Northern Ireland Water Ltd
Annual Information Return 2013

Part 3 of 9 containing:
Non-financial Measures - commentaries for tables 7 to 16b
(excluding table 10b)

Public Domain Submission
23 October 2013

Halcrow

Table 7 – Non financial measures – Water properties and population

Commentary by REPORTER

1. Background

This table reports on the properties connected during the year, billing information and average report year population estimates.

2. Key Findings

- We were able to reconcile the property numbers reported to the Rapid extract presented by NI Water.
- However, there remain some anomalies in NI Water's new connections data.
- There are circa 2,000 NHH which are not included in this table. These are potentially billable customers and thus we consider that NI Water should confirm the status of these properties as soon as reasonably practicable.
- We also believe that the confidence grades for property numbers should remain consistent with those agreed in Undertaking A.
- NI Water's commentaries do not fully address all of NIAUR's Reporting Requirements.
- The methodology for Block C is consistent with that used in AIR12.
- NI Water has assigned confidence grades to the population data reported in Table 7 of AIR13. Whilst we feel NI Water has made a reasonable estimate of the confidence grades, based on an understanding of the NISRA methodology, we do not consider this provides any discernable value to the Utility Regulator, as the data has been primarily sourced from the NISRA website.

3. Audit Approach

The audit consisted of an interview with the NI Water system holders to discuss the methodology and data that has been used to populate this table as well as plans for improving the data in future years.

4. Audit Findings

4.1 General

The key source of information for the new connections and property data is the customer billing database, RapidXtra. This is an automated system where customer information is updated through various means, including customer contact. The Company outlined that data on property counts and classifications are reported monthly and reconciled with other data collection activities, such as the data quality programme. During the audit we sought an update on various issues which had been raised in previous AIRs, PSs and PC10 reviews. The following provides an overview of the discussions held with NI Water:

Whilst we acknowledge that the Company has attached their Methodology Statement to provide the detailed year on year reconciliation, the Company did not comment as required on reconciliation between Tables 2 and 7. We strongly recommend that NI Water checks the Reporting Requirement every year and include the commentaries required. The Company stated that within their responses to the AIR12 draft commentaries, they confirmed that Table 2 was an end of year figure whereas figures within Table 7 are average figures (start of end and year of end averaged), therefore they wouldn't directly reconcile.

Test meters

We acknowledge that the Company has provided the detailed history on Test Meter categorisation and the summary table of the review in their commentary. The Company advised that the survey of all 10,898 test meter accounts was finished at the end of 2011/12, 39 of these still need to be confirmed and uploaded to Rapid.

Given this programme has now finished we recommend NI Water should work further towards fully implementing the outcomes of this project within their property estimates.

We queried the Company whether the classified properties are included in the property numbers in Table 7. They confirmed that where a test meter has been reclassified and it fits within a Table 7 reporting line, it will have been included. For example, a test meter that has been found to be serving a non-domestic property and billable will be reported in Table 7 Line 9 - Non-Household Billed Measured Water

Whilst the Reporting Requirement expects that NI Water to *'use a consistent approach to reporting 'test meters' between customer groups e.g. between household and non household customer groups*', NI Water advised that a different approach has been adopted in reporting household and non-household property numbers: 'Test' meter numbers have been included in household property numbers but excluded from non-household numbers. This methodology is consistent with the Company's approach in AIR12.

We checked the Table 10 methodologies which confirmed that the consumption from NHH Test meter accounts is included as water taken legally unbilled, therefore the approach of NHH test meter between Tables 7 and 10 are same. The consumption from HH Test meter accounts is included in the unmeasured household water consumption. Therefore the approach of HH test meter between Tables 7 and 10 are same.

Site meters

The Company explained that as part of their ongoing data checks the number of site metered properties (multiple properties being charged through a single meter) is currently being investigated and verified. To ensure these are not double counted the Company has excluded these meters from their Table 7 property counts. We understand this approach is consistent to that adopted in previous AIR submissions.

Population
The population estimates use the same approach as previous years, drawing on a combination of data from NISRA and company databases. Only small year-on-year changes are observed.

4.2 Properties

Line 1 – Household properties connected during the year
This line reports the number of new household properties added within the Company's area of supply. We confirm the total number of connections reported in this line is consistent with the extract from Rapid provided by NI Water. We note an increase of 316 (or 8%) new connections when compared to the AIR12 figure.

In AIR12 we checked 15 new connections from the Company's list and raised several queries. This year we carried out the checks on 30 new connections from the Company's new connection list. We found similar anomalies as last year and some examples are detailed together below. These apply to both household and non-household properties and water and wastewater services.

- There are anomalies in the categorisation of water and wastewater status in Rapid (and the new connection list) such as measured unsewered and demolished.
- Customer agents' comments do not always assist. For example, in one day a property was demolished, undemolished and became a measured property without sufficient explanation.
- A property with well water supply and septic tank becomes a measured customer. This could be a genuine change in customer types however we could not find a sufficient audit trail.

The Company explained that they are currently undertaking a review of these categorisations in the Rapid system. They also added that a customer agent would not be able to demolish or undemolish without the NI Water's approval from the current year. This should be reviewed again for AIR14.

The methodology for new connections states that '*Properties with a reference number of 0 were excluded'*. NI Water explained that these were omitted as there was a potential to double count. We reviewed this and did not find any properties with a reference number of 0 in AIR13.

Line 2 – Non-household properties connected during the year
This line contains the number of new non-household properties added within the Company's area of supply during the Report Year. We confirm the total number of connections reported in this line is consistent with the extract from Rapid provided by NI Water. However we have raised queries on the data and population of Table 7 (please see the section above).

We note a significant decrease of 134 new connections (or 41%) when compared to the AIR12 figure. We believe this decrease is associated with a slow economic recovery.

4.3 Billing

Line 3 – Households billed unmeasured water

We note an increase of 8,279 properties reported in this line since AIR12. The Company was able to demonstrate the consistency of the number reported in this line to extracts from records on Rapid.

This line is calculated as the average of occupied domestic properties plus the properties where a test meters has been identified. NIAUR has previously asked the Reporter to check the numbers and comment if there are difference between PC13 and AIR submissions. We discuss in detail in Line 12 section below, however, although the differences are very small, the numbers of void property for 1st December and 31st March in the Company's commentary Additional Information section are incorrect.

	AIR13 (000's)	PC13 2012/13 (000's)	PS 2013-14 (000's)
Unmeasured Household	681.095	677.996	682.284
Measured Household	0	0	0
Unmeasured non-Household	10.896	10.943	10.735
Measured non-household	69.158	70.927	68.907
Void Properties	53.015		52.806

Note that the figure for AIR is April-March average, and PC13 is November-October average while PS is 1st of December figure. The divergences in each of the 3 submissions are largely a result of the dates of each submission. Nevertheless, the three submissions are reasonably well aligned with relatively small percentage differences.

NI Water provided a year on year reconciliation to derive Block B figures in their Methodology Statement attached with the Table 7 commentary. We have reviewed the figures amongst the Table, Methodology Statement and the supported document and confirm that they are consistent.

The movement of HH customer group is provided in their commentary. However we found errors in their commentary and the 2012/13 year end figure in their commentary does not match with the methodology statement, therefore we can not reconcile these figures with the supporting documents. We have not verified the number of properties in 'Data cleanse/Backlog' category. If we use their property types, we believe the table should be shown as below:

Property Numbers	2011/12 Actual	2012/13 Actual
Start of the Year	668,661	676,970
New/Metered (plus)	3,838	4,154
Data Cleanse/Backlog (plus)	5,917	3,840
Test Meters (minus)	595	537
Site Meters (plus)	67	31
Voids (minus)	918	-761
End of the Year	**676,970**	**685,219**

The Reporting Requirements require the Company to provide details of '… *any change in treatment or data cleansing* …'. We feel that the data cleansing project is a 'behind the scene' work which does not show a true movement in property numbers. NI Water may carry out the data cleansing and backlog project on 5,361 properties, some of which may be already accounted for the numbers in other property categories such as test meters and voids. We suggest that the following table would show the true movement of the property numbers.

Property category	Previous Year Actual	Reporting Year Actual	Current Year Forecast
Start of the Year			
New			
Metered (FMO, Selective)			
Deletion/Demolitions			
Voids			
End of the Year			

Voids could be expanded to a detailed categorisation such as measured, test meter and site meter.

The data cleanse and backlog project could have a set of table as follow.

Re-categorised as uHH	
Re-categorised as mHH	
(Add if any) …	
Re-categorised as Voids	
Re-categorised as Demolition	
Total	**5,361**

Line 4 – Households billed measured water (external meter)
Whilst NI Water has been installing meters on all new household connections since April 2007, customers are not being charged on a measured basis. As such, all household properties are reported as unmeasured. We believe this is appropriate.

Line 5 – Households billed measured water (not external meter)
The number of billed measured households is again reported as zero. This remains unchanged since AIR08. The Company does install internal meters on household properties but these are not charged upon.

Line 6 – Households billed water
This is a calculated line, the sum of Lines 3, 4 and 5. The figure reported represents the number of domestic properties that would have been billed had charges been introduced.

The increase observed is consistent with the rise in unmeasured household properties reported in Line 3.

Line 7 – Household properties (water supply area)
We note that the number of household properties connected in the Company's water supply area has increased by circa 8,357 since 2011/2. We have checked that the Company calculated this number as the total number of domestic connections (including voids) less those customers who are connected for sewerage only or receive water from well supplies.

Line 8 – Non-households billed unmeasured water
As expected we note that the number of non-households billed for unmeasured water within the supply area has decreased by circa 1,047 (9%) during the year.

The decrease observed is also a result of the Company's non-household metering programme. We reviewed the Company's progress in delivering this programme and our commentary on delivery of the programme this is provided in Table 8.

Line 9 – Non-households billed measured water
Our audit indicates that the Company has followed their stated methodology in preparing this line.

We note that the number of non-households billed for measured water within the supply area has slightly increased by 484 properties (1%) since 2011/12. A sum of Table 8 Lines 7 and 8 – Meters installed (selective and FMO) is 787. We would have expected to observe a corresponding increase in the number of measured properties reported in this line.

Line 10 – Non-households billed water
This is a calculated line and is the sum of Lines 8 and 9.

Line 11 – Non-household properties (water supply area)
We note that the average number of connected non-household properties within the water supply area, including void properties, has decreased by 606 (0.7%) from 11/12. Similar to Line 7, this number is calculated as the average of gross non-domestic, less those customers who do not receive a water supply or are connected for sewerage only. As reporting methodologies become embedded over time we would expect the number of properties reported within this line to remain relatively consistent over time.

Line 12 – Void properties
As mentioned above, although the differences are very small, the numbers of voids as at 1st December 2012 and 31st March 2013 are incorrect. We believe that the voids as at 1st December 2012 should be 52,852 and the number on 31st March 2013 should be 52,760.

Correct version as below:

Property Numbers	1st April 2012	1st Dec 2012	31st March 2013
Unmeasured Water Household	676,970	682,855	685,219
Unmeasured Water Non-Household	11,267	10,744	10,525
Metered Water Non-Household	68,860	69,504	69,456
Voids	53,270	52,852	52,760

We note that the average number of void properties has increased by 34 (0.1%) from 11/12. The number reported in this line has remained relatively consistent from that reported previously in AIR12. NI Water defines properties within this line as those which are connected to the distribution system but do not receive a charge as there are no occupants as per the Reporting Requirement.

NI Water confirmed the following for their Non Household Test Meter customers, Non Household Site Meter customers and Unmeasured Non Household which are currently not charged.

NHH Test Meter: Even though the test meter project is now completed – there are circa 2,000 test meters which need further reviewed before a billing decision is finalised e.g. shared supplies, unable to locate etc – therefore for reporting they have been kept as test meters until a change has occurred on the billing system.

NHH Site Meter: these are properties which are linked to another property that has a primary meter. This category ensures NI Water holds the property appropriately on Rapid and ensures they do not bill it directly for water. NI Water keeps such records to enable us to ascertain what our water supplies serve, for property count purposes and MIP situations.

NHH Unmeasured not charged: The 'unmeasured not charged' category is primarily used on the non-household side - NIW and Fire Authority connections making up the majority of this category. On the household side, the difference between the 'unmeasured' and the 'unmeasured not charged' is that NI Water would bill the properties in the unmeasured category if domestic charging was introduced, whereas they would not bill those in the 'unmeasured not charged' category.

4.4 Reconciliation of the property numbers

Whilst the Reporting Requirements ask the Company to provide a reconciliation of the property numbers in Table 7 to the figures reported in Table 2, the Company has not commented. We provide our understanding of the reconciliation here.

uNHH	18,265	T7L11
mNHH	74,253	
uHH	694,060	T7L7
mHH	30,400	
Test meter (mHH not charged)	402	
Site meter	579	
Unmeasured not charged	1	
Total	**817,960**	

In the table above, a sum of Table 7 Lines 7 and 11 as at 31 March 2013 equals to Table 2 Line 1.

4.5 Population

Total population is derived from 2010 based population projections obtained from the Northern Ireland Statistics and Research Agency (NISRA), which are provided for the year ending 30th June. In order to comply with the Utility Regulator's guidelines, NI Water reports a mid year average population for Table 7. For AIR13, NI Water has extrapolated between the June 2012 and June 2013 estimate, in order to derive a September 2012 (mid year) estimate of 1,818,470 (1,808,820 for AIR12, an increase of 0.5%). This population is then assigned to the various categories required for Table 10 using the approach outlined below and summarised in Figure 7.1.

We are aware that companies in England and Wales that use census derived data to estimate populations can see large fluctuations when estimates are updated. We challenged the company to explain how it would handle any large fluctuations in population estimates should they arise. The company explained that from its experience the population forecasts within Northern Ireland are significantly more stable. This is likely to be due to the smaller and more defined location and greater knowledge of any movement of population into and out of Northern Ireland. As stated in the company's commentary the difference between the forecast and actual 2011 census population for May 2011 is only 158 (<0.01%).

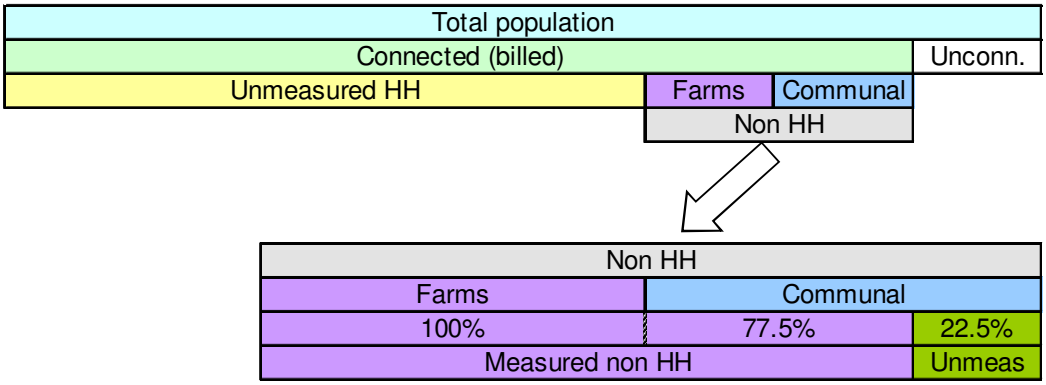


Figure 7.1: Population Estimates

The Company advised that the total population (Line 17) is adjusted to account for the number of properties within the province without a water connection. This line is derived from the RAPID database number of unconnected properties of 8,016 (6,080 in AIR12 and 7,994 in AIR11) and an occupancy estimate of 0.866 (the same as AIR12 and AIR11). The occupancy estimate is taken from the NIHE Housing Condition Survey.

The non-household population is based on the population associated with measured farms and the population in communal residence. The communal population (31,570) is based on the latest NISRA 2010 based Census estimate, which shows a small (1%) increase from the estimate used in AIR12. The communal population is split between unmeasured and measured on a pro-rata basis consistent with the measured non-household split reported in lines 8 and 9, after excluding farms. The split is 77.5%:22.5%, which results in 7,110 being assigned to unmeasured non households (Line 15) and balance of 24,459 being added to the measured non-household. The unmeasured non-household population has decreased by 500 (7%) from AIR12.

The farm population is derived from the number of metered farms (31,676) from RAPID and the average NI occupancy rate (2.47), giving a total 78,240. The total measured non-household population is the sum of communal measured population and the farm population giving at total of 102,699 (line 16). This value is virtually identical to AIR12, being only 39 higher.

Unmeasured household population is reported as the balance when the non-household population (farms and communal properties) is deducted from the total connected population, giving a value of 1,709,661 (Line 13). This is a 11,111 (0.7%) increase from the AIR12 value.

5. Confidence Grades

5.1 Properties

As we described in Section 4.2, we challenged a number of aspects relating to new connections data and the system to derive the Table 7 figures. Following our sample audit this year, we remain concerned about the numbers of new connections. Therefore we are not confident that the system is capturing the correct details necessary to accurately report the data required. The Company's billing system, Rapid, has been used to extract the figures for Table 7 since AIR07, and the new connections data has been embedded into total number of households/non household numbers (Table 7 Block B) since. We therefore believe that as the latest new connection figures contain material categorisation errors, this will be reflected in the historic data and will impact on the accuracy of Block B.

We also noticed during our DG8 audit that although there was no leakage reported, some measured properties see high consumptions while void inspectors report the properties as void. In such instances there is a risk that a number of voids could be overlooked. There is no follow-up system in place to scrutinise the allocation of such properties. NI Water added that this is a known issue and as such is listed as one of

the Data Quality Projects (Business Improvement) projects which is to be undertaken under the Data Integrity Group.

NI Water explains that as they have introduced an automated tool to populate the Table 7 figures, the confidence grades should be A. This improvement will have made the process more robust. Nonetheless, the concerns expressed in our Undertaking A report on NI Water's lack of direct access to their unmeasured customers base (which would help ratify the numbers) remain.

5.2 Population

As we reported in previous years we do not consider it reasonable for NI Water to be required to provide confidence grades against population estimates as we do not feel this provides any discernible value to the Utility Regulator, as the data has been primarily sourced from the NISRA website. With the exception of a number of minor adjustments/assumptions made by NI Water the reported data is public domain information and NI Water has no influence on the methodology adopted by NISRA.

However, the Company has made a reasonable attempt at assigning confidence grades to this data. Based on its understanding of the NISRA methodology and the degree to which NI Water has allocated the total population between customer types, we consider the confidence grades are probably appropriate.

We recommend that NIAUR reconsider their requirement for NI Water to report confidence grades against population data. NI Water has no real influence over the derivation of this information, and unless they commission their own annual population survey it will be difficult for NI Water to improve this methodology and thus confidence grades in the future.

6. Consistency Checks

The number of void properties should be consistent with the following calculation:
(Line 11 – Line 10) + (Line 7 – Line 6) = Line 12

When we carry out the same calculation, these are consistent.

The total population (Line 17) is identical to the total population reported in Table 10A (column 11).

Date: 29 July 2013
Prepared by: HMS

Table 8 – Non financial measures – Water Metering (Lines 1 – 12)

Commentary by REPORTER

1. Background

Table 8 is designed to track activity installing meters against planned activity. It also typically provides summary information on the demand of household customers after having a meter installed.

2. Key Findings

- NI Water reports that meters have been installed on all new properties and that it has made good progress with metering of non-household customers.
- There is a significant difference between the number of domestic meters installed (Table 8, line 1) and the number of new domestic properties (Table 7 Line 1). This data is derived from different sources, but we consider the current difference is too large to be due to phasing issues. We therefore challenged the company to explain this difference who explained that it had identified unsatisfactory processes within its metering contractor during the report year.
- The processes for metering new properties are being revised for 2013-14; in recognition of the fall in data quality we agreed with the company that the confidence grade for line 1 should be downgraded from B2 (± 5%) to B3 (± 10%). However we note this change was not included in the final table.
- The Company has not met the targets set out within Appendix 19 of their response to the draft determination; a total of 454 installations have been reported against a target of 1,000. The Company explained that it had undertaken surveys at 3,731 properties but was unable to install a meter for a number of reasons, the most significant problem, which accounted for 943 of the surveys was the property being on shared supplies. Other reasons included the identified property having ceased trading, changed to domestic or already metered.
- Methodology to calculate consumption at recently metered properties has changed from AIR12. In AIR13, data for this calculation are from meters installed since 2006 to 2013.
- We believe that the methodology does not capture appropriate data. For example, the calculation should exclude consumption from the properties which had not completed the first year of measured charging in 2012/13.
- The confidence grade for Line 13 is not appropriate.

3. Audit Approach

The audit consisted of an interview with the NI Water system holders to discuss the methodology and data that has been used to populate this table as well as plans for improving the data in future years.

4. Audit Findings

The Company confirmed its metering policy:

- Household: includes installing meters on all new connections as per the obligation associated with Article 81 of the Water and Sewerage Services (Northern Ireland) Order 2006.
- Non-household: metering of all non-household customers where possible.

NI Water has been increasing its meter penetration across its non-domestic customer base through selective metering or customer optants. The Company also reports that it has metered 454 against the target of 1,000 large volume non-domestic customers as outlined for 2012/13 in Appendix 19 of their response to the draft PC10 Determination. Further commentary on these installations is provided below.

4.1 Block A – Household Installations (Lines 1 to 6)

Within line 1 of the table the Company have reported the number of meter installation at new domestic properties. The number of installations reported (3,078) is circa 25% less than the number of new domestic properties reported in Table 7.

Over the last three years since this line was introduced there has been an increasing discrepancy between the number of new domestic properties reported in Table 7, and the number of domestic meters installed. The Company has confirmed that all domestic meter installations are made within an existing boundary box. Table 8 refers to meters fitted (from the works management system) whereas Table 7 refers to properties added to the billing system. In AIR12 we considered this could have been due to the significant time lags between carrying out metering activity and recording, however we now consider this discrepancy is larger than we would have expected from a phasing issue, and could indicate meters not being installed or increasing delays in installation.

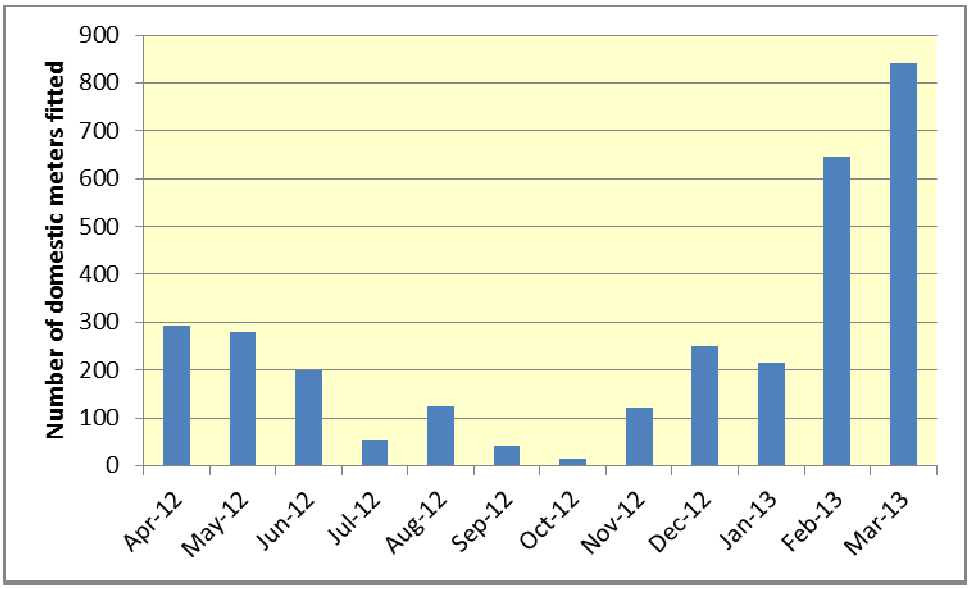
		AIR11	AIR12	AIR13
Number of new domestic properties (Table 7, line 1)	'000	4,748	3,838	4,154
Number of new domestic meters (Table 8, line 1)	'000	4,427	3,458	3,078
Percentage of meters installed	%	93%	90%	74%

The Company explained that [

x

]

The Company provided us with a spread sheet that contained details of all domestic meters installed which confirmed the total number of installations. We reviewed the monthly profile of meter installations, as shown in the following graph.



We challenged the Company to explain the large variation in the monthly profile which varies from 14 in October 2012, to over 800 in March 2013. The Company explained that the issues with the metering contractor had come to light during the year, so the changes from October onwards are the result of the revised processes that were put in place.

The company also explained that it put a temporary moratorium on new connection meter installations at the start of 2013-14 to ensure a close-out of the 2012-13 numbers. This moratorium will have an impact on the profile for AIR14.

4.2 Block B – Non-household installations (Lines 7 to 12)

4.2.1 Line 7 – Selective Meters Installed

The Company reports that 692 meters were installed under this category. The Company provided a spreadsheet that supported the calculation of this number. We found that the majority (454) of the meters installed relate to the properties identified with the Company's Appendix 19 response to the PC10 Draft Determination.

The remaining meters (238) were installed as a result of the metering of new large diameter connections and other installations performed by the metering section staff.

The Company explained that they had been working hard with its metering contractor to reach the target, but had encountered problems identifying large consumption properties suitable for metering. When suitable properties were identified these were then sent to the metering contactor. A total of 3,731 (an increase from 3,400 in AIR12) properties were sent to the metering contractor. However, a large number were not suitable for metering due to a number of reasons including, but not limited to, having

shared supplies (943), changed to domestic (186), vacant (271), engineering difficulties (82) or already metered (546). We are satisfied the Company made a realistic attempt to reach the target number of 1,000 meter installations.

The Company proposes a much lower level of meter installation for PC13 period.

4.2.2 Line 7a – Number of non-household meters renewed

NI Water reports that 4,653 meters were renewed during the Report Year, which is significantly lower than AIR12 (8,722). The Company explained that the replacement/renewal is driven by the ability of meter readers to obtain a meter reading. Where a meter cannot be read, either due to failure or the location of the meter then a meter maintenance request (MMR) is generated. The Company's target to meet DG8 (meter reading) in 2011-12 led to an increase in meter replacement which was then scaled back in 2012-13.

We found that the Company currently assumes the lifespan of a meter to be circa 17 years and where a meter is removed for testing (and replaced with a new meter) then this would count as a renewal and reported within this line.

4.2.3 Line 8 – Meter Optants installed

NI Water reports that 45 (67 in AIR12) non-household customers opted to have a meter installed.

4.2.4 Line 9, 10 and 11 – Meter Location

Within these lines the Company reports the location of the meters they have fitted. NI Water's preference is to fit meters externally where possible but a number of installations have been reported as internal fits.

We confirm that total number of meter installations reported in Line 7 and Line 8 equals the number of meters reported in Lines 9, 10 and 11.

4.2.5 Line 12 – Meter installations requests outstanding greater than three months

In total the Company reports that 10 installation requests were outstanding for greater than 3 months. NI Water advised that a small number of requests may take an extended period of time due to the complexity or type of installation required.

We reviewed the Company's spreadsheet of meter requests and confirm there were 10 installations that took longer than 3 months in 2012-13. Of the installations that took greater than three months the average was 5 months, with the maximum being 196 days (6.4 months).

4.3 Water demand at recently metered properties

We have checked NI Water's calculation of this volume and confirm it is consistent with the audit trail supplied. We found that the Company had extracted all recently metered property data where readings had been taken using a report generated from Rapid, which equates to 907 records. This excludes meters which have 0 cubic

meters consumption and no meter reading taken in 2012/13. We believe this is reasonable as the inclusion of any of the components would skew the estimate made.

However, while we reviewed the list of 907 records, the list includes the meters which were installed before 2011/12 (i.e. 31 March 2011) and after 2011/12 (i.e. 1 April 2012). The Reporting Requirement states that *'Average volume of water billed … that complete the first year of measured charging in the report year'*. We queried the Company on this. NI Water explained that all properties included in their calculations are properties which were uploaded onto Rapid in 2011/12. The delays in uploading are as a result of a backlog in the uploading of meters and possibly due to a query either on the account or with the meter detail. We believe this is reasonable. The Company also explained that the meter installations at properties after 31 March 2012 are meter replacement and these properties should be included in the calculation. We believe that meter replacement is not classified as recently metered properties and these properties should be excluded.

When we asked the Company on the first billing dates for these properties, we found that a property had not completed the first year of billing based on measured charging before 31 March 2013. Due to the timing we did not carry out further investigation. We believe that the current methodology is not calculating the figure accurately and this reflects the confidence grades.

We recommend the Company to revise their methodology to capture all of the Reporting Requirements.

5. Methodology

5.1 Meter Installations

We found that the number of meters installed, and reported in Table 8, is derived from the Company's contractor's records. During the audit we discussed the process by which meter installations are requested and raised and the interaction between the Company's various systems and Directorates. The following provides an overview of these discussions:

- Customer driven new connections are processed through the Customer Services Directorate and a job request is raised on the Company's Work Management System and closed once the connection is complete.
- New connections meter installations are automatically scheduled by the metering contractor as a result of the new connection instruction.
- For selective metering the Company raises an order with their metering contractor who surveys and installs the meter at the requested property.

Due to the inconsistencies between the contractor records (Table 8) and the number of new properties (Table 7) the Company is proposing changing its reporting process for AIR14. The Company proposes to use information from its own database to determine when meters have been fitted, although we understand this would still rely on records

from the metering contractor. For AIR14 we would expect the Company to fully document any changes to its methodology.

5.2 Water Demand at recently metered properties

NI Water provided the list of properties which were uploaded onto Rapid in 2011/12. We checked this and confirm they have correctly excluded the properties with FMO, HH (including HH use at NHH property) and various other means of supplies such as free supply and DRD.

NI Water explains that they now use an extracted data directly from Rapid. They also added that as the uploading to Rapid does not always complete on the day of installation, properties may not have completed their first year of charging in 2012/13. Therefore they used properties where meters were installed from 2006 to 2013.

6. Assumptions

Except where noted above we do not believe there are any material assumptions to report.

7. Confidence Grades

During the audit we discussed the confidence grades assigned and the Company's rationale and in the majority of cases we concur with the grades assigned to each line.

The data from Line 1 is derived from data supplied by the metering contractor, therefore due to the issues discussed previously we agreed with the company that is should revise the confidence grade for this line from B2 to B3 to reflect the greater uncertainty. However, this change was not included in the final table.

Lines 7, 7a and 8 have seen a continual improvement since AIR10, but we do not, however, feel that this improvement is sufficient to merit moving from B2 to A2 at this stage.

The data and the calculation are appropriate to derives Line 13, however the stratification of the data is not appropriate to calculate the reported figure. As described in section 4.3, we believe that the confidence grade is not appropriate for AIR13.

8. Recommendations

We recommend the Company to revise the methodology to capture all of the criteria in the Reporting Requirements. We have proposed a couple of options which NI Water could consider. The Company confirmed that the methodologies proposed will be taken into consideration when preparing this figure for AIR14. A further check will be incorporated into this calculation next year to ensure measured consumption billed is for at least year.

Date: 29 July 2013
Prepared by: HMS

Table 9 – Non financial measures: Water quality

Commentary by REPORTER

1. Background

This information (along with DWI reports) will be used to examine performance with quality standards, the outputs funded in Price Controls 2010 and the quality of the water received by customers.

2. Key Findings

- There was a slight decrease in Mean Zonal compliance, OPI, and compliance at WTWs and SRs largely due to the increase in number of iron exceedance.
- No existing or new 'Legal Instruments of Work', or Authorised Departures for distribution input were in effect at the end of the Report Year.
- Further improvements to plumbosolvency reported during the year, with 99.5% zonal compliance with the current 25 µg/l target limit for lead.
- Declaration of 3 CPEOs covering MCPA, THMs and various parameters.

3. Audit Approach

The audit consisted of an interview with the NI Water system holder and a review of relevant documentation, system methodology and data used to compile Table 9. Spreadsheets behind the table numbers were also examined to verify calculations. The audit also included a review and comparison of the Company's commentary and table data with previous year submissions.

4. Audit Findings

4.1 General

As the DWI requires calendar year reporting, the Company also continues to report Table 9 based on a calendar year. For calculation purposes, the total average daily input applied to the 2012 calendar year was 563.648 Ml/d, a slight (6%) decrease from the 2011 figure of 601.801 Ml/d. We verified this and individual inputs against the source flow data.

Mean zonal compliance
This year, NI Water reports a steady level of overall Mean Zonal Compliance to 99.80%. The slight decrease in water quality was observed due to the increase in iron and pesticide exceedances.

Operational performance index
Following an improvement in performance last year, the Operational Performance Index has decreased to 98.96%. The Company explained that the wet weather experienced across Northern Ireland in 2012 had the effect of scouring much of our

distribution system. It is felt that this has caused to the higher level of exceedance for iron in 2012.

Number of WSZs
As in previous years, NI Water has continued to conglomerate some Water Supply Zones (WSZs) with the resulting decrease in number of WSZs this year to 52 from 53 in 2012. NI Water advised that these changes were largely as a direct result of the closure of a borehole and the need to align the zones to suit the new supply arrangements.

The site decommissioned during the year (Lenamore Spring) is not included, although we note that this has had no impact on the line totals this year.

4.2 New Legal Instruments of Work and Work Programmes

The Company confirmed that they have not agreed to fulfil any new Legal Instruments of Work or Authorised Departures for distribution input this year. All Authorised Departures in place were issued prior to 2011.

No new legal instruments relating to turbidity, *Cryptosporidium* or plumbosolvency have been agreed this year.

We queried NI Water has not needed any new legal undertakings for the last few years. They believe that this has been achieved through good communication and an open and honest relationship with DWI. Specifically, NI Water advised that they hold monthly meetings with DWI and provided quarterly progress reports to them to discuss potential issues. They also inform DWI for any changes, incidents and near misses whenever they occur. We therefore remain satisfied that the Company appears to be taking timely and appropriate action to identifying and resolving problems and that they are working in full co-operation with the DWI.

4.3 Water Treatment and Distribution Inputs (Lines 1 – 3)

There is no outstanding Authorised Departures from previous years; therefore the reported Line 1 total of zero is confirmed as the correct summation of the volumes of distributed water affected for all legal instruments still in place on 31st December 2012. NI Water confirms that there are no other legally binding instruments in place.

NI Water confirmed that no new Authorised Departures, Article 31s or other legal instruments have been agreed this year and hence there are no contributory sites to Line 2. The total number is therefore correctly reported as zero.

The percentage total in Line 3 is based on comparison with actual flow data recorded at each WTW. As there are no Authorised Departures in place at the end of the year, the figure is 100%.

We reviewed the data behind the line totals and can confirm that the calculations appear correct and accurate.

4.4 Distribution Systems (Lines 4 – 5)

The totals in Lines 4 and 5 are made up from the properties within WSZs affected by the any Authorised Departures applied to the distribution system and still in effect at year end. The Line 4 percentage is therefore correctly reported as zero.

There were no new legal instruments received this year and hence there are no contributory zones to Line 5. The percentage is therefore correctly reported as zero.

We reviewed the spreadsheet behind the Line figures and can confirm that the percentages for Lines 4 and 5 have been correctly calculated from the number of properties within the affected WSZs.

4.5 Raw Water Deterioration (Line 6)

In 2012, one CPEO was issued at Dorisland WTW for pesticide exceedances. Therefore, Line 6 includes volume from this site which is 23.10Ml/d. We reviewed the Company's data and confirm the table entry is consistent with the data.

As detailed in the Company's commentary, the Authorised Departures at Altmore WTW and Lough Braden WTW relating to pesticides expired prior to 2012, therefore these are not included in the calculation.

Dorisland and Camlough WTWs are under enhanced monitoring programmes on MCPA since 2006/07. During 2012, a further 7 sites; Ballinrees PPP, Derg, Killyhevlin, Belleek, Clay Lake, Seagahan and Carran Hill WTWs, are under enhanced sampling programmes but no Authorised Departures are in place. Hence these are not included in the calculation.

4.6 Plumbosolvency (Line 7)

As stated in their commentary, NI Water currently has a policy of orthophosphoric acid dosing at their treatment works to control plumbosolvency in the distribution system. This affects almost all water entering supply with the exception of the small number of remaining boreholes which are largely programmed for abandonment. In total 100.0% of water entering supply is currently dosed. Dosing levels are based on compliance with the lead target of 10µg/l, although regulation is currently based on a 25 µg/l limit. The dosing programme is optimised annually. Rathlin Borehole was not dosed in 2012.

	AIR11	AIR12	AIR13
T9 L7	623.693 Ml/d	601.801 Ml/d	563.648 Ml/d
Average DI	626.64	604.08	563.73
T10 L26	625.15	583.93	558.82
% of dose base on average DI	99.5%	99.6%	100.0%

Please note that after NI Water's submission we found an inconsistency between the Table 9 entry and the commentary. The Company also found a mistake in their data to derive Line 7 figure. We reviewed the revised data, Table 9 and the commentary

and can confirm that the figures in all 3 documents are now consistent.

In 2012, NI Water has agreed with DWI the reduction of the dosing rates at 2 sites where the Company believed some rationalisation could be applied. There is also a site which has not met the criteria in 2011 but the phosphate does rate remains at 2011 level. NI Water confirmed that these sites are monitored and that they remain committed to working with the DWI towards achieving the future lead target of <10µg/l in all zones by the end of 2013.

We reviewed the overall performance of the dosing with NI Water who informed us that total number of sample failures above the lead target of 10µg/l has continued to decline from 52 in 2011 to 11 in 2012 and with only 0.51% failure above 25µg/l limit. This represents an overall zonal compliance of 99.50% (base on a total sample base of 392).

The Company has no reported changes to existing measures at any site. Although the closure of sites such as Lenamore Spring at the end of 2012 will have affected the figures, the change in the Line 7 totals primarily due to fluctuations in average daily flow volumes rather than any direct change. We reviewed the spreadsheet behind the line total and can confirm that the total is the correct summation of annual flow output volume from all WTWs the exception of the Company's borehole sites where orthophosphate dosing is not applied.

NI Water currently does not have a targeted lead replacement programme in place and replacements of lead communication pipes are done opportunity basis through capital works and maintenance projects.

Line 7 is confirmed as being reported on the situation at calendar year end.

4.7 *Cryptosporidium* (Line 8)

There were no legal instruments in place at the end year for *Cryptosporidium* and hence there are no contributory zones to Line 8. The total numbers is therefore correctly reported as zero.

As pointed out in the Company's commentary, *Cryptosporidium* risk assessments are now captured under other areas and are currently being separately assessed by the DWI.

4.8 Other Parameters (Line 9)

NI Water has declared 3 Consideration of Provisional Enforcement Orders (CPEOs) within this line. Checks confirmed that the CPEOs were in place during the year at Dorisland, Caugh Hill and Lough Bradan WTWs. NI Water has included site specific details in an appendix to their commentary which clearly illustrates the requirements and progress at the site. Having reviewed and discussed the details with the Company, we are satisfied that they have undertaken appropriate actions rectify the issues. We therefore understand that progress remains to the satisfaction of the DWI such that NI Water does not foresee any requirement for escalation of the issue.

5. Company Methodology

The Company explained that there was no change in their methodology.

The Company uses actual flow data records taken over the year to produce an average daily flow volume for each WTW for the calendar year. These totals are used to calculate the figures in lines 1, 2 and 3.

Contributing volume from each works is calculated from the average of the daily flow inputs throughout the calendar year. In line with previous clarification from NIAUR, the Company does not include sites which have been taken offline par-way through a year although they provide full details in their commentary to ensure transparency. We have previously questioned this approach and recommend consideration of an annually averaged value for any site with active legal instruments still in place at year end. We note that due to the number of legal instruments still in place, this has no impact on the figures for this year.

The data spreadsheet can be accessed by the LIMS, Regulation and Internal Audit teams. No one can change the original spreadsheets and the original is downloaded to the LIMS team server and the team can change it. If something looks odd then they can see who saved the sheet last.

6. Company assumptions

The Company makes the following assumptions:

- For Lines 1-5 and 6-9, the average daily flow volumes from WTWs are reliant on the accuracy of flow measurement devices at each site.
- For Lines 4 and 5, the volume of water input to a zone is proportioned to the number of properties in the zone. It is possible that large non-household users could affect this. The Company also utilise a factor to estimate population from the property count based on external statistical data. As the calculation for the line total is based on proportions, this factor is largely irrelevant, although it can impact the zonal size limits and required sampling rate.
- A problem affecting part of a WSZ is deemed to affect it all.

7. Confidence Grades

The Company's confidence grades remain unchanged from last year, maintaining the policy of reporting A2 grades for all non-zero data and A1 for all zero entries. With no significant changes to the methodologies or data techniques and sources, the generally applied confidence grade of A2 is still considered reasonable given the potential for inaccuracies in estimating average flow and numbers of properties.

Date: 29 July 2013
Prepared by: HMS

Table 10 – Water Delivered

Commentary by REPORTER

1. Background

The information in this table records the total volume of water delivered to measured and unmeasured households and non-households and the assumptions which companies have made in determining their overall water balance, including; per capita consumption, meter under-registration and unmeasured non-household use.

2. Key Findings

- We confirm that the Company has adopted the principles of NERA/UKWIR Demand Forecasting Methodology for estimating the components of the water balance.
- The Company has reported a fall in leakage from 168 Ml/d to 162 Ml/d.
- The Company has now implemented an improved leakage management software package. The Company estimates the revised method of calculation will lead to an increase in leakage of approximately 8 Ml/d. When the improved accuracy of leakage estimation is used within the MLE adjustment this results in a post-MLE leakage of 170.73 Ml/d. This change has been recognised by the Regulator when setting the AIR14 leakage target of 169 Ml/d. We recommend that any changes in leakage during 2013-14 should be compared against a value of 170.73 Ml/d, and not the value reported in the AIR13 table.
- The Company has maintained a number of assumptions used within the leakage calculation (such as hour to day factor and night use allowances for example) consistent through the PC10 period. We recommend that these are now updated, which the Company intends to do as part of Sustainable Economic Level of Leakage (SELL) update. During this process we consider it essential the Company understands the impact both the SELL and on the on water balance for AIR14.
- The Company has provided a detailed commentary on the water balance for AIR13.
- Distribution input has fallen by 25 Ml/d (4%). This decrease has been due to the decrease in leakage and a decrease in demand driven by both the weather (cool, wet) and the economic conditions.
- For AIR13, the pre-MLE estimate of distribution input (559.41 Ml/d) exceeded the sum of the components of the water balance by 7.21 Ml/d (1.29%), which is well within the 5% threshold set by the Utility Regulator and shows a further significant improvement from previous years 2.32% at AIR12 and 4.14% at AIR11.
- The Company has achieved a SOSI score of 100, which has largely been driven by lower distribution input. We identified that the changes to the parameters of the SOSI calculations, at Company level since AIR08, has resulted in a significant year-on-year improvements from -26 (AIR08) to 45 (AIR09) to 88

(AIR10) to 97 (AIR11) to 100 for AIR12 and AIR13 for the dry year average planned Levels of Service (LoS) conditions.

- The SOSI has been calculated by reference to figures contained within the Water Resources Management Plan. Full details on the changes in the SOSI base data from previous years, and the consistency with the WRMP is presented in our Commentary on Table 10a.

2.1 Recommendations

Over recent years the Company has made significant improvements to the water balance calculation. We do not consider further step changes are required, but recommend that the Company undertakes an on-going programme to refresh the assumptions/estimates. Some minor components could be reviewed on a 5-year cycle, whereas others should be reviewed on a more frequent basis.

During 2013-14 the Company will be developing a updated SELL, so we consider this year provides an opportunity to review the leakage assumptions, including supply pipe leakage, hour to day factor and night use allowances. When undertaking any revisions to these assumptions it is important that the Company considers the impact on the wider water balance calculation and not just the leakage component(s).

Some of the least robust components of the water balance are the estimates of service reservoir and trunk mains leakage. The Company is part-way through a study to develop Company specific estimates for these two components based on flow data. Although the Company needs to complete validation of the data the initial indications are that it should be able to prepare more robust estimates of these components of leakage. Many companies within England and Wales still rely on the use of default values so if the Company is able to complete the study and develop robust estimates of these components of leakage it will be a leader in this field.

3. Audit Approach

The audit consisted of an interview with the system holders and a review of documentation, systems and data used to generate the water balance for AIR13.

4. Audit Findings

We confirm that the Company has adopted the principles of NERA/UKWIR Demand Forecasting Methodology for estimating the components of the water balance.

As stated in the Company's commentary the weather in 2012-13 was cool and wet, which was demonstrated by rainfall, temperature and sunshine records. This weather has led to a reduced demand and also ensured there was no winter peak in leakage. Leakage has fallen from 168 to 162 Ml/d; the leakage target of 168 Ml/d has been met.

The Company has transferred to a new leakage management software package; this will increase the robustness of leakage data for operational management and annual reporting. All AIR13 leakage estimates have been derived from the old system

(TDMS) but the Company will use the new system (Netbase) for leakage management in 2013-14 and for AIR14. The Company has calculated the revised method of calculation has lead to an increase in leakage of 8 Ml/d, but when the impact of the revised accuracy is included within the MLE adjustment post-MLE leakage increases to 170.73 Ml/d. This is consistent with the analysis we undertook in November 2012 based on mid-year estimates. We consider this a reasonable estimate.

4.1 Overview of Water Balance

NI Water has reported an annual average leakage of 161.75 Ml/d at year-end, a decrease of 6.48 Ml/d from that reported for AIR12. The Company has therefore met its leakage target of 168 Ml/d for AIR13.

The imbalance in the water balance has fallen again this year, from 2.32% at AIR12 to 1.29% at AIR13; we consider this is likely to be due to both better/more robust data and due to the benign weather experienced within the year. We consider the Company should expect to achieve an imbalance of around 1-2% in future years, and investigate if it should increase outside this range.

The following table compares the water balance for AIR13 with that for the previous year.

Component	AIR12			AIR13			Variance for the year (Ml/d)
	Initial Estimate (Ml/d)	Accuracy (%)	Final Estimate (Ml/d)	Initial Estimate (Ml/d)	Accuracy (%)	Final Estimate (Ml/d)	
Measured Household Consumption	0.00	10	0.00	0.00	10	0.00	0.00
Measured Non-h'hold Consumption	128.41	10	129.64	120.83	10	121.44	-8.20
Unmeasured Household Consumption	294.84	10	301.31	293.83	10	297.41	-3.90
Unmeasured Non-h'hold Consumption	7.55	15	7.56	6.86	15	6.87	-0.69
SPL	46.31		46.31	46.31		46.31	0.00
DSOU	2.97	25	2.97	2.36	25	2.36	-0.61
Water taken unbilled	20.33	25	20.52	15.24	25	15.30	-5.22
Top Down Leakage	177.30			166.59			
Distribution Input	585.09	2	583.93	559.41	2	558.82	-25.11
Bottom Up Leakage	163.74	15	168.23	159.38	15	161.75	-6.48
Water Balance Variance	23.56 (2.32%)			7.21 (1.29%)			

We provide additional comment on the various components of the water balance and explanation for the above variances in Section 4.2 of our commentary below.

4.2 Water Delivered – Volumes

4.2.1 Measured Volumes (lines 1 to 3)

Line 1 represents the average volume of water delivered to households which is measured. Legislative changes and deferral of charging by the Northern Ireland Assembly in March 2007 means that household customers are not issued with bills for water usage. Therefore no value is reported for billed measured households, which is consistent with previous years.

Line 2 – Billed measured non-household, corresponds to the average volume of water delivered to non-households which is measured. These volumes are determined from the Company's customer billing system Rapid and do not include test meter volumes, trade effluent volumes, free supplies or NI Water supplies.

We note that the reported value for water delivered to measured non-households has continued to decrease from 129.64 to 121.44 Ml/d after a similar fall last year, we consider the fall this year is likely to be a combination of the impact of the weather and the economic conditions.

In terms of supply pipe leakage, the Company has not added an allowance for this as all measured non-households are externally metered and the billed consumption would already include it. In terms of meter under-registration, following a NI Water project undertaken during AIR10, a Company specific value of 8.33% has been added.

The confidence limit of 10% on this component has not been changed and is considered to be appropriate.

4.2.2 Unmeasured Volumes (lines 4 to 6)

Line 4 - NI Water has calculated the volume of water delivered to unmeasured household properties by applying its estimates of unmeasured population, the regional average per capita consumption (adjusted for MUR) and supply pipe leakage for unmeasured households.

Line 5 - NI Water has based the water delivered to unmeasured non-household properties on the actual consumption of comparable measured non-households, the number of connected unmeasured non-households (excluding voids) and MUR. To assess the consumption of unmeasured non-households, NI Water undertook an analysis of consumption at measured non-household properties and derived a weighted average consumption for property types matching unmeasured categories. Average consumption in each property category was then assessed, excluding the highest 10% and lowest 10% in each category (which excludes outliers from the analysis), and an average total consumption of 198.01 m^3/yr which is an increase from the value reported in AIR12 (191.21 m^3/yr) but still lower than the value for AIR11 (211.65 m^3/yr).

This estimate of PPC is then multiplied by the total number of connected

unmeasured non-households (excluding voids) and adjusted for MUR (8.33%) to derive a total volume of 6.87 Ml/d (a reduction of 9%). This decrease, despite the increase in per property consumption is driven by metering an additional 737 non household properties (Table 8, lines 7 and 8). We consider this to be an appropriate means of deriving unmeasured non-household consumption.

4.3 Water Delivered Components

4.3.1 Unmeasured Water Delivered per Property (lines 7 & 7a)

These are calculated lines.

The estimated volume of water per unmeasured household (UHH) was based on estimates of unmeasured PCC, occupancy rate, SPL and the number of UHHs. We checked the basis of the calculations and for consistency between water delivered (line 5), the water delivered per unmeasured household (line 7) and the number of unmeasured non-households (Table 7 line 8) and found the results to be consistent.

4.3.2 Unmeasured per capita consumption (lines 8 & 9)

In order to derive a Company specific estimate of the per capita consumption for unmeasured household properties, NI Water maintains a domestic consumption monitor, comprising 104 discrete areas (predominantly cul-de-sacs of similar property types). The areas were designed to predominantly contain a different property type, such that a representative sample of detached, semi-detached, terraced and apartment style housing is included. This approach is in line with the UKWIR report '*Best Practice for Unmeasured Per Capita Consumption Monitors' (1999)* and is consistent with NIAUR's definitions for a B reliability grade.

To ensure the monitor remains up to date NI Water has undertaken regular investigation into the properties within the monitor sites, with 100% of the properties having been surveyed during 2008/09, with a further 30% during 2009/10, 20% during 2010/11, 17% during 2011/12 and 20% during 2012/13. The aim is to visit each site once every five years, and so visit approximately 20% per year. Most customers within these areas are therefore acutely aware that their consumption is being monitored. The Company has therefore added 1.5% to the recorded consumption (Hawthorne Effect). We consider this small adjustment appropriate.

The occupancy rate for the PCC monitor of 2.40 is consistent with that quoted by NISRA in its latest population update, which further confirms the validity and value of the work undertaken.

We checked for consistency between the billed unmeasured HH water delivered (line 4) and the PCC (line 8) and found the calculations to be consistent.

In order to determine an overall average PCC value for the Region, NI Water has employed a multi-regression analysis. We believe this to be an effective technique that reduces the need to separate out property types within each area, and should simplify the process of adjusting the size of their domestic consumption monitor in

the future, as areas will no longer need to be limited to containing just one property type. For AIR13, a pre-MLE unmeasured household PCC of 136.38 l/h/d (137.38 l/h/d for AIR12) was calculated.

For AIR13, NI Water has reported a post-MLE estimate for unmeasured PCC of 149.98 l/h/d, which includes an adjustment for meter under-registration. This represents a 1.9% decrease on that reported in AIR12 and continues the downward trend seen over recent years of 152.82 l/h/d (AIR12) and 164.19 l/h/d (AIR11).

4.3.3 Supply Pipe Leakage (lines 10 to 13)

For AIR09 NI Water re-assessed its supply pipe leakage using the latest best practice principles, described in UKWIR Report "Towards Best Practice for the Assessment of Supply Pipe Leakage". The same approach was used for AIR10. More robust data was obtained for repair times and run times. The numbers of bursts was updated to the 2009/10 values. Company specific values were derived for AZNP and hour:day factor (see below). The estimate of supply pipe leakage for the AIR 10 Water Balance was 46.31 Ml/d; this value has been retained for AIR13.

Application of the UKWIR methodology to a combination of NI Water specific data and UKWIR default values resulted in an estimate of 62.03 l/pr/d for unmeasured households and 31.01 l/pr/d for other customer types.

To allow consistent like-for-like comparison NI Water has agreed with the Utility Regulator to keep supply pipe leakage constant through the PC10 period. We consider this approach will, however, result in a misleading split between supply pipe losses and distribution losses as we would expect both components of total leakage to reduce in similar percentages year-on-year as the Company drives down leakage.

We consider it important that estimates and assumptions used within the water balance are refreshed regularly. We understand that the Company is intending to update its estimate of supply pipe leakage as part of the SELL review. We support this approach and recommend that the Company uses the revised values for AIR14 and within the PC13 and PC15 periods.

4.3.4 Meter under Registration (MUR) (lines 14 & 15)

The MUR estimates are the same as AIR12:

- Household MUR of 7.39%.
- Non-household MUR of 8.33%.

4.3.5 Distribution System Operational Use (line 16)

As was the case for AIR12, NI Water has undertaken a comprehensive assessment of DSOU for AIR13. The assessment, which involved deriving volumes of water used for eight separate operational activities, was based primarily on the recommendations of the UK Water Industry Report D, Appendix F and supplemented using NI Water specific information.

The volume derived for AIR13 was 2.36 Ml/d pre-MLE (2.97 Ml/d for AIR12). We checked the components, assumptions and approach and found them to be largely unchanged since AIR10 and are not considered to materially impact on the leakage estimate or the overall water balance.

4.3.6 Water Taken Unbilled (lines 17 to 19)

Water taken legally and illegally unbilled was based on a variety of different components. We found that the assessment of unbilled consumption is broadly consistent with that used for AIR12, although the Company has continued to work to ensure all components of unbilled consumption are identified, which has resulted in a number of changes. The value reported for AIR13 (15.30 Ml/d post MLE) is 25% lower than the value reported for AIR12 (20.53 Ml/d post MLE) which follows a similar reduction from AIR11 (28.04 Ml/d).

We investigated this apparently significant reduction and found that like in previous years it was due to a number of factors, including for this year lower consumption by sewage treatment works, non-domestic test meters and local council use.

NI Water has made a continuing effort to obtain a better understanding of all unbilled consumption components and has derived a relatively robust list of sources of unbilled consumption. We anticipate that due to the range of different components, which is each estimated independently, will result in year-on-year variability. This uncertainty is recognised within the MLE adjustment by assigning this component 25% uncertainty.

4.3.7 Water Delivered (potable/non potable) (lines 20 – 23)

The total volume of potable water delivered is calculated as the sum of all measured and unmeasured consumption (Lines 3 and 6) and the total volume of unbilled water taken (Line 19).

NI Water has no customers eligible for billing at non-standard rates (line 22).

4.3.8 Total Leakage (lines 24 & 25)

Total leakage is determined from both the top down (as described above) and bottom up leakage estimates.

Bottom up leakage is calculated using a minimum night flow (MNF) methodology. NI Water has an extensive network of DMA's (~ 1,070 in total) covering 99% of properties, from which MNFs are obtained to assess DMA leakage.

The estimate of bottom up leakage is derived from night-flows within DMAs, so require an estimate of night-use within the DMA. This is deducted from the night-flow to develop an estimate of leakage. NI Water estimates bottom up leakage on a monthly basis, by taking the 20th percentile of the daily minimum 15 minute flows into the DMA between 2.00am and 6:00am.

To ensure consistency between reporting years the AIR11 estimate for household night use of 2.42 l/prop/hr has been used. Likewise, to ensure consistency between reporting years the AIR11 estimate for non-household night use of 8 l/prop/hr has been used.

We undertook a sample audit for a randomly selected DMA (Drumnakelly White Mountain DMA) following the data-trail and calculations from the raw nightline data in September 2012 through to the calculated leakage value for the month. We confirm that we found no errors or omissions within the calculation process.

Like many of the England and Wales water companies the estimate of trunk mains and service reservoir leakage is significantly less robust than distribution leakage. The trunk mains leakage is estimated using the trunk mains length and a default leakage per length of mains per year of age. The leakage per length of mains per year of age was taken from 'Managing Leakage'.

The service reservoir leakage is estimated using total volume of service reservoirs and a default level of losses (expressed as a percentage of service reservoir volume). The default level of losses was derived from 'Managing Leakage'. Leakage from service reservoirs is also based on a default value. The Company provided details of an approach that is being developed for AIR14 that makes use of Company flow data; we consider this will provide a significant improvement to the estimate of this component for AIR14.

Trunk mains leakage remains one of the least robust components of leakage for all water companies. A recent UKWIR report presented a range of options; best practice is considered to be the use of metering at both ends of lengths of trunk mains. However, many English and Welsh water companies still rely on simple estimates, similar to that used by NI Water. The Company provided details of an approach that is being developed for AIR14 that makes use of Company flow data. Although there is still a significant amount of data validation required we consider this will provide an improvement to both the management of trunk mains leakage and the estimate of this component for AIR14.

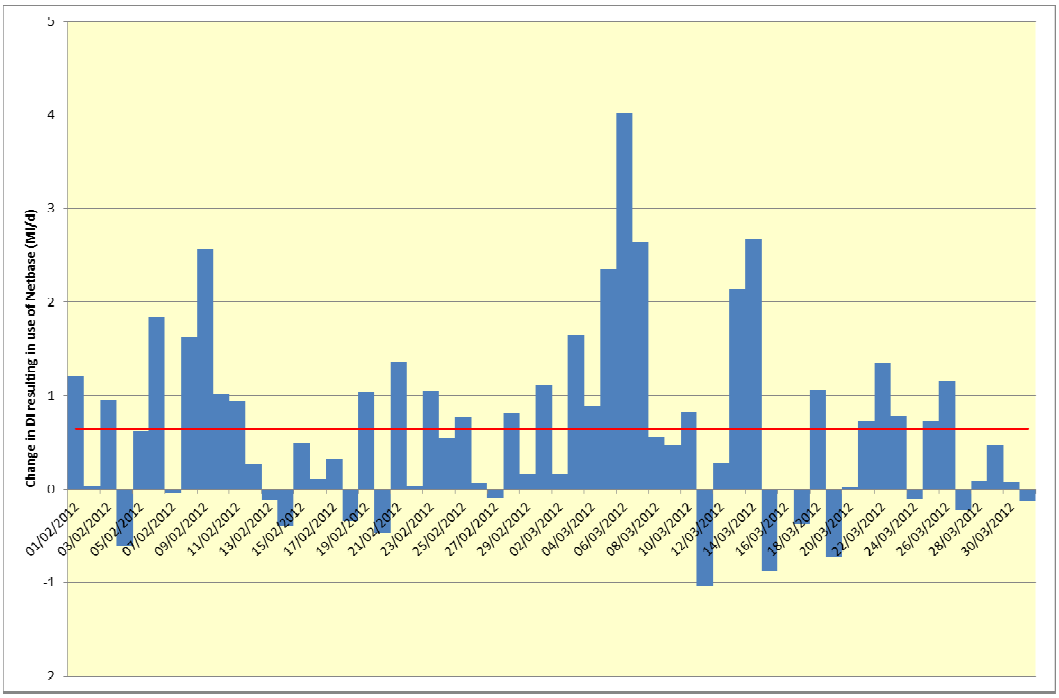
The Reporting Guidelines present a specific calculation for line 25, which is not followed by NI Water; the Company's commentary explains the different leakage values that would be derived if the guidelines were followed. We concur with the Company's conclusion that the value entered in line 25 is an accurate representation of total leakage for the report year.

4.3.9 Distribution Input (line 26)

For AIR13, NI Water has reported a pre-MLE DI of 559.41 Ml/d, some 25 Ml/d below the pre- MLE DI reported in AIR12 of 585.09 Ml/d.

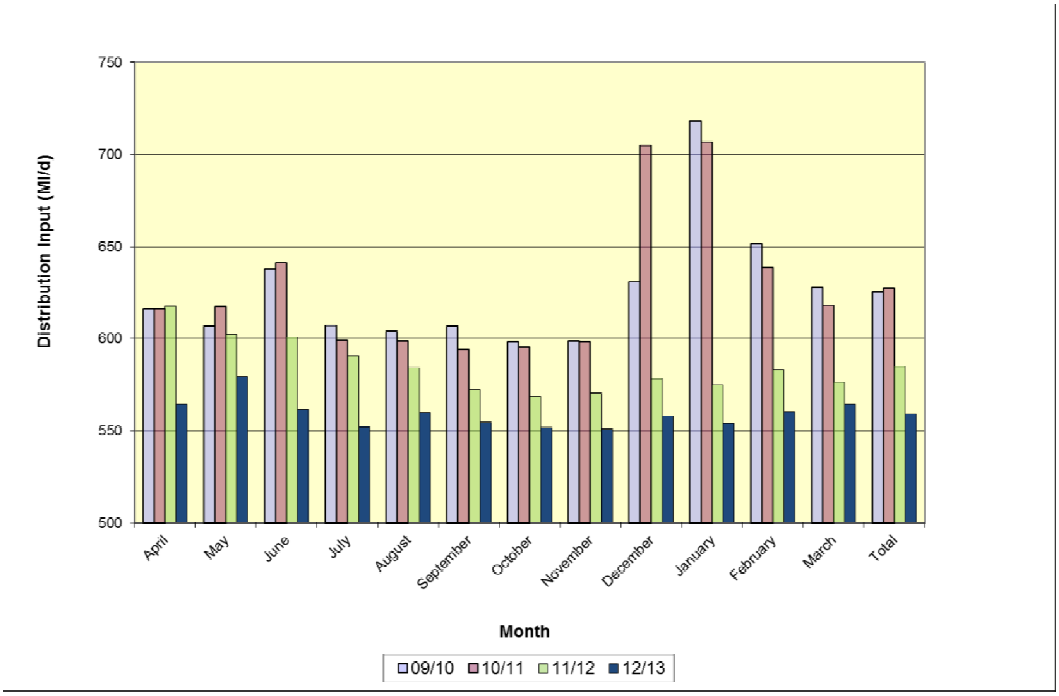
For AIR13 the Company has used Netbase to calculate distribution input. The Company undertook a comparison between the values calculate using the previous system (TDMS) and the new system which identified that, on average, Netbase resulted in an increase of 0.64 Ml/d (0.1%) over the two months used for the

analysis. The following graph demonstrates the daily differences between the two systems for the sample months.



Based on this analysis we conclude there is no material difference between the calculation of DI using either Netbase or TDMS.

We also reviewed the DI profile for NI Water for the report year, as can be seen in the graph below there was a decrease of the order of 15 – 40 Ml/d in all months from the equivalent 2011-12 values. The monthly profile for AIR13 is very flat, with no evidence of either a summer or a winter peak of any significance.



4.3.10 Bulk Supply Imports/Exports (lines 27 & 28)

The small volume of reported exports relate to supplies to 72 individually metered NI Water customers, located in the ROI.

4.3.11 Water Balance by MLE

The Company has estimated total leakage using MNF Analysis and has reported a pre-reconciled total leakage figure of 159.38 Ml/d for AIR13. The integrated flow method as applied by NI Water has produced an imbalance of 7.21 Ml/d, resulting in a final reported leakage figure of 161.75 Ml/d.

The Company has continued to see improvements in the accuracy of the water balance as a result investment in more robust data systems and analysis over recent years. The small imbalance for AIR13 may also be partially due to the benign (cool/damp) weather, but we would continue to expect an imbalance of the order of 2% in future years.

We note that the accuracy estimates applied to individual components used in the MLE are identical to AIR12.

AIR13 is the last year that bottom-up leakage has been estimated using TDMS, and with the introduction of the new leakage management system (Netbase) we would expect the improved accuracy for leakage estimation to be recognised, with a move from the current ±15% to ±10% for AIR14 and beyond.

4.4 Security of Supply Index

Security of supply index – Company's planned levels of service
The SOSI is a calculated column. We confirm that this calculation is correct and is consistent with that reported in Column 14 of Table 10a(i).

The Company has achieved again achieved a SOSI of 100. We identified that the changes to the parameters of the SOSI calculations, at Company level since AIR08, have resulted in a significant improvement in SOSI from -26 (AIR08) to 45 (AIR09) to 88 (AIR10) to 97 (AIR11) to 100 (AIR12 and AIR13) for the dry year average planned Levels of Service (LoS) conditions. Changes primarily result from the lower distribution input. We have checked for consistencies with the WRMP.

Further details are provided in our Table 10a commentary.

We are satisfied that the Company has followed the NIAUR guidelines for the preparation of this index for the planned levels of service for average demand in a dry year.

Security of supply index – reference levels of service
As discussed in our reporting for Table 10a(ii), the Company has not calculated SOSI for the reference levels of service and these are identical to the Table 10a(i) annual average data entries. These would be expected to be different when the Company's planned Levels of Service (LoS) frequency statements are compared with the Reference LoS definitions. The Company reports in its commentary that there has been no separate assessment for a reference level of service and that, as stated in the WRMP, this is not appropriate for NI Water.

We therefore confirm that the value given here is consistent with that reported in Column 14 of Table 10a(ii).

5. Confidence Grades

NI Water reported a confidence grade of C4 for unmeasured non-household PPC.

For unmeasured household PCC, NI Water has reported a confidence grade of B3. This conforms to NIAUR's definition for PCC reliability, grade B, as an area monitor of 104 dead-end sites are utilised and the monitor does not fully comply with the UKWIR report "Best Practice for unmeasured PCC monitors" 1999. With the recent improvements to the PCC monitor we consider a reliability grade A may be appropriate in the future.

For AIR13, NI Water has reported a confidence grade of B4 for Total Leakage. We confirm that the Company estimates leakage using the Minimum Night Flow Method, using night line data that is estimated with Continual Night Flow Monitoring covering over 60% of properties, recorded in excess of 20 times a year, which supports a B confidence grade. Due to the MLE adjustment of 15% applied to bottom up leakage, NI Water has assumed a 4 accuracy band. We believe an accuracy band of 3 may be appropriate from AIR14 now that the Company has commissioned its new

leakage management software.

NI Water has assigned a confidence grade of B2 for Distribution Input. This is consistent with the Company's assessment of the accuracy of the Distribution Input meters being 2.1%.

NI Water has reported a confidence grade of B2 for the overall water balance for AIR13. We challenged the Company to explain why it had not moved to A2 as it now meets the requirements for the confidence grade, particularly since the imbalance is below 2%. The Company explained that it will consider improving the confidence grade for AIR14 and beyond once it has confidence that the water balance imbalance has settled down at the lower level seen in AIR13 and can be maintained in future years.

Date: 29 July 2013
Prepared by: HMS

Table 10a – Non financial measures – Security of Supply Index

Commentary by REPORTER

1. Background

Table 10a calculates the security of supply index (SOSI) for the Company planned and reference levels of service for average demand in a dry year.

2. Key Findings

- The Company has completed the SOSI using data from the Water Resources Management Plan (WRMP). Commentary on individual column entries is given below.
- The Company has achieved a SOSI of 100 in the Report Year. We identified that the changes to the parameters of the SOSI calculations, at Company level since AIR08, have resulted in a significant improvement in SOSI from -26 (AIR08) to 45 (AIR09) to 88 (AIR10) to 97 (AIR11) to 100 for AIR12 and the current report year for the dry year average planned Levels of Service (LoS) conditions.
- In recognition of the cool/wet weather experienced in 2012-13 the Company has applied both a normal year uplift (+5%) and a dry-year uplift (+7%) to the report year distribution input. We consider this a reasonable approach, but recommend the Company investigates if data exists within the Company to further refine the normal year uplift for possible use in future years.
- The calculated surplus capacity varies from 1.3% (Central Zone) to 26.6% (North Zone). The relatively small surplus within the Central Resource Zone suggests this zone could fall into dry year deficit within a few years, but we do not consider this an immediate cause for concern as dry year headroom is still in excess of 7%. The actual headroom in the Central Zone was 5.5 Ml/d (18%) for 2012-13.
- The Company has not prepared a table for the Critical Period, although following the freeze-thaw incident in 2010-11 the Company recognised that the critical period analysis may be relevant for NI Water and therefore asked their consultant to undertake critical period analysis. The consultant's report states that the critical period is not appropriate for water resource planning within Northern Ireland. To remain consistency with the WRMP we agree that it is not necessary for the Company to present a critical period SOSI.
- The Company does not feel it is appropriate to present scenarios based on "reference" or "planning" Level of Service as, unlike water companies in England and Wales it does not report its level of service in terms of return periods of hosepipe bans (or similar).

3. Audit Approach

The audit consisted of an interview with the NI Water system holder to discuss the methodology and data that has been used to populate this table as well as plans for improving the data in future years.

We compared entries used in the calculations for this table the Water Resources Management Plan and checked for consistency in assumptions and approach.

4. Audit Findings

- We confirm that the Company has submitted out-turn data reporting on Security of Supply for the (i) Planned Level of Service and (ii) Reference Level of Service for the 2012-13 reporting period.
- We consider the Company has recognised that 2012-13 was cool/wet and adjusted distribution input appropriately.
- The Company does not report a Critical Period level of service.
- We observed that, as for previous years, Table 10a(ii) submissions are identical to the Table 10a(i) annual average data entries. These would be expected to be different when the Company's planned Levels of Service (LoS) frequency statements are compared with the Reference LoS definitions. The Company reports that this is not appropriate for its circumstances as it does not report a "Level of Service" with specific return periods for hosepipe bans for example. The Company has therefore not undertaken separate analysis for "planned" or "reference" levels of service.
- We note that there whilst has been no change in approach from AIR11 in the Company's calculation of SOSI for the dry year demand (Table 10a (i)-planned levels of service) the data has been updated based on the WRMP and the current year.
- We note that, as for previous years, the Company quote a pre-MLE distribution input whereas in Table 10 a post-MLE value is quoted. These two values are consistent, with the difference being the appropriate MLE adjustment.

4.1 General

The Company's has updated its WRMP although the methodology for completing this table remains unchanged from AIR12 and the data is of similar quality.

We identified that the significant changes to the parameters of the SOSI calculations, at Company level, since AIR13 may be summarised as follows:

- Column 2 – the WAFU remains unchanged from AIR12 at 358.69 Ml/d.
- Column 3 – the bulk imports remains unchanged from AIR12 at 403.00 Ml/d.
- Column 4 – the total of bulk exports remained unchanged from AIR12 at 0.0 Ml/d.

- Column 5 – the dry year distribution input has increased from AIR12 by 2.45 Ml/d (0.4%).
- Column 6 – the reporting year distribution input has decreased from AIR12 by 25.68 Ml/d (4.4%).
- Column 8 – a slight decrease in target headroom of 0.36 Ml/d.
- Column 11 – no change in the distribution of population across the zones.

We identified that the changes to the parameters of the SOSI calculations, at Company level since AIR08, have resulted in a significant improvement in SOSI from -26 (AIR08) to 45 (AIR09) to 88 (AIR10) to 97 (AIR11) to 100 for AIR12 and AIR13 for the dry year average planned Levels of Service (LoS) conditions.

Our detailed commentaries on the Company's submissions are given in the following sections, for Table 10a (i). As Table 10a (ii) contains identical entries we do not provide line by line commentary.

5. Company Methodology

Column 1 – Water Resource Zone (Text)
The Company has used the same 5 WRZs used in AIR12.

Column 2 – Water Available For Use (WAFU) (Ml/d)
The Company has reported the same WAFU as recorded in AIR12 (358.69 Ml.d).

Column 3 – Bulk Imports (Ml/d) and Column 4 – Bulk Exports (Ml/d)
The Company has reported the same Bulk Imports as AIR12 (403 Ml/d), however there remains an inconsistency with the WRMP, although this is not material.

The Company reports no exports; this is consistent with the WRMP.

Column 5 – Dry Year Distribution Input (Ml/d)
The Company's dry year average distribution input (DI) is 2.45 Ml/d higher than its AIR12 estimate at the Company level. The Company has calculated its dry year DI from the reporting year DI and both normal and dry year distribution input adjustment factors. Detailed calculations were carried out as part of the WRMP to derive the dry year uplift factors using the actual data for each WRZ. In recognition of the cool/wet weather experienced in 2012-13, for AIR13 the Company has also applied a normal year uplift (+5%) to derive an estimate of normal year distribution input.

Whilst we consider the use of a normal year uplift factor is a sensible approach we also consider the combined impact of the normal and dry year uplifts may over-estimate the impact as, despite the decrease in leakage the dry year distribution input has increased slightly (2.45 Ml/d) from the AIR 12 estimate. We recommend that the Company continues to refine the normal year uplift for possible use in future years.

Column 6 – Reporting Year Distribution Input (Ml/d)
We note that the Company reports that its Reporting Year distribution input (DI) at 559.41 Ml/d which is 25.68 Ml/d lower than its AIR12 estimate at the Company level. We note that the Company uses pre-MLE estimates of DI in this table, whereas Table 10 reports post-MLE. We checked the Reporting Guidance which does not state whether Table 10a should be based on pre- or post-MLE estimates of DI.

The Company's methodology for measuring DI has been discussed as part of our audits on table 10.

Column 7 – Dry Year Available Headroom (Ml/d)
Dry Year Available Headroom is a calculated column. We have confirmed that the correct formulas have been used within the Table 10a(i) to calculate this.

Column 8 –Target Headroom (Ml/d)
The Company reported that Target Headroom values used in Table 10a are consistent with the WRMP. We have checked the values are consistent with the WRMP. Target headroom increases year-on-year due to increasing uncertainty in future years. We recommend that the 2012-13 values for target headroom are used for future years, until the WRMP is updated. However, if a new resource is commission this will also impact on target headroom, which will then need to be revised.

Column 9 –Surplus/Deficit (Ml/d)
Surplus/Deficit is a calculated column. We have confirmed that the correct formulas have been used within table 10a(i) to calculate the Surplus/Deficit.

Column 10 – Percentage Deficit (%)
Percentage Deficit is a calculated column. During our checking procedure, we have confirmed that the calculations are correct.

Column 11 – Zonal Population (000)
We confirm that the total population in consistent with Table 7 and that the distribution of population across the zones is consistent with the WRMP.

Column 12 – Percentage of Total Population with Headroom Deficit (%)
Percentage of Total Population with Headroom Deficit is a calculated column. We have confirmed that the correct formula has been used by the Company to calculate the Percentage of Total Population with Headroom Deficit.

Column 13 – Zonal Index (nr)
Zonal Index is a calculated column. During our checking procedure, we have confirmed that the calculations are correct.

Column 14 –Security of Supply Index (nr)
The SOSI is a calculated column. We confirm that this calculation is correct. We have also confirmed that the SOSI is consistent with that reported in line 31 of table 10.

We are satisfied that the Company has followed the NIAUR guidelines for the preparation of this index for the planned levels of service for average demand in a dry year.

6. Assumptions

The Company's assumptions are consistent with those made in the DWRMP. In recognition of the cool/wet weather in 2012-13 the Company has also developed a normal year uplift factor (+5%).

7. Confidence Grades

Confidence grades are not required for table 10a.

8. Consistency Checks

We have checked for consistency with tables 7 and 10 (pre MLE) and found the values to be consistent.

Date: 29 July 2013
Prepared by: HMS

Table 11 – Water Service Activities

Commentary by REPORTER

1. Background

Network activities provide a good measure of work achieved provided they can be related to associated investment. The investment breakdown included in these reporting requirements provide this linkage, with the separation of base service expenditure from that related to enhancements in Table 35.

2. Key Findings & Recommendations

- Reduction in lengths of mains renewals and abandonments compared to AIR12 figures which were unusually high.
- Small drop in the total number of communication pipes being replaced, largely in line with overall decrease in mains activity.
- All zonal study models have now been completed, and plans are in place to start updating of the oldest models.
- Confidence grades similar to last year, with only a slight improvement for Line 8.
- The continuing reduction in the number of mains bursts reported (line 11) can largely be attributed to the success of the mains renewal programme and continual improvements in data quality.
- The reduction in the number of mains bursts reported (line 11) is likely to be due to a combination of both the mild weather experienced in 2012/13 and the success of the mains renewal programme.

3. Audit Approach

Our audit consisted of interviews with the relevant NI Water system holders, a review of the Company methodology, the commentary and the table entries. Table entries were reviewed for consistency with previously audited data and supporting data was audited for accuracy. Confidence grades were reviewed to ensure compatibility with the methodologies used.

4. Audit Findings

There have been no significant changes to overall methodologies or commentary structures compared to last year, although the Company has generally carried out greater manual checking to remove data errors and duplication. The commentary segregates the inputs from Networks Water Operations (NWO) and Engineering & Procurement (EP).

The data for Lines 2 to 7 is based on information returned from construction and operations activities on site, whereas the data on total length of mains for Lines 1 and 12 comes from GIS systems. The GIS data is being continually improved using information from various sources, resulting on the correction of previous errors. The

Company has the option of taking account of such corrections in Line 7 (Mains abandoned and other changes) but has not done so. Instead Line 7 is used only to report on mains abandoned. Therefore, the change to total length of main reported between Lines 1 and 12 differs from that which could be calculated using the information in Lines 2 to 7 by 185km.

4.1 Asset Balance at 1 April (Line 1)

This figure has been correctly carried forward from the total closing balance of last year's report.

4.2 Main renewal, relining and cleaning (Lines 2-6)

In line with the Reporting Requirements, the inputs into the line totals comprise input data from EP and NWO. Mains owned and operated by PPP (comprising of 16.42km of trunk main between Castor Bay and Forked Bridge) are correctly excluded from the line totals.

Trunk main lengths have been included in the totals.

Line 2 - Mains Renewals
The Company reports a reduction in mains renewals this year from 443.95km to 285.42km, all of which were undertaken by EP under the water quality programme. As with previous years, NWO do not carry out any main renewals works under their maintenance programme. Checks were carried out against the source data provided by the Company which confirmed the contributing lengths and line total.

The decrease in activity from last year is in line with Company expectations based on where they are in their investment programme

Line 3 - Mains Relined
Pipes replaced by pipe bursting or structural lining methods (standard slip-lining techniques are generally considered to replace the existing main) are correctly included in Line 2 as these are deemed to replace the existing pipe. Only where a lining is applied to the fabric of the existing pipe (e.g. spray application) is it reported in Line 3. Historically, the Company does not employ any non-structural lining methods and hence the Line 3 total is zero.

Line 4 - Mains Cleaning
Mains cleaning is all undertaken by NWO under maintenance activity and hence the EP input is zero. This year, the Line 4 total of 683.75km represents a decrease to the length of 839.75km reported last year. The reduction in length flushed is mainly due to a significant reduction in reactive flushing. The length flushed is expected to rise again next year as a significant number of new maintenance scheduled tasks have recently been added to Ellipse system. The trend of switching from reactive to planned flushing is a positive one.

As adopted in AIR11, NI Water currently assigns 1 of 5 defined Maintenance Schedule Task codes and unique activity code to all flushing activities to clearly define whether

the activity has been carried out as part of a regular flushing programme (categorised into weekly, monthly, quarterly or bi-annually) or a one-off/reactive operation. This enables identification of any repeat activities on the same length of main. We were also advised that the Company also has an additional code ('prime main and flush') to cover activities where flushing is carried out for non-cleaning reasons such as post-works priming of a main. The assigned activity code enables the exclusion of reactive and non-cleaning related flushes, and the Company confirmed that these activities have not been included in the line total.

The Company undertakes manual checks to assess the data for errors and duplication. NI Water admits that there remains a potential for some double counting (primarily of repeated one-off incidents within year or for cleaning in response to customer water quality complaints following a mains repair), but advise that these occurrences are 'minimal'. We agree that recent changes to the system through the adoption of work codes and that carrying out manual checks on the data have greatly improved the reliability and reduced the potential for error. We are therefore satisfied that the impact of any remaining duplications is likely to be well within the margin or error covered by the current B3 confidence grade.

Line 6 – New Mains

The reported length of new mains installed has decreased from 118.16km last year to 89.05km within the Report Year. This comprises 27.61km reported by NWO and 61.44km reported by EP which includes 20.45km relating to nominated trunk main projects.

The 27.61km total reported by NWO relates to new housing developments, and is very similar to last year's total of 27.02km.

We noted that the length of new mains from housing developments is the only component not captured and reported through the MWM system. NI Water informed us that the numbers are collated and submitted monthly into a separate database by three field managers. The system is therefore reliant on their interpretation and manual checking of work orders which in turn relies on clearly reported lengths and descriptions on the order form. There is no reason this data could not also be entered into the MWM system to centralise reporting and it would appear a logical step to take.

4.3 Mains abandoned and other changes (Line 7)

The Company has reported a total of 357.29km of abandoned mains this year, all of which are reported by EP under the mains rehabilitation programme. Lengths are based on data provided by individual project managers.

Our review concluded that the lengths of abandoned mains have been correctly extracted in accordance with the Reporting Requirements. The total includes both wholly abandoned mains and those replaced by renewals as per the Line 7 definition. Due to the way NI Water reports abandoned mains, it is not possible to ascertain from the data how much of this length was wholly abandoned and how much was through the process of renewal.

4.4 Communication pipes (Lines 8-10)

The totals in lines 8-10 comprise input data from both EP and NWO. The Company reports a total number of lead communication pipes replaced during the year of 1,726 of which 455 were for quality reasons and 1,271 for maintenance. These results compare the 341 and 2,119 respective values reported last year. The Company provides possible explanations for these increases in their commentary which we consider reasonable.

The total number of non-lead communication pipes being replaced within the same period in Line 10, decreased to 8,566 from 10,253 last year. The decrease is broadly in line with the decrease in mains renewal activity this year.

We are satisfied that the results are a valid representation of actual activity, although there remains a potential for error in the designation of numbers between lead and other materials due to the current methods of data capture (refer to Section 5 for details). It is also difficult to define sometimes the difference between a repair to a communication pipe and the replacement of the pipe.

Although representing only a relatively small proportion of the totals in lines 9 and 10, NI Water reports that they have made improvements in the data quality reported by NWO through manual checking and improved awareness of field managers. This has contributed to the identification of more lead replacements by NWO which would previously have been categorised as 'other'.

The ratio of lead pipes replaced to non-lead pipes replaced has remained similar to that reported in recent years.

NI Water does not currently have a strategic lead replacement programme and old communication pipes (lead or otherwise) have been replaced on an opportunistic basis when encountered through other capital or maintenance works. However, a new PC13 Lead Communication Replacement Pipe Programme is being developed for implementation during PC13, which will result in target replacement of lead pipes during each of the PC13 years.

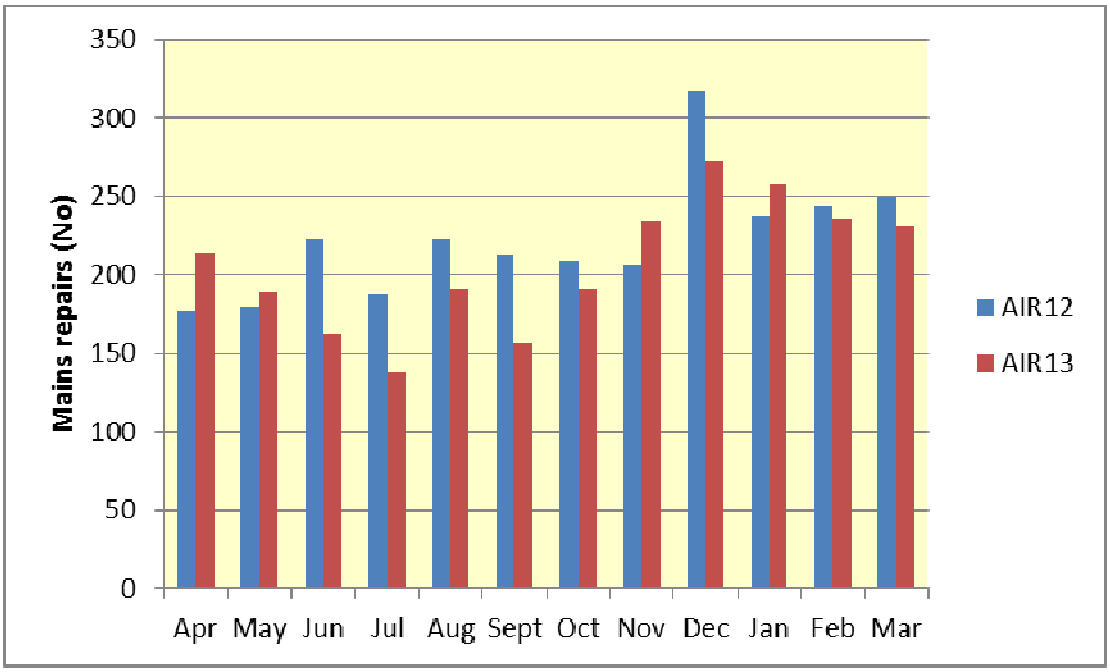
4.5 Mains bursts per 1000km (Line 11)

There has been a further reduction in the reported number of mains bursts per 1000km this year, decreasing from 101 to 93 bursts per 1000km. As explained in the Company's commentary, this figure is derived from the total number of recorded burst events, divided by the total length of mains. The calculation applies a total length of 26,700.79 km which is the length reported in Line 12. The number of bursts is calculated directly from data compiled and reported primarily by the Water Business Unit and agreed with field managers within Networks Water Function.

Following changes to the systems in AIR10, all data is now stored and extracted from the Mobile Works Management system (MWM).

A check against the source data confirmed the contributing total of 1,467 (1,706 in

AIR12) reported burst mains repairs by Networks Water. An additional 1,068 (1,040 in AIR12) repairs were undertaken due to waste detection. Additionally, 61 (81 in AIR12) repairs due to third party damage on mains were deducted from the total giving a total of 2,474 (2,665 in AIR12) repairs in the report year.



We consider that there has been a general decrease in the number of bursts each month, which has led to the reduction in the annual total. This reduction is likely to be due to a combination of the milder weather and the benefits of the mains renewal programme.

NI Water confirmed that any repairs to PPP mains are not included in the totals. The line total is confirmed as the correct summation of the data obtained from the two data sources divided by 1000km as required.

4.6 Asset Balance at 31 March (Line 12)

The total length of mains has increased by 201.76km this year to 26,700.79km. This figure has been taken directly from a query of its GIS system on 31/03/13. NI Water confirmed that this length excludes raw water, private mains, mains owned and operated by PPP, non-potable mains and all small diameter service pipes.

The comparable total by the defined calculation method of mains changes in Lines 1, 2, 6 and 7 differs by -184.58km due to the difference in data sources. The main reason for the difference is the increasing accuracy of the GIS database, where previously unknown mains are being added each year.

4.7 Distribution Studies (Lines 13-17)

NI Water's zonal model development started in 1999 leading to the adoption of a distribution zonal study programme in 2001. The programme aimed to set up models to cover all 71 water supply zones, and the final 7 models were completed last year, slightly behind the original schedule. NI Water now has models for all 71 distribution zones, and consequently 100% of the zones studies have been completed, and 100% of the population are now covered.

Now that all models have been completed, the Company has started a new programme to update the oldest models, those where significant changes may have occurred, and those covering areas where there may be operational problems. A tender process is currently underway to appoint a consultant to update the first 9 such models. Work on updating of these models is expected to start soon and to be completed by the end of 2013.

Given that all of the original distribution zone studies have now been completed, the information requested in Lines 13 to 17 should be reassessed. It would be more relevant in future years to know how many of the models are up-to-date, perhaps measuring how many of the models have been updated within the previous 10 years, and what percentage of the population or properties are covered by these models.

Currently, the construction and management of all models is undertaken by sub-consultants under the management of a lead consultant. NI Water provides strict guidelines for the development and operation of models to ensure consistency between sub-consultants. In addition, the Company carries out regular audits at various stages of model build, including cross-checks against GIS records and OS mapping to ensure the model accurately reflects the real network. In general, this set up has worked reasonably well, although NI Water admits they are looking to improve in-house skills to enable greater and more direct control and maintenance of the models to remove some of the issues that have led to recent delays. This seems a judicious approach. Lack of in-house modelling capability limits the ways in which models can be used. Water companies in England are starting to move towards real-time monitoring and automated control of distribution networks in order to optimisation pumping arrangements and reduce power costs.

NI Water has a project called Water Infrastructure Investment Planning currently underway, which is investigating and identifying future capital maintenance requirements on water main assets. This project is identifying needs on the basis of customer complaints rather than using model derived information.

No consolidation or amalgamation of zonal models has occurred this year, although NI Water expects consolidation of zones will be necessary in the future. Through discussion, we understand that the Company is considering a major reduction in the number of zones as part of its 'Phase 2' programme. Given the number of changes to the network in recent years, we agree that the current 71 DSZs are no longer particularly logical in terms of source or distribution areas or efficient in terms of the numbers of zonal models and associated boundary conditions. Improvements in computing power also mean larger models are now more feasible. We therefore

agree that some significant rationalisation of zones would be beneficial.

4.8 Water Service Activities (Lines 18-27)

In line with our previous recommendations, the Company has included tables of the nominated schemes within their commentary, including the relevant beneficial use date, enabling direct comparison of the line totals against the number of included schemes. In general, the Company has provided a full and detailed explanation of the line totals in their commentary. Comments on specific line total are as follows:

- Line 18 – the Company has reported completion of two nominated trunk main schemes during the past year - TMS/003 (Ballydougan to Newry Ph.1) and TMS/005 (Ballydougan to Newry Ph.2A. These were the only two nominated trunk main schemes scheduled for delivery during AIR13 period, and this marks completion of the PE10 trunk mains programme.
- Line 19 – no outputs for completion of nominated water treatment works schemes has been reported for AIR13 period. The PE10 WTW programme has already been reported as having been completed in previous years.
- Line 20 – the Company has reported the completion of one nominated scheme to increase the capacity of services reservoirs and clear water tanks (SRV/010 Tully SR). Added to the 8 schemes reported completed in AIR11 and AIR12, this marks completion of the PE10 Service Reservoir / Clear Water Tank programme.

In response to a query, the Company confirmed that they report a scheme as being completed for Lines 18, 19, and 20 when it is put into beneficial use.

5. Company Methodology

5.1 Lines 1-10

There are no significant changes to the Company's methodologies this year.

As in previous years, the EP element of information in lines 2-10 is based on data extracted from the Company's centralised project database system entitled 'Captrax'. The database is a working record of all active capital works projects and is updated regularly with project information obtained directly from the relevant team. NI Water project managers are responsible for all inputs and updates on their projects based on forms submitted by site teams. All information is therefore reviewed and approved by the relevant project manager before being entered onto the database records. Internal cross-checks are also carried out on the data to ensure compatibility with other internal systems. A final check on the final measurements compared to as-built drawings is made at the end of each project.

For mains cleaning (Line 4), information is compiled separately via Ellipse and the Mobile Work Management (MWM) system. NI Water only records the number of cleaning events and do not record the actual length of any individual flushing event. In order to report against the required units, they apply a fixed conversion factor of 0.156

to provide a length of mains flushed. The line total of 839.75km is therefore based on 5,383 flushing events as indicated in the Company Commentary.

While heavily reliant on assumed flushing volumes and pipe sizes, the use of the 0.156 factor provides a convenient and logical approach to enable them to report on total length as required. Furthermore, provided the factor remains fixed, it also provides a stable benchmark around which to monitor performance. However, having improved their data record system, we encourage NI Water to consider reducing the reliance on this assumption and collate actual length of cleaning, particularly for regular flushing programmes where the extent is likely to be pre-defined.

With the current exception of mains from housing developments, field data is compiled by field managers via the Mobile Work Management system onto a central database. Remote access for operatives is available via 'toughbooks'.

Field data is collated through a standardised, electronic form which has removed many of the previous irregularities and significantly improved the capture, allocation and transfer of monthly data. The form includes defined activity codes which enables clear allocation of work activities to specific data groups. This enables simple identification of the inclusion of any activity into the line totals through a simple query process. This includes differentiation between mains or communication pipes replaced for quality and those replaced for maintenance reasons.

Information on the form is always checked and updated against the final as-built records submitted at the end of the project. The monthly data collection is primarily used for monthly reporting and payments. Hence any errors are generally corrected through cross checks against the final logs and drawings and signed off by the contractor and project manager. This also explains why negative lengths are occasionally reported within monthly summaries as they represent data corrections from final records.

The Company does not declare any mains acquisitions as all water mains are installed by themselves and hence theoretically already included in their figures.

5.2 Lines 11

Mains burst data for Line 11 is obtained from records compiled by Networks Water. The data is compiled by interrogation of the work order code and categorisation.

Networks Water repairs are reactive and their work orders are largely in response to customer and third party calls. Networks Water is split into Repair & Maintenance and Distribution who record and report on their specific areas. Systems utilise a simple logging and reporting system based on individual work orders. Each work order is assigned a unique reference number.

The Company does not include work on valve packing, hydrants, air valves, communication pipes or mains repairs due to third party damage which is in line with the Reporting Requirements.

We undertook a sample audit of the data for September 2012 which confirmed that NI Water had undertaken a detailed validation of the individual burst data and that the numbers used in the analysis were correctly derived.

5.3 Lines 12-20

The total length of mains in Line 12 is extracted from the Company's GIS database which is applied as the baseline figure for comparison against the other line totals. The GIS system is independent from the systems used by Engineering Procurement and Network Water. The GIS mapping system requires regular updating to keep pace with new developments and other physical changes. As a result, there is invariably some difference between the totals reported by the GIS system and the totals reported by other systems. To ensure continuity between totals, an adjustment factor can be applied in Line 7 which is considered the most suitable location as it encompasses 'other changes'. The adjustment factor principally represents the difference in year-end data stored on the 'Captrax' and the GIS systems and hence some adjustment is considered inevitable. The figure is usually positive to reflect the delay in getting data from project records onto the GIS system, although the factor can be negative if the Company removes a back-log of data. At present, NI Water does not apply a factor, and hence the line totals are not wholly consistent.

The numbers of lead and other communication pipes replaced for quality, maintenance and other reasons are extracted directly from Captrax which is based on field records and cross checked against data in the cost management system. Currently, the work activity code does not differentiate between lead and other materials and tends to default to the latter unless specifically noted on the form or manually amended. Whilst this system appears reasonably effective, it requires a significant amount of manual interpolation which is an obvious source of potential error. We therefore continue to encourage NI Water to improve the system to more effectively capture the material type.

Distribution study models are focussed around the production of zonal models based around the Company's 71 water supply zones, with typically one model to cover each zone. Zones are interlinked by defined network nodes.

Zonal studies are divided into three phases; a needs phase, an options phase and a solutions phase. The completion of each zonal study therefore includes the completion of the physical network model, as well as analysis and production of a needs report to identify possible problems on the network. This is then assessed by NI Water staff at options phase for cost implications and used to create a programme of works. Solutions are presented and passed onto design consultants for action. Models are re-visited and updated after completion of the related works (which can be several years later once all planned works have been completed). These updates are then checked and verified against field survey data in the affected locations. This concurs with the line definitions and hence validates their inclusion in the line totals. A study is defined as 'complete' once the draft options report has been formally submitted for review and action by NWO.

Now that models have been completed for all 71 water supply zones, the focus is shifting onto maintenance of the models, starting with updating of the oldest models, and those covering areas where significant changes are known to have occurred since the original model was completed.

The models are currently built and maintained by sub-consultants based on a set of strict guidelines to ensure continuity. Models are based on a snapshot of the Company's GIS system at time of development and are not typically re-visited to check for updates unless specifically requested for a project. This inevitably results in models not being fully up to date with the current GIS system.

The GIS system was set up in 2001 and utilises an Oracle database with graphical front end and stores all infrastructure data. Data records prior to 2001 have been digitised and transferred into the database to include all existing assets. Each asset has its own unique ID reference and confidence grades are assigned to asset properties to guide to reliability. The system is updated via direct requests from water mains rehabilitation teams, new developments or engineering procurement (capital works) via a relevant manager for check and approval. All changes are undertaken centrally once approved. The Company aims to undertake all changes within 4 weeks, but acknowledges that they experience some delays, mainly attributable to the collation of information from site teams. All changes to the GIS system are subject to a peer review to provide a level of checking.

The Company has recently completed a one-off, 18 month project entitled ADAI, specifically aimed at updating internal asset records to improve records and attempt to remove some historic ambiguities. Informal corrections to GIS data continue to be carried out on an ad hoc basis.

In general, we consider the methods listed by the Company to be largely robust and in accordance with the reporting guidelines.

6. Company Assumptions

The calculation for Line 4 is based on a fixed, assumed flushing rate based on typical hydrant flushing volumes (currently 0.156km per flush).

Line 12 assumes that the GIS system is the most reliable source of information on total length of mains and hence supersedes the specified calculation from the individual line totals.

7. Confidence Grades

The Company generally apply average confidence grades for Lines 2-10 to reflect the two separate streams of information from Engineering and Procurement (EP) and Network Water Operations (NWO).

Currently, all data provided by EP for Lines 2-10 is applied a confidence grade of either A1 or A2 due to the detailed project records held and theoretical accuracy of the data. Data provided by NWO for Lines 2-10 is applied confidence grades varying from A1 to

B3. Given the relative accuracy of the various data sources, we consider these confidence grades to be appropriate with the possible exception of Line 4, where a grade of B3 might be more appropriate than B2 for NWO inputs given the use of the assumed average length per flush.

The overall grade applied to each line is generally to lower of the confident grades from the relevant data sources. The exception to this is Line 4, where the Company has used an overall confidence grade of B3 in line with the recommendation of the reported in AIR12. As mentioned in the previous paragraph, we continue to support this grading for Line 4.

Lