cabling or radio systems. Consideration is currently being given into whether any of these should be reported in CP5.

Jobs were checked randomly from the project list and none of them contained any reportable volumes work.

6.5 Observations

The above checks reveal some discrepancies between volumes reported in the Telecoms central spreadsheet and P3e. In the table below we compare the overall delivered volumes in 2011/12 to Period 10 from these two sources and additionally compare them to the Finance Pack. We also show the difference between the Telecoms spreadsheet and Finance Pack.

Table 6.3: Comparison of Telecoms 2011/12 P10 renewal volumes reported from three sources

	P3e	Delivered in Telecoms Excel spreadsheet	Reported in Finance Pack	Difference between spreadsheet & Finance Pack
CIS	281	284	333	+17%
PA	2272	2183	2400	+8%
CCTV	194	180	220	+22%
Clocks	0	9	9	0
Large Concentrators	0	2	1	-50%
Small Concentrators	14	14	14	0
DOO	116	117	117	0
PET	8	8	12	+50%
Voice recorders	0	1	1	0

The differences in P3e can partly be explained by the fact that it is not used for any work carried out by maintenance. However, the Telecoms spreadsheet and the Finance Pack should be the same whereas there are some significant discrepancies.

The major reason given for this discrepancy was the loss of the reporting specialist to another department. This gap needs filling quickly and additional staff trained to ensure they are not reliant on one individual.

The procedure has not been updated to reflect recent organisation changes and needs to be rectified quickly.

Currently the Telecoms Asset team make little use of P3e for tracking work. Other asset teams use this as their main source of data and Telecoms should seriously consider doing the same. The small number of jobs undertaken by Maintenance means that it should be a reliable source of delivered volumes data with only minimal chasing up of non P3e volumes required.

When the Reporter Team checked the P3e records an additional job was discovered which had not been reported. Greater use of P3e would lessen the chance of similar errors in the future.

There were a significant number of variances on individual jobs between the volumes reported and those actually delivered.

Where the use of modern technology required the fitting of fewer units than the old ones, Telecoms claim the original volume number. This process is not formal and is not agreed with ORR. It is the opposite way round to the practice in signalling who claim the new, smaller number.

There were a number of jobs where project managers varied the volumes without going through change control. If it is considered that this practice is acceptable, the methodology should be formalised.

6.6 Conclusions

The reporting of Telecoms volumes contained a substantial level of variances between the actual number of units delivered and those reported to ORR. Errors were identified throughout the process chain but in particular in transferring the information from the central Telecoms spreadsheet to the Finance Pack. The main reason appears to be the loss of the reporting specialist whose post still needs to be filled. A more systematic approach to the collation and checking of information is required as a matter of urgency.

The Telecoms team were very open about the weaknesses in the P10 reporting pack and were aware of the shortcomings in their arrangements at the time. Following our audit, they report that they have introduced some additional support to cover some aspects of the current vacancy and are introducing a new spreadsheet to manage the reporting of volumes from the out-based teams to the central report.

7 Electrification & Plant

7.1 Reporting Process

The process for reporting renewal volumes is set out in Network Rail's 'Procedure for the Reporting of Electrification and Plant Renewal Volumes' NR/ARM/M36/PR, Issue 1 dated 21st December 2011. This document makes reference to NR/ARM/M36/DF, Issue 1 also dated 21st December 2011, which provides definitions for the reporting of Electrification and Plant renewals.

The reporting process set out in these documents is for each Route Asset Manager (RAM) for E&P to provide volumes on all of the route's projects to a central Senior Business Planning Specialist. The Senior Business Planning Specialist then compiles all information from all of the routes and sends this to the Programme Finance Manager who then passes it on to Central Finance for reporting to the ORR.

The procedure documents have been sent to all relevant managers and, following our audit, have been published on Network Rail's intranet. However, this process has not yet been fully implemented. Currently the central E&P business team extract the information on all projects from the Primavera P3e database and send it to the RAMs for checking before sending it on to the Programme Finance Manager. The exception is LNW route that send their own report to the central team.

A new 'Form E Certificate of Engineering Completion' will be introduced in Period 1 of 2012/13 for all renewal, enhancement and extension work as part of Network Rail standard NR2/L2/ELP/27311³. It requires the contractor and the Network Rail Project Engineer to confirm the work carried out and any deviations to the plan once all equipment has been tested and commissioned.

The Full Year Plan for E&P is the same as that provided in the Delivery plan. The forecast is not updated during the year, however the team is looking to provide updated forecasts every period for 2012/13.

7.2 Sample Size

All renewal jobs reported up to Period 10 of 2011/12 have been reviewed in this audit.

In addition, a considerable number of projects - in excess of 20 - which were planned for 2011/12 have not reported volumes, for one of two stated reasons:

- The project has been reclassified as 'not renewal' – refurbishment, for instance; and
- Slippage to a future year, or to be delivered later this year.

We reviewed a number of these projects that were listed in the central Business Planning spreadsheet. In addition, we picked a random sample of 10 zero volume

³ Engineering Assurance Requirements for Design and Implementation of Electrical Power Engineering Infrastructure Projects, Issue 4, Compliance date 03/09/2011

projects from the Primavera P3e database to check that these too did not have reportable volumes.

7.3 Review of Renewal Jobs

The review was undertaken by comparing the Business Planning team's central spreadsheet of all jobs which forms the basis of the Finance Pack with volumes recorded in P3e. Any differences were investigated by examining the business plan for the relevant project and any associated change control documentation to understand what should be the correct values. Helpfully, the Senior Business Planning Specialist provided a comparison for all projects in advance of our audit.

Our detailed findings are presented in Appendix B and are summarised in the table below. It should be noted that the Business Planning team's central spreadsheet is consistent with the volumes reported in the Period 10 Finance Pack. We also checked that the spreadsheet was complete and not missing any projects in P3e with recorded renewal volumes in 2011/12.

Table 7.1: Comparison of reported and corrected Full Year Forecasts and Year to Date delivered volumes (Period 10, 2011/12)

Asset	Full Year Forecasts			Year To Date Delivered		
	Reported	Corrected	Error	Reported	Corrected	Error
OLE Campaign Changes (wire runs)	1214.85	1218	0%	852.96	932	-9%
OLE Re-wiring (wire runs)	48	47	+2%	31	29	+7%
Conductor Rails (km)	25.85	5.23	+394%	15.5	0	~+100%
AC HV Switchgear (circuit breakers)	33	33	0	32	30	+7%
AC GSP Transformers (no.)	0	0	0	0	0	0
AC GSC Cable (km)	0	0	0	0	0	0
AC Booster Transformers (no.)	6	6	0	0	0	0
DC HV Switchgear (no.)	29	23	+26%	14	14	0
DC HV Cables (km)	61	47	+3%	33	19	+74%
LV Switchgear (no.)	13	13	0	13	13	0
LV Cabling (km)	22	22	0	0	0	0
DC Transformers Rectifiers (no.)	30	30	0	25	28	-11%
Points Heaters	643	607	+6%	499	461	+8%

Some of the causes for the errors identified are as follows.

- Volumes reported for projects delivered by Maintenance can be susceptible to error. They use Oracle Projects rather than P3e to project manage these projects. The Central Team receive a monthly summary of all maintenance projects but this does contain some errors.
- LNW route report their volumes in a different way to other routes. They send their own monthly report to the central team. All the other routes receive a report from the central team for checking and reviewing as appropriate. From our review, it appears that the latter method is more robust than the former.
- One project reported in error volumes of pilot cables in DC HV cables. The definition for counting these volumes in standard NR/ARM/M36/DF specifically includes pilot cables so this needs to be clarified.

7.4 Zero Volume Renewal Jobs

We chose 10 E&P projects at random which have incurred costs during 2011/12 but had no reported volumes. We wanted to understand the nature of these projects and check that no volumes were missing.

Network Rail provided a description of the status of each of these projects and an explanation of why no volumes had been reported. This is shown in Appendix B. We are satisfied that all of these projects are at the design stage and have not yet delivered any renewal volumes.

7.5 Conclusions

It was clear to us that the E&P Business Planning team have put a lot of effort into improving the reporting of volumes over the last few months. This is evident in the fact that two new procedure documents have been issued.

That said, there are still errors that need to be addressed. One particular area of weakness is reporting the volumes delivered by Maintenance for which the process does not appear to be robust and needs to be strengthened. As well as errors in the volumes reported in the Finance Pack, we also found errors in P3e. This database is the initial source of the volumes and so it is important to record volumes accurately.

The central Business Planning team provide an important checking process for all projects which finds and corrects errors. It is important that such checking is maintained during devolution.

8 Civils

8.1 Reporting Process

The assets reviewed in this category included structures but excluded Buildings. The basic process remains unchanged from last year and the procedures remain unchanged. There has however been one significant change. Maintenance delivered renewals work now uses the same change control process as that delivered through the IP project teams and this ensures they are included in the reported numbers. Also the variance narratives are now provided by the Asset Managers based on the information provided by the central team as opposed to last year where they were wholly compiled centrally.

Additionally the benefits of the Visible and Agile Workbank Planning (VAWP) process, which was introduced progressively from 2009/10, have been fully seen for the first time in 2011/12. This is designed to engage suppliers at the earliest opportunity to improve value for money on jobs. As part of this there is a volumes verification process to enable suppliers to price works. This means that jobs in the baseline (i.e. P12 the previous year) will have already been let to contractors and therefore the accuracy of the baseline should be higher. This process will apply for all volumes in 2012/13 onwards.

This means that the basis of the reported numbers remain those calculated during the planning process. When the project managers actualise the job this simply converts the planned volumes into actual volumes. The quality of the plan therefore remains crucial in reporting volumes.

8.2 Sample Size

It was agreed that given the scale of jobs to be reviewed that the Reporter Team would look at a sample which would cover a representative sample of job types and geography. Prior to the review the Reporter Team supplied NR with their suggested sample sizes to cover at least 50 jobs.

On the day NR produced records for 61 jobs based on the following table.

Table 8.1: Spread of Sampled Jobs

Job Type	LNE	LNW	Scotland	South	South East	Western	Total
Bridges	6	5	5	2	4	2	24
Earthworks	4	5	5	3	6	5	28
Major Structures	1	1	1	0	0	0	3
Other	1	1	0	0	1	0	3
Tunnels	1	1	1	0	0	0	3
Grand Total	13	13	12	5	11	7	61

8.3 Review of Renewal Jobs

The Reporter Team looked at each job by checking the records for volumes reported against those in the volumes analysis spreadsheet. It was not possible to check against P3e live on the day because the national system was unexpectedly offline. However, the records were provided subsequently for confirmation purposes.

The majority of the 61 renewal jobs were found to match on all aspects and therefore did not warrant any comments. The following set out any noteworthy issues:

8.3.1 Bridges

Job No. 100726 Western - Overbridge

There was an additional 879m² in P3e compared to baseline. A change control record exists but gives a poor explanation of why the additional work was required. A better explanation is provided in the volume analysis spreadsheet. This was reported correctly.

Job No. 101328 LNE - Underbridge

The baseline was 229m² but P3e records it as 232 m². This is explained by LNE as a result of their Cost Analysis Framework 7 (CAF7) audit which carries out a detailed check of delivered volumes against the planned volumes. LNE do these checks routinely although they are not required by the process. This does lead to greater levels of accuracy on LNE, but at a cost in terms of time.

Job No. 107283 South - Underbridge

Year to Date actual deliveries are 425 but the baseline showed no planned volumes by P10. The decision had been taken to phase in volumes earlier due to problems with the original plan. The actual volumes were recorded correctly.

Job No. 112302 LNW - Viaduct (Stockport)

The baseline was for 150m² but an actual of 475m² was reported in P3e. The change was put through the change control process and reasons logged. The actual volumes were recorded correctly.

Job No. 115157 LNW - Underbridge

The baseline was 240m² but the delivered job was 225m². This was stated to be because of an incorrect baseline but no substantial reason was offered. The actual volumes were recorded correctly.

8.3.2 Earthworks

Job No. 103192 Western

Baseline was for 1600m² but the reported volume was 8000m², an additional 6400m². Change control records gave a good explanation of the reasons. The actual volumes were recorded correctly.

Job No. 104722 South East

Reported volumes of 4440m² delivered but baseline does not show any expected volumes.

From the explanation given, this was a job that slipped and the volumes were not phased in during the year. The 4440m² reports the full volume of the planned job. The actual volumes were recorded correctly.

Job No. 115172 LNE

This job had a baseline of 865m² and an actual of 1349m². The explanation was that this was identified by a CAF7 review. This is a high error margin and does lead to the question of whether other routes would have identified this as they do not do CAF7 reviews. The volume in P3e was 1348m².

Job No. 115270 Scotland

This job was change controlled to bring the work forward from 2012/13, but delayed by poor weather hence the differences.

Job No. 123397 South East

Job was delivered by maintenance. The original baseline was 1600m² but the actual job was 3997m². This was subjected to the change control process and the job was amended to undertake only the necessary repair work. The actual volumes were recorded correctly.

8.3.3 Major Structures

Job No. 115793 LNE

The baseline was 365m² and the actual was 362m². Whilst no explanation was offered this was almost certainly due to a CAF7 review.

8.3.4 Other and Tunnels

No issues were noted for the jobs reviewed in both these categories.

8.4 Zero Volume Renewal Jobs

The only zero volumes jobs recorded by Civils are inspections and therefore do not deliver any reportable volumes.

8.5 Observations

Overall the process appears sound and well controlled. There is a risk to this from the current decentralisation taking place in Civils Asset Team. This could lead to the controls currently in place being lost without careful planning.

The totals reported and those recorded on the master spreadsheet used for keeping records matched and the reported volumes for each task matched the records.

The one area of concern was the impact of the CAF7 audits on LNE. Whilst these audits are not required by the process, in one case they did highlight a very

significant variance between the planned and actual volumes delivered. It is a matter of conjecture whether the application of this process more widely would lead to greater levels of variation being highlighted. There is clearly a cost involved in introducing this nationally but consideration should be given to sampling jobs on a similar basis nationally.

8.6 Conclusions

Based on the sample of jobs reviewed, the volumes reported to the ORR accurately reflect the actual volumes recorded by NR. The change control process is generally applied well, including now to Maintenance delivered work, however the description of the reasons for the changes could be improved.

The CAF7 audits on LNE route identified some errors in volumes which were corrected. This raises the question as to whether there are errors on the other routes and we would recommend that similar audits, if only on a sample of jobs, should be considered for all routes.

9 Confidence Grades

We have assessed the reliability and accuracy of the total renewal volumes reported as delivered for each asset in the Period 10 2011/12 Finance Pack using the grading described in Appendix C. For comparison, we also provide the grade given in last year's Independent Report.

The ORR have set a benchmark grade of A1 for each asset, which they believe Network Rail should achieve. The Independent Reporter agrees that this benchmark should be achievable.

9.1 Track

The process for reporting volumes delivered by IP on plain line jobs is very clear. A spreadsheet tool with user guide is used for recording volumes to be input to GEOGIS and P3e. The conversion of yards to meters is carried out automatically in P3e. The same process is used for S&C projects although the rules for reporting the accompanying plain line renewals are more complicated and might be open to misinterpretation. Volumes delivered by Maintenance use a separate process. Although more manual than the IP process, it has been tightened up and a monthly review of projects data is now undertaken.

The accuracy of volumes reported on the sampled IP plain line and Maintenance projects was high with only small discrepancies of up to 1% identified. S&C units have also been reported accurately.

Greater discrepancies have been found on the reported plain line renewals on S&C projects. However, the proportion of plain line renewed in this way is only 1.7% and so is very minor.

Last year's Confidence Grade for Track was B2. This year's audit has seen an improvement in the reporting of Maintenance projects, however it has also uncovered some minor shortcomings with the S&C projects. A reliability score of B is therefore appropriate. The overall accuracy of reported volumes is within the 1% error band and so we judge that a B1 grade is appropriate this year.

9.2 Signalling

The process for reporting volumes is not as reliable as it should be. The change control which should be maintained through investment documentation contained errors in SEU counts for 6 of the 10 signalling projects reviewed, although reported volumes were not always inaccurate as a result. Scope changes very late in the process, prior to commissioning, appeared to be a particular issue.

As a result, a Reliability Grade of B has been awarded. The accuracy checks found that 8 of the 11 signalling and level crossing projects reviewed were reported with 100% accuracy, 2 of the 11 were within 1% and 1 of the 11 was poor (Robin Hood). These produced a total SEU count at period 10 of 1,159 instead of 1,170 (-0.9% error). The total count of renewed Level Crossings was correctly reported as 14. Overall an accuracy score of 1 (within 1%) is applicable for the Period 10 report. This is an improvement from last year's score of B2.

9.3 Telecoms

Checks on individual projects revealed some errors in the volumes reported in the central Telecoms spreadsheet (used as the basis for the Finance Pack) and the corresponding volumes reported in P3e. In addition, we found one project in P3e which was missing from the central spreadsheet. However, more significantly the volumes in the central spreadsheet did not match those in the Finance Pack for several sub-categories and in two cases the error was 50%. This is a significant shortcoming in the reporting process and appears to be caused by the loss of the reporting specialist whose post still needs to be filled. The procedures used have not been updated and the limited use of P3e means that routine checks of actualised data are not undertaken.

The Confidence Grade for Telecoms is therefore C5. This compares with last year's grade of B3.

The Telecoms team were very open about the weaknesses in the P10 reporting pack and were aware of the shortcomings in their arrangements at the time. Steps are already in hand to correct these weaknesses.

9.4 Electrification & Plant

New procedures for reporting volumes have been set up and are in the process of being implemented. The reporting of volumes delivered by Maintenance is less robust and relies on the central E&P reporting team having to confirm project details which has resulted in some errors. In addition, LNW follow a different reporting process than the other routes and there is some evidence that this has resulted in errors.

All 2011/12 E&P projects up to Period 10 have been reviewed. A number of errors have been identified in the reported volumes. Of the nine sub-categories reporting some volumes in Period 10, six were accurate to within 10%, one was within 11% and one had an error of 74%; the ninth sub-category (Conductor Rails) reported 15.5 km as being renewed when none should have been reported. There is therefore a wide range of accuracies, with an average error across all sub-categories of 24%. We judge an accuracy score of 4 (within 25%) is applicable.

The Confidence Grade for E&P is C4. This asset was not graded last year.

9.5 Civils

Civils reporting of volumes within the established process appears satisfactory. Only two items of concern were raised:

- Change Control, when applied, was insufficiently descriptive of what had changed and why, and was a poor link in the audit trail; and
- The use of the CAF7 audit routines by LNE had uncovered a number of errors in reporting, one of some significance for reporting accuracy. It is open to conjecture whether this process, if used by other routes, may have similarly uncovered inaccuracy in reported volumes. Last year's recommendation 2011REN04 called for a form of independent verification process within Civils, and the findings from LNE would appear to give even greater weight to this recommendation.

A Reliability Grade of B has been awarded as a result. In terms of Accuracy, the data checks merit a 1 grade as no errors were found in the sampled jobs. This B1 grade is an improvement from last year's C2, reflecting the evident progress in establishing a number of new routines and disciplines for improving reliability and accuracy of reporting.

10 Recommendations

No.	Recommendation	Reference	Who	When
2012REN01	Track – consider a year end review of reported jobs to correct minor errors.	4.3.1	Paul Greene	February 2013
2012REN02	Signalling – consider a simplified description of project history in investment documentation to improve audit trail on volumes and efficiencies.	5.5	Andy Smith	July 2012
2012REN03	Telecoms - Update and issue the procedure for reporting renewal volumes.	6.1	Richard Lawes	July 2012
2012REN04	Telecoms - Appoint a new reporting specialist and ensure deputies are in place	6.1, 6.5	Richard Lawes	July 2012
2012REN05	Telecoms – Use P3e as the source information for renewal volumes delivered	6.1, 6.5	Richard Lawes	July 2012
2012REN06	All – standardise the setting of the baseline for all assets (consider if this should be the Delivery Plan)	6.1	Bill Davidson	February 2013
2012REN07	E&P – fully implement new procedures	7.1	Peter Krawczyk	October 2012
2012REN08	E&P – clarify when to report volumes (staged or final commission)	7.1	Peter Krawczyk	July 2012
2012REN09	E&P – update full year forecasts of renewal volumes every period	7.1	Peter Krawczyk	May 2012
2012REN10	E&P – improve reporting of volumes delivered by Maintenance	7.3	Peter Krawczyk	October 2012
2012REN11	E&P – seriously consider imposing central reporting on LNW route	7.3	Peter Krawczyk	July 2012
2012REN12	E&P – review the reporting of pilot DC HV cables	7.3	Peter Krawczyk	July 2012
2012REN13	Civils – the arrangements followed	8.5, 8.6	Dan Athol	July 2012

	by LNE for independent post-project validation and verification of volumes reported should be reviewed for wider adoption (to be read alongside recommendation 04 in the Phase 1 report)			
2012REN14	All – ensure there is a robust process for collating renewal volumes after devolution	7.5, 8.5	Bill Davidson	December 2012

Appendix A

Mandate

Mandate for Independent Report – Data Quality

Audit Title:	Audit of renewal volumes data (Phase 2)
Mandate Ref:	AO/025
Document version:	Draft D
Date:	7 November 2011
Draft prepared by:	(name redacted)
Remit prepared by:	(name redacted)
Network Rail reviewer:	(name redacted)

Authorisation to proceed

ORR		
Network Rail		
Independent Reporter		

Purpose

This mandate sets out the scope of work for the Part A independent reporter (Arup) to undertake a second review of the renewals data, published by Network Rail in the Annual Return 2011 and in periodic (four weekly) Finance Packs, for reliability and accuracy.

Background

Network Rail published the CP4 Delivery Plan update 2010 (DPu10) on 31 March that year, using revised asset policies to determine the renewal volumes and associated expenditure included in the document. It publishes a report of delivery against delivery plan updates annually, in the Annual Return. We monitor delivery of the renewal volumes against delivery plans, as part of our assurance that the policies are being implemented in CP4. The renewals data reported in the Annual Return also contributes to our annual assessment of Network Rail's efficiency.

Network Rail also report renewal volumes delivery every four week period in the Finance Pack. We use this to check progress against plan within the year, to give us early indication of any risk to year end delivery and brief internally on progress.

An initial review of renewal volume reporting was completed around July 2011, to give an early indication of confidence in Network Rail's renewals reporting accuracy. In the interests of time, the scope of this review included a relatively small sample of renewals data and electrification renewals was excluded (as no asset champion was available at Network Rail). We plan to use the independent reporter to complete a second audit of renewals data reported in the 2011 annual return and in the most recent Finance Pack, building on the initial audit, to ensure there is a statistically significant sample, for reliability and accuracy.

The objective of this review is to determine the reliability and accuracy of the renewals volume data reported in the:

- annual return (informing our assessments of policy delivery and efficiency); and,
- Finance Packs (informing our in-year monitoring).

To achieve this purpose we expect the independent reporter to state two reliability and accuracy scores for each asset group, reflecting the confidence scores for data in the annual return and Finance Pack.

Scope

An audit of renewal volumes data in the 2011 **Annual Return**, for each renewal volume line listed in the Delivery Plan update 2011. The review should report an alpha-numeric confidence grade for each of the following asset groups:

- Track
- Signalling
- Telecoms
- Electrification
- Civils (although civils volumes are not included in the delivery plan, actual delivered volumes reported in annual return should be reviewed)

An audit of renewal volumes data as reported in the latest **Finance Pack** available at the start of the review. The review should report an alpha-numeric confidence grade for each of the following asset groups:

- Track
- Signalling
- Telecoms
- Electrification
- Civils (although civils volumes are not included in the delivery plan, actual delivered volumes in Finance Pack should be reviewed)
- Plant (although plant volumes are not included in the delivery plan, actual delivered volumes in Finance Pack should be reviewed)

This review should build on the initial renewal volumes review, by carrying out further samples. For clarity, a complete list of all renewal lines listed in Delivery Plan update 2011, is included as Appendix A.

The independent reporter is required to review a statistically significant sample, to be agreed by ORR and Network Rail.

Methodology

The reporter is required to:

- Recommend the statistically significant sample of renewals data to be audited, clearly documenting its rationale for this proposal. The recommended sample size is to be agreed by Network Rail and ORR;
- Critically review/audit the renewals data in the 2011 Annual Return and Finance Pack. This review includes any related systems, processes, methodologies and procedures, to ensure that the data provided is comprehensive, accurate and consistent. This review is carrying out further samples, building on the initial renewal volumes audit.
- The review of periodic, Finance Pack reporting should consider any differences in accuracy of these renewal figures compared to end of year reporting.
- The audit for reliability and accuracy of all data mandated should be assessed using the confidence grading system employed for the quarterly programme of Network Rail data assurance.

Deliverables

The first deliverable is a short paper recommending the sample size to be audited to ensure the confidence grades are statistically significant. The report will explain the rationale for proposing the statistically significant sample. ORR and Network Rail will use this report to agree the sample size (by correspondence).

After the data review is completed, we expect to receive a data assurance report including detail of the review and resulting recommendations. The report shall contain appendices listing reference documentation and the people interviewed.

We expect the report to include two confidence grades (for annual return and Finance Pack figures) for each of the asset groups listed in the scope section of this mandate

In addition, the reporter shall make recommendations on potential improvements, sufficiently described to outline tasks and benefits (SMART). The reporter should also recommend a system for tracking progress against the recommendations.

The final version of the report will be made available on the ORR public website.

Timescales

Initial work to commence end November 2011

- Paper recommending statistically significant sample size by mid December 2011
- ORR and Network Rail to agree sample size by end December 2011
- Data audit to commence January
- Draft report and presentation of results to review meeting by mid March 2011
- Final report end March 2011

The governance process for issuing Independent Reporter reports is outlined in appendix B.

Independent Reporter remit proposal

The Independent Reporter shall prepare a proposal for review and approval by the ORR and Network Rail on the basis of this mandate. The approved remit will form part of the mandate and shall be attached to this document.

The proposal will detail methodology, tasks, programme, deliverables, resources and costs.

Appendix A

Volume categories to be audited (as listed in Network Rail CP4 Delivery Plan update 2011)

Track (*Delivery Plan 2011 update – appendix 17*)

Rail

Sleeper

Ballast

S&C

Signalling (*Delivery Plan 2011 update – appendix 19*)

Conventional SEU

ERTMS SEU

Crossrail accelerated

Level crossings

Telecoms (*Delivery Plan 2011 update – appendix 24*)**Station information and surveillance systems**

CIS (monitors)

Public address (speakers)

CCTV (cameras)

Clocks (no.)

Operational telecoms

Large concentrators (no.)

Small concentrators (no.)

DOO CCTV (systems)

PETS (no.)

Voice recorders (no.)

Electrification (*Delivery Plan 2011 update – appendix 26*)

Campaign changes (wire runs)

Re-wiring (wire runs)

Structure painting (no.)

AC distribution

HV switchgear (no.)

GSP transformer (no.)

GSP cable (km)

Booster transformers (no.)

DC distribution

HV switchgear (no.)

HV cabling (km)

LV switchgear (no.)

LV cabling (km)

Transformer rectifiers (no.)

Appendix B

Governance process for issuing Independent Reporter reports

Revision	Purpose	Outcome
Draft	Review for factual correctness and comments	First drafts of the report should be issued to ORR and Network Rail, who have fourteen days to review the contents before a tri-partite session is arranged at which feedback is provided to the reporter. Network Rail may choose to provide Director level input at this stage.
Final draft	Review	The Reporter will issue a final draft report to both ORR and NR within five working days of the tri-partite meeting All three parties agree contents and recommendations as far as possible via correspondence or meetings as appropriate. Further comments shall be provided within five working days.
Final report		The Reporter will issue its final report to both the ORR and NR. If agreement over its contents has not been reached the report will contain the Reporter's independent assessment together with opinions from ORR and NR to document their positions ORR will publish the report on their website It is anticipated that the issue of the final report (i.e. version 1) would take no longer than 1 working week after receiving the final report.

Appendix B

Electrification & Plant - Audit by Project

B1 OLE Campaign Changes

In the table we show both the Full Year Forecast (FYF) for 2011/12 and the Year to Date (YTD) volumes delivered at Period 10. The reported volumes are compared against what is considered to be the correct values having checked P3e, investment papers and, if appropriate, discussed with the RAM.

Table B.1: OLE Campaign Changes Tension Lengths

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
103080	Anglia	FYF = 103 YTD = 56	103 49	RAM advises that actual = 49, though P3e stated 45.	0% +14%
103404	LNW North	FYF = 10 YTD = 0	10 0		0% 0 %
103405	LNW North	FYF = 0 YTD = 0	0 0	Project cancelled	0% 0 %
106333	Scotland	FYF = 379 YTD = 359	379 359	Central report FYF agrees with investment paper of 26/8/09. P3e wrongly states FYF = 368, YTD = 348.	0% 0%
106423	LNW South	FYF = 0 YTD = 0	0 0	Project slipped to 2012/13 due to need for more surveys. Merged with 121951.	0% 0 %
106434	LNW South	FYF = 0 YTD = 0	0 0	Volumes slipped to 2012/13. P3e mistakenly shows FYF = 2.5.	0% 0%
106435	LNW	FYF = 0 YTD = 0	0 0	Volumes slipped to 2012/13 due to lack of available possessions.	0% 0%
107851	LNE	FYF = 571 YTD = 343	573 390	It is likely that P3e is correct.	0% -12%
119861	LNW North	FYF = 0 YTD = 0	14 21	Cantilever Frame Renewals which is not a campaign change or a reportable volume.	-100% -100%
119862	LNW South	FYF = 55 YTD = 16	46 29	This job is delivered by Maintenance who use Oracle Projects rather than P3e.	+20% -45%
119865	LNW North	FYF = 9.85 YTD = 7.76	11 8		-10% -3%
119866	LNW South	FYF = 0 YTD = 0	0 0	Volumes transferred to 121951 to allow more efficient delivery in 2012/13	0% 0%
121903	LNE	FYF = 17 YTD = 11	17 11		0% 0%
GGRN58	LNE	FYF = 4 YTD = 4	4 4		0% 0%
GGRM68	M&C	FYF = 0	0	Slipped to 2012/13 whilst	0%

		YTD = 0	0	scope is re-assessed to seek potential efficiencies	0%
106439	LNW South	FYF = 66 YTD = 56	61 61		+8% -8%
Total		FYF = 1214.85 YTD = 852.76	1218 932		0% -9%

Overall for these projects the Full Year Forecast is accurate to within 0.3% but the Year to Date delivered volume is 9% too low. In some cases P3e contains errors. One noticeable issue is that the project delivered by Maintenance is not reported accurately which might be caused by Maintenance using Oracle Projects rather than P3e to report costs and volumes.

B2 OLE Re-wiring

Table B.2: OLE Re-wiring Tension Lengths

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
101075	LNE	FYF = 4 YTD = 4	4 4		0% 0%
101567	Anglia	FYF = 39 YTD = 22	39 21		0% +5%
102055	Anglia	FYF = 1 YTD = 1	0 0	P3e states 0 for FYF and YTD although the Business Plan states 1 unit to be delivered in 2011/12.	- -
GGRN58	LNE	FYF = 4 YTD = 4	4 4		0% 0%
Total		FYF = 48 YTD = 31	47 29		+2% +7%

B3 Conductor Rails

Table B.3: Conductor Rails (km)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
120296	LNW North	FYF = 2 YTD = 2	2 0	LNW send MBRs to central team which contained this error. For the other routes, central team send a monthly report from P3e for routes to correct.	0% -
106441	LNW South	FYF = 3.23 YTD = 0	3.23 0		0% 0%
121761	Sussex / Kent	FYF = 17.44 YTD = 10.6	0 0	Delivered by Maintenance. No volumes in P3e. Appears to have slipped into 2012/13.	- -
100643	LNW North	FYF = 2.9 YTD = 2.9	0 0	Error in report from LNW.	- -
106440	LNW North	FYF = 0.28 YTD = 0	0 0		- 0%
Total		FYF = 25.85 YTD = 15.5	5.23 0		+394% -

There are two main problems with the reporting of these jobs. Firstly, and as mentioned before, the Maintenance delivered job is not reported accurately. Maintenance provide the central team with a summary report of all their projects on a single page. It appears that this is missing key information.

The other problem relates to the way that LNW route report their volumes. Unlike the other routes, they send their own monthly report to the central team. All the other routes receive a report from the central team for checking and reviewing as appropriate. It appears that the latter method is more robust than the former.

B4 AC HV Switchgear

Table B.4: AC HV Switchgear (circuit breakers)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
100668	LNE	FYF = 2 YTD = 2	2 2		0% 0%
110995	LNE	FYF = 23 YTD = 23	21 21	Business Plan states 23 whereas P3e states 21.	+10% +10%
118635	Scotland	FYF = 0 YTD = 0	3 0	P3e states 3 as forecast. Project slipped due to requirement to add Bare Feeders.	-100% 0%
123356	LNW South	FYF = 0 YTD = 0	- -	Project should not be in the list as for partial discharge testing and not delivering renewal volumes.	0% 0%
FF731A	Anglia	FYF = 7 YTD = 7	7 7		0% 0%
LLF290	Scotland	FYF = 1 YTD = 0	0 0	P3e states forecast of 0.5 which is an error. Project slipped into next year.	- 0%
103465	LNW North	FYF = 0 YTD = 0	0 0	Project has slipped.	0% 0%
Total		FYF = 33 YTD = 32	33 30		0% +7%

B5 AC GSP Transformers (no.)

Table B.5: AC GSP Transformers (no.)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
100604	LNW North	FYF = 0 YTD = 0	0 0		0% 0%
Total		FYF = 0 YTD = 0	0 0		0% 0%

B6 AC GSP cable (km)

Table B.6: AC GSP Cable (km)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
100604	LNW North	FYF = 0 YTD = 0	0 0		0% 0%
Total		FYF = 0 YTD = 0	0 0		0% 0%

B7 AC Booster Transformers (no.)

Table B.7: AC Booster Transformers (no.)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
106331	Scotland	FYF = 6 YTD = 0	6 0		0% 0%
106442	LNW North	FYF = 0 YTD = 0	0 0	P3e shows 20 as forecast and 12 as delivered. However, these are refurbishments and not renewals.	0% 0%
Total		FYF = 6 YTD = 0	6 0		0% 0%

B8 DC HV Switchgear (no.)

Table B.8: DC HV Switchgear (no.)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
103131	Sussex / Kent	FYF = 9 YTD = 0	6 0	Volumes have now slipped to 2012/13.	+50% 0%
BBE500	Sussex / Kent	FYF = 20 YTD = 14	17 14	P3e shows additional 3 have slipped to 2012/13.	+18% 0%
Total		FYF = 29 YTD = 14	23 14		26% 0%

B9 DC HV Cables (km)

Table B.9: DC HV Cables (km)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
101516	Sussex / Kent	FYF = 5 YTD = 5	5 5		0% 0%
103126	Wessex	FYF = 24 YTD = 24	10 10	P3e shows 24 for forecast and delivered. However, 14 are pilot cables and should not be counted. Corrected in P11 report.	+140% +140%
103832	Wessex	FYF = 11 YTD = 0	11 0		0% 0%
105335	Wessex	FYF = 1 YTD = 0	1 0		0% 0%
106410	Sussex / Kent	FYF = 20 YTD = 4	20 4		0% 0%
BBI340	Sussex / Kent	FYF = 0 YTD = 0	0 0		0% 0%
115206	LNW North	FYF = 0 YTD = 0	0 0		0% 0%
EEPH50	LNW North	FYF = 0 YTD = 0	0 0		0% 0%
122523	Wessex	FYF = 0 YTD = 0	0 0		0% 0%
Total		FYF = 61 YTD = 33	47 19		+30% +74%

The one project with an error arose from not correctly applying the reporting definition of excluding pilot cables.

B10 LV Switchgear (no.)

Table B.10: LV Switchgear (no.)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
BBK850	Sussex / Kent	FYF = 13 YTD = 13	13 13		0% 0%
BBJ540	Sussex / Kent	FYF = 0 YTD = 0	0 0		0% 0%
Total		FYF = 13 YTD = 13	13 13		0% 0%

B11 LV Cabling (km)

Table B.11: LV Cabling (km)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
101513	Sussex / Kent	FYF = 0 YTD = 0	0 0	Original volume was 36, 26 went to Thameslink and 10 slipped to 2012/13.	0% 0%
120296	LNW North	FYF = 0 YTD = 0	0 0	P3e shows 1 as forecast in error. The work has slipped to 2012/13.	0% 0%
TBA067	Network	FYF = 22 YTD = 0	22 0	This is a budget for Minor Works delivered by Maintenance and not reported in P3e.	0% 0%
Total		FYF = 22 YTD = 0	22 0		0% 0%

There is a tracker spreadsheet for all maintenance jobs. An authorisation form is currently filled in for each task which shows the volumes to be delivered. However, the Business Planning team have to phone round to collate these. A new task close-out form will be introduced in 2012/13.

B12 DC Transformers Rectifiers (no.)

Table B.12: DC Transformer Rectifiers (no.)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
103134	Sussex / Kent	FYF = 20 YTD = 17	20 17	P3e wrongly shows 20.5 as forecast.	0% 0%
BBE480	Sussex / Kent	FYF = 6 YTD = 6	6 6		0% 0%
EEP04	Anglia	FYF = 4 YTD = 2	4 4		0% -50%
BBE470	Wessex	FYF = 0 YTD = 0	0 0		0% 0%
123083	Wessex	FYF = 0 YTD = 0	0 1	There was a transformer part renewed which should have been claimed as 1. Corrected in Period 11.	0% -100%
Total		FYF = 30 YTD = 25	30 28		0% -11%

B13 Points Heaters (no.)

Table B.13: Points Heaters (no.)

Project	Route	Reported at 2011/12 Period 10	Correct at 2011/12 Period 10	Comments	Error in central report
103830	Wessex	FYF = 89 YTD = 79	85 75		5% 5%
103095	Western	FYF = 26 YTD = 26	26 26		0% 0%
103423	LNW North	FYF = 19 YTD = 19	19 19		0% 0%
103458	Anglia	FYF = 140 YTD = 70	108 38	The 'correct' figures taken from P3e. P3e also has 63 in Period 13 of 2010/11, so possible the difference is due to deciding which volumes belong to which year.	30% 84%
106453	LNW North	FYF = 2 YTD = 2	2 0		0% +100%
BBD780	Sussex / Kent	FYF = 367 YTD = 303	367 303	P3e shows forecast as 370, but 3 point ends have been de-scoped so needs correcting.	0% 0%
Total		FYF = 643 YTD = 499	607 461		+6% +8%

The main error found here relates to a project crossing from one year to the next and identifying which volumes belong to which year.

B14 Zero Volume Projects

We selected a sample of 10 projects which have incurred costs during 2011/12 but had reported no renewal volumes. The following table lists each of these projects along with an explanation from Network Rail as to why no volumes have been reported.

Project ID	Project name	Engineering Owner	Eplanation
129078	Continuous Transformer Monitoring Product Trial	Kent	This projects is currently at GRIP stage 4 and we do not start work on site or deliver volumes till GRIP stage 5. This means the money spent so far has been on design and development. Implementation on both these schemes starts in the next financial year.
102031	Air Circuit Breaker Renewals	LNE	This is a national project which is delivering 133 volume in 12/13 and 13/14. Due to exit stage 4 development on the 19th March 2012 and have spent 77k in 11/12. We will be designing up to September 12/13. Delivered volume forecast is 33 in 12/13 and 100 in 13/14
100648	DC Electric Track Equipment 07/08 & 08/09 - BUSINESS PLAN	LNW North	Costs in the year due to the following: 1)Detailed design production for Willesden substation (Contractor: AMCO) 2) Survey costs for Kenton substation (to be awarded to Contractor: AMCO) Volumes are due to be delivered next financial year.
119861	Cantilever Frame Renewals	LNW North	The volumes are refurbishment rather than full renewal. They were being reported before until we clarified the definitions.
117533	Kenton Substation Remedial Works	LNW South	117533 simply has £1000 for closing out the project. All work has been delivered.
121949	LNW Lighting Renewal	LNW South	Costs in the year due to the following deliverables: 1)Technical Workscopes / Designs undertaken by EPDG for both locations 2) Authority 6-8 obtained 3)Contract Award to Manchester MDU 4) PM Services costs. Volumes due to start to be delivered April 2012 onwards.
122398	Structure Renewal (Linhouse)	Scotland	Volumes delivered in 10/11 - Expenditure associated with close out.
102988	Stewarts Lane Depot	Sussex	This projects is currently at GRIP stage 4 and we do not start work on site or deliver volumes till GRIP stage 5. This means the money spent so far has been on design and development. Implementation on both these schemes starts in the next financial year.
127575	South Wales Plant Renewals	Wales	This project is currently in Development. South Wales Plant Renewals includes points heating and lighting assets in the South Wales Area. Please find attached remits 106467 (including Appendix A) and 121798 issued under the former project numbers, prior to the creation of the current project number 127575. The points heating locations for OP127575 are as listed in the Appendix A and the lighting asset is Pengam. The new OP number 127575, along with 127573 and 127574 were created when the project delivery team decided to repackage the works to represent more efficient delivery packages. Site surveys, outlines designs and cost estimates have been produced by the Project Development team, including options for conversion of existing gas points heating sites.
103100	Paddington Water Hydraulic Buffer Stop Refurb 0910	Western	This project is currently in Development. Paddington hydraulic Buffer Stop refurbishment which has been in prolonged development, due to lack of expertise for the refurbishment/renewal of this type of equipment. A revised strategy was agreed recently and an updated remit issued, see attached. The buffer stop risk assessment is under review to minimise expenditure on this asset due to the impending remodelling works at Paddington Station.

Appendix C

Definition of Confidence Grades

C1 Introduction

Each asset is awarded an alpha-numeric grade of the reliability and accuracy of its reported renewal volumes. The definition of the grading is described below.

C2 System reliability grading system

System Reliability Band	Description
A	<p>Appropriate, auditable, properly documented, well-defined and written records, reporting arrangements, procedures, investigations and analysis shall be maintained, and consistently applied across Network Rail. Where appropriate the systems used to collect and analyse the data will be automated. The system is regularly reviewed and updated by Network Rail's senior management so that it remains fit for purpose. This includes identifying potential risks that could materially affect the reliability of the system or the accuracy of the data and identifying ways that these risks can be mitigated.</p> <p>The system that is used is recognised as representing best practice and is an effective method of data collation and analysis. If necessary, it also uses appropriate algorithms.</p> <p>The system is resourced by appropriate numbers of effective people who have been appropriately trained. Appropriate contingency plans will also be in place to ensure that if the system fails there is an alternative way of sourcing and processing data to produce appropriate outputs.</p> <p>Appropriate internal verification of the data and the data processing system is carried out and appropriate control systems and governance arrangements are in place.</p> <p>The outputs and any analysis produced by the system are subject to management analysis and challenge. This includes being able to adequately explain variances between expected and actual results, time-series data, targets etc.</p> <p>There may be some negligible shortcomings in the system that would only have a negligible effect on the reliability of the system.</p>
B	<p>As A, but with minor shortcomings in the system.</p> <p>The minor shortcomings would only have a minor effect on the reliability of the system.</p>
C	<p>As A, but with some significant shortcomings in the system.</p> <p>The significant shortcomings would have a significant effect on the reliability of the system.</p>
D	<p>As A, but with some highly significant shortcomings in the system.</p> <p>The highly significant shortcomings would have a highly significant effect on the reliability of the system.</p>

Notes:

1. System reliability is a measure of the overall reliability, quality, robustness and integrity of the system that produces the data.
2. Some examples of the potential shortcomings include old assessment, missing documentation, insufficient internal verification and undocumented reliance on third-party data.

C3 Accuracy grading system

Accuracy Band	Description
1*	Data used to calculate the measure is accurate to within 0.1%
1	Data used to calculate the measure is accurate to within 1%
2	Data used to calculate the measure is accurate to within 5%
3	Data used to calculate the measure is accurate to within 10%
4	Data used to calculate the measure is accurate to within 25%
5	Data used to calculate the measure is accurate to within 50%
6	Data used to calculate the measure is inaccurate by more than 50%
X	Data accuracy cannot be measured

Notes:

1. Accuracy is a measure of the closeness of the data used in the system to the true values.
2. Accuracy is defined at the 95% confidence level - i.e. the true value of 95% of the data points will be in the accuracy bands defined above.

C4 Benchmark grades

The ORR has set a benchmark grade for each asset which it believes should be achieved by Network Rail. The table below provides these benchmark grades for reporting the renewal volumes.

Measure	Benchmark grade
Signalling	A1
E&P	A1
Track	A1
Telecoms	A1
Civils	A1

Appendix D

Stage One Report - Sampling Proposal

Office of Rail Regulation and
Network Rail

Part 'A' Independent Reporter

**AO/025: Renewals Volumes
Sampling Proposal**

218746-06-01

Issue | 1 February 2012

This report takes into account the particular
instructions and requirements of our client.

It is not intended for and should not be relied
upon by any third party and no responsibility is
undertaken to any third party.

Job number 218746-06

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Appendices

Appendix A

Notes of Meetings which took place at 40 Melton Street on 25th & 27th January 2012

Appendix B

Sampling Plan

1 Background

- 1.1 A second phase of renewals volumes data assurance is to be undertaken by the Part A Independent Reporter during Quarter 4 with a view to the results and outcomes being available for review by NR and the ORR by April 2012.
- 1.2 The first stage of this work is to agree the size, shape and composition of the data samples to be reviewed across the asset categories, to ensure that NR and ORR can be confident that the sample results are representative of the whole data population. A series of meetings with data champions from each asset group was set up for this purpose. The Arup Reporter team for each meeting included a statistical expert, who was able to advise on the structure of the samples and the confidence levels which could be derived from these samples.
- 1.3 The meetings all took place at 40 Melton Street on Wednesday 25th January and Friday 27th January. The assets reviewed were:
- Signalling;
 - Electrification and Plant (E&P);
 - Track;
 - Telecoms; and
 - Civils.
- 1.4 For all asset groups, the ultimate objective of this work will be to verify and assure the renewals volumes data which is recorded in the Period 10, 2011/12 Finance Pack.

2 Recommendations

2.1 The recommendations from this paper are summarised as:

- The aim of the work is to establish the accuracy of the reported volumes for each project within each asset category.
- The sample sizes by asset category are shown in the table below.

Asset Category	Population of jobs in 2011/12 P10 Finance Pack	Sample Size	%	Jobs reported as Zero Volume	
				Population in 2011/12 Finance Pack	Sample Size
Signalling	13	11	85%		
E&P	32	32	100%	31	10
Track	1,067	50	4.7%		
Telecoms	36	36	100%	Approx 15	5
Civils	542	Up to 50	9%	Thousands ¹	10
Total	1,690	181	10.7%		

- Some assets have jobs with zero volumes reported in the Finance Pack, and we recommend sampling from them as well as the jobs with reported volumes to understand their nature and composition.
- The sample sizes with reported volumes for Track and Civils are apportioned according to sub-categories such as route and volume.
- The sample size for Civils may need to be reduced to fit with the available timescales.
- Given there are only 10 Signalling renewal jobs, all will be sampled. The additional 3 Level Crossing jobs are small, so only one (the largest) will be sampled.
- E&P and Telecoms also have relatively small numbers of jobs and it was agreed with the data champions that sampling all the jobs would be practical and desirable.
- Confidence intervals created around the sample mean accuracy after the sampling has been performed will provide limits within which the population accuracy is expected to lie.

¹ Projects less than £50k are not included in the counts; inspections (120k in number) and interventions (13k) have no volume activity.

3 Endorsements

- 3.1 The group is asked to approve the previous recommendations.
- 3.2 Supporting information can be found in the appendices. Appendix A provides notes from the meetings with NR and Appendix B provides details of the sampling plan.

Appendix A

Notes of Meetings which took
place at 40 Melton Street on 25th
& 27th January 2012

A1 Signalling

The signalling discipline is characterised by a relatively small number of major resignalling jobs. Data will be assured by tracking the Signalling Equivalent Unit (SEU) count from project inception, through the business and investment approvals processes, to project delivery, data recording and data reporting.

The 2011/12 Delivery Plan shows projects, of which 3 are level crossing schemes (the latter accounting for 4 LXEU). The planned SEU count for these works is 1041, with a further 211 SEUs associated with ERTMS on GW Route.

It was agreed that it would be desirable to audit all 10 of these signalling projects. As the Level Crossing schemes are small schemes (2 x 1 LXEU, 1 x 2 LXEU), it was proposed to sample just the bigger of the 3 schemes (Stocks Lane/ Causeway) only.

A2 Electrification & Plant

The data champion described the arrangements in E&P; 13 Asset types in 4 categories as follows:-

- (i) AC Distribution
 - HV switchgear (circuit breakers)
 - AC GSP Transformers
 - AC GSP Cable
 - Booster transformers
- (ii) Contact Systems
 - OLE Re-wiring (wire runs)
 - OLE Campaign changes (wire runs)
 - Conductor Rail (km)
- (iii) DC Distribution
 - HV Switchgear
 - HV Cables
 - LV Switchgear
 - LV Cables
 - Transformers /Electrifiers
- (iv) Plant & Machinery
 - Point Heaters.

In 2011/12 there are 33 jobs reporting volumes - 27 electrification and 6 plant. A considerable number of projects - in excess of 20 - which were planned for 2011/12 have not reported volumes, for one of two reasons:-

- The project has been reclassified as 'not renewal' – refurbishment, for instance; and
- Slippage to a future year, or to be delivered later this year.

The data champion agreed to supply further information about the 'zero-value' projects. He will also identify the Route and RAM ownership of each project on the E&P volumes spreadsheet.

As with Signalling, it was agreed that it would be feasible to audit all of the projects delivering volumes up to Period 10, 2011/12. It was also agreed to take a sample of approximately 10 'zero-volume' schemes, evenly split between the Routes involved, to understand the nature and composition of these.

A3 Track

In Track, the following categories and dimensions apply to 2011/12 renewal volumes, as advised by the data champion:-

- 2 types of asset renewal - plan line (composite kms) and S&C (equivalent units); and
- delivery organisations - Amey/Colas (High Output), Babcock, Amey/Colas (conventional), Balfour Beatty, NR Maintenance.

Approximate job count and volumes over the year 2011/12 are as follows:-

- 2056 composite kms of plain line delivered in 400 plain line jobs
- 336 S&C units (equivalent) delivered in 40-70 S&C jobs
- NR Maintenance delivery is approximately 14% of the plain line total, and 10% of S&C

Following extensive discussions, the following was agreed:-

- The data champion to populate a matrix of contractors, jobs and volume for plain line and S&C
- It was proposed to sample 12½% of jobs and volume - approximately 50 jobs in total, evenly spread across the cells in the matrix, subject to a minimum of 3 jobs per cell. Such a sample should provide a reasonable statistical confidence in the time available (see Appendix B for a discussion of statistical confidence).

A4 Telecoms

The data champion described the arrangements in Telecoms; 9 asset types in 2 categories as shown in the table below.

Asset Type	No. projects planned for 2011/12	Volume planned for 2011/12
Station Information & Surveillance Systems		
CIS (Monitors)	4	522
Public Address (Speakers)	10	2,784
CCTV (Cameras)	3	260
Clocks (No.)	2	54
Operational Telecoms		
Large Concentrators (No.)	2	2
Small Concentrators (No.)	7	27
DOO CCTV (Systems)	3	123
PET Systems (No.)	4	12
Voice Recorder (No.)	1	1

Additionally, approximately 15 projects have zero volumes reported. These are predominantly minor works or maintenance/ repairs, or cabling/ cable routes, comprising up to 20% of the renewals activity and financial budget, but which are not counted as renewals volume. The volume count does however include all *new works* as Renewals.

As with Signalling, given the relatively small number of jobs, it was agreed that it would be feasible to audit all of the projects delivering volumes up to Period 10, 11/12. It was also agreed to take a sample of approximately 50% of the “zero-volume” schemes to understand the nature and composition of these.

A number of issues were noted in the discussions, which will be of assistance when undertaking the data audit work.

A5 Buildings & Civils

The data champion circulated a spreadsheet showing the relevant asset categories and number of jobs in each, for the CP4 financial years. The spreadsheet showed the 10 asset reporting categories (with Earthworks further sub-divided) for financial year 11/12, as follows.

Asset Reporting Category	No. projects planned for 2011/12
Overbridges	43
Underbridges	241
Bridgeguard 3	18
Footbridges	11
Tunnels	34
Culverts	35
Retaining Walls	12
Earthworks – Cuttings	44
Earthworks – Drainage	25
Earthworks – Embankment	62
Coastal/ Estuary Defences	9
Other (inc. Major Structures)	13
Total	547

The volume measure in all categories is sq. metres, except in Coastal/Estuary Defences where the measure is Linear metres.

Following extensive discussions, the following relevant issues were noted:

- 17-20% of renewals cost is not reflected in reported volumes (cost of inspections, for instance).
- 50k sqm schemes or smaller are not included in renewals volumes, and are considered to be ‘minor works’.
- Most of the work is delivered by IP but a small proportion is undertaken by NR Maintenance.
- Asset categories can be clustered in a meaningful way. Six categories were suggested – Footbridges, Other Bridges, Earthworks, Tunnels, Major Structures, Others.
- As a guide to the relevant significance of the main categories, CP4 spend is budgeted as follows;
 - Bridges £850m
 - Major Structures £250m
 - Earthworks £400m
 - Tunnels £ 90m
 - Other £ 20m

The following actions were agreed;

- The data champion to produce 2 matrices, splitting the 2011/12 civils renewals works
 - By 10 Routes, number of jobs in each reporting category
 - By 10 Routes, renewals volumes in each reporting category
- The reporter team to select a random sample of jobs from the matrix cells, which best represents a 10% total of jobs spread across the categories, 10% of volume, and 10% by weighted cost. (See Appendix B for a discussion on the implication of statistical confidence.)
- The reporter team to speak with the data champion to discuss next stage methodology for auditing the data and processes to understand the quantum of prep work, quantum of audit work, and availability of NR resource to enable these activities.

Appendix B

Sampling Plan

B1 Introduction

As it is not possible to review all projects it is appropriate to closely examine a representative sample of projects and extrapolate the results across the wider population. This appendix specifies sample sizes which will enable the results of the review to be considered statistically significant.

The aim of the sampling plan is to ensure that the results obtained from the sample are representative of the population as a whole. This is best achieved by giving attention to each of the asset groups and considering specific categories within these groups. The appropriate sampling method is stratified random sampling.

There are widely used equations that can be used to determine an appropriate sample size depending on the characteristics of the population, the sampling method used, what is being measured and the desired level of accuracy for the results. Determining a sample size typically depends on five considerations:

1. Population and available resources;
2. Desired precision of results;
3. Desired confidence level;
4. Degree of variability; and
5. Response rate.

1. Population and Resources

The size and characteristics of the overall population should be considered first. If the population is small and resources allow then it may be preferable to do a census of the entire population, rather than use a sample. The characteristics of the population influence the choice of sampling method. If there are differences between groups within the population then it is recommended that stratified sampling be used which will have implications on the sample size.

2. Precision of Results

The level of precision is the closeness with which the sample predicts the true value of the population. A precision level of $\pm 2\%$ means that the population value is predicted to lie within a band of 4% around the value provided by the sample. The higher the level of precision that is specified the larger the sample size that is required.

3. Confidence Level

This is the level of certainty that the sample value does not differ from the true population value by more than the specified precision level. The higher the confidence that is specified the larger the sample size required. Confidence levels of 95% are typically used.

4. Degree of Variability

The degree of variability within the population, as measured by the standard deviation, will impact the accuracy of the sample. The greater the observed variability the larger the sample size that is required to provide a specified level of

accuracy. Population standard deviations are rarely known in reality and often have to be estimated or derived from similar studies.

5. Response Rate

The base sample size is the number of complete observations required for analysis. If not all observations can be included for whatever reason then it is necessary to increase the sample size from the outset in order to cater for any null observations that will be returned. There may be null observations from the sampling so the response rate will need to be taken into account.

B2 Signals

There have been 10 signalling projects completed up to period 10 of 2011/12, plus 3 level crossings. The relatively small number of large projects advocates a full census of the signalling project population. As discussed with the data champion, we will also include the largest of the 3 Level Crossing projects in our sample.

B3 Electrification and Plant

The E&P projects completed to date are summarised by route in Table B.1. Of the 63 projects it is observed that only 32 projects have volume recorded against them, leaving 31 projects with zero volume (though not zero value). It is recommended that a full census of the 32 projects with volume be conducted together with a sample of 10 zero volume projects.

Table B.1: Electrification and plant projects

Route	All Projects		Projects with Volume			Zero Volume Projects		
	Count	Volume	Count	Volume	%	Count	Volume	%
Anglia	6	158.0	6	158.0	100%			
LNE	7	391.0	7	391.0	100%			
LNW	1	0.0				1	0.0	100%
LNW North	16	33.7	5	33.7	31%	11	0.0	69%
LNW South	7	72.0	2	72.0	29%	5	0.0	71%
Midlands & Cont'l	1	0.0				1	0.0	100%
Network	1	0.0				1	0.0	100%
Scotland	4	359.0	1	359.0	25%	3	0.0	75%
Sussex / Kent	12	372.6	8	372.6	67%	4	0.0	33%
Wessex	7	103.0	2	103.0	29%	5	0.0	71%
Western	1	26.0	1	26.0	100%			
Total	63	1,515.3	32	1,515.3	51%	31	0.0	49%

B4 Track

The number and volume of track projects are summarised in Table B.2 along with sample percentage guidance for the category. The sample percent combines count and volume percentages to provide a composite average percentage.

Table B.2: Track projects

Category	Plain Line			S&C		
	Count	Volume (ckm)	Sample Percent	Count	Volume (EqU)	Sample Percent
AmeyCOLAS High Output						
LNE	25	52	2.7%	0	0	0.0%
LNW	86	106	7.2%	0	0	0.0%
Western	54	243	9.7%	0	0	0.0%
AmeyCOLAS						
LNW	40	65	3.8%	8	23	1.1%
Western	54	106	5.7%	12	52	2.1%
Babcock Rail						
LNE	91	240	11.3%	12	50	2.0%
LNW	53	139	6.6%	7	38	1.5%
Scotland	53	111	5.8%	6	26	1.0%
Balfour Beatty						
SE	82	188	9.4%	15	56	2.4%
Maintenance						
PL Associated with S&C	-	20	0.6%	56	18	3.1%
Total	951	1,430	86.8%	116	262	13.2%

Ideally a sample of around 50 projects will be selected using the sample percent as guidance. For example, the AmeyCOLAS High Output LNE category would account for approximately $2.7\% \times 50$ projects in the sample. The actual number selected from each category will have to be rounded and scaled as only integer values are allowed.

B5 Telecoms

There are 36 telecoms projects with volumes attached as summarised in Table B.3. A full census of these projects should be undertaken. In addition there are approximately 15 projects which have zero volume and a sample of 5 of these should be investigated.

Table B.3: Telecoms projects

Telecoms	Projects	Volume
Station Info & Surveillance Systems		
CIS (monitors)	4	522
Public address	10	2,784
CCTV	3	260
Clocks	2	54
Operational Telecoms		
Large concentrators	2	2
Small concentrators	7	27
DOO CCTV	3	123
PETS	4	12
Voice recorders	1	1
Total	36	3,785

B6 Buildings and Civils

The number of B&C projects is summarised by RWI and route in Table B.4.

Table B.4: Number of B&C projects

CAF RWI	Anglia	East Midlands	Kent	LNE	LNW	Scotland	Sussex	Wales	Wessex	Western	Total
Underbridge	17	12	10	36	82	47	8	14	8	5	239
Overbridge	2	4	4	4	14		5	3	4	2	42
Overbridge BG3	2	1	1	3	4	4		1		3	19
Bridges	21	17	15	43	100	51	13	18	12	10	300
Major Structures	0	0	0	2	3	4	0	2	0	2	13
Earthworks Cutting Rock	1	1	1	2	2	36	1	0	0	0	44
Earthworks Cutting Soil	0	1	2	1	4	11	3	0	1	1	24
Earthworks Embankment	2	6	5	11	11	7	0	3	4	11	60
Earthworks	3	8	8	14	17	54	4	3	5	12	128
Tunnel	0	2	2	1	20	4	1	1	0	3	34
Footbridge	0	0	0	2	1	5	1	0	1	0	10
Culvert	3	1	1	16	2	9	1	0	1	2	36
Coastal and Est Defences	0	0	0	0	2	2	0	1	2	2	9
Retaining Wall	0	0	1	2	6	1	1	1	0	0	12
Other Assets	3	1	2	20	11	17	3	2	4	4	67
Total	27	28	27	80	151	130	21	26	21	31	542

In the final column of Table B.5, the percentages for the number of projects, volume of projects and value of projects have been averaged to give sample percentage guidance for the major B&C categories. The sample percent combines count and volume percentages to provide a composite average percentage.

Table B.5: Number, volume and value of B&C projects

CAF RWI	Projects		Volume		Value		Sample Percent
	Number	Percent	m ²	Percent	£m pa	Percent	
Bridges	300	55.4%	99,439	14.7%	170	52.8%	41.0%
Major Structures	13	2.4%	35,689	5.3%	50	15.5%	7.7%
Earthworks	128	23.6%	502,221	74.3%	80	24.8%	40.9%
Tunnel	34	6.3%	25,277	3.7%	18	5.6%	5.2%
Other Assets	67	12.4%	13,335	2.0%	4	1.2%	5.2%
Total	542	100.0%	675,961	100.0%	322	100.0%	100.0%

Ideally 50 projects would be sampled, with approximately 41% of them being bridges for example.

B7 Sample Size Equation

As commented upon earlier, determining a statistically significant sample size in part depends on the degree of the variability in the population at large. This is used in an equation for determining the sample size (n) for an infinite population as:

$$n_{inf} = \frac{s^2 \times z_{\alpha}^2}{p^2} \quad (1)$$

where s is the standard deviation,
 z is the inverse of the standardised normal distribution for
confidence level α ,
 p is the level of precision.

This is adjusted for finite populations using:

$$n = \frac{n_{inf}}{1 + \frac{n_{inf} - 1}{population}} \quad (2)$$

The resultant value is rounded up to the nearest integer to provide the final sample size.

B8 Sample Size Scenarios

We do not have an existing view of the standard deviations so it is not possible to calculate a definitive sample size. Instead equations (1) and (2) have been applied using a range of standard deviations and a range of precision levels. The results for a population size of 500 and using a confidence interval of 95% are presented in Table B.6. It is observed that as the standard deviation increases or the precision level increases then the recommended sample size also increases.

Table B.6: Sample size scenarios for a population of 500

Precision Level (p)	Standard Deviation (s)									
	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%
0.5%	15	55	109	166	218	263	301	332	357	378
1.0%	4	15	33	55	81	109	137	166	193	218
1.5%	2	7	15	26	40	55	72	90	109	128
2.0%	1	4	9	15	23	33	44	55	68	81
2.5%	1	3	6	10	15	22	29	37	46	55
3.0%	1	2	4	7	11	15	21	26	33	40
3.5%	1	2	3	5	8	12	15	20	25	30
4.0%	1	1	3	4	6	9	12	15	19	23
4.5%	1	1	2	4	5	7	10	12	15	19

Utilising a sample size of 50 for both Track and Civils will allow a reasonable level of precision irrespective of the standard deviation observed in reality.

B9 Further Analysis

A useful piece of analysis that can be performed after the collection of the sample statistics is the calculation of a *confidence interval*. In this case a confidence interval which specifies the limits within which the true average accuracy is likely to lie can be calculated using:

$$\bar{x} \pm \frac{s}{\sqrt{n}} \quad (3)$$

By way of example, suppose the sample size (n) is 50, the sample average (\bar{x}) is 96.5% and the sample standard deviation (s) is 5.0%, then the 95% confidence interval is given by:

$$0.965 \pm 1.96 \frac{0.05}{\sqrt{50}}$$

This would mean that there is a 95% chance that the population accuracy is between 95.1% and 97.9% based on the sample values. Note that the width of the confidence interval is directly related to the precision level that is specified when determining a sample size.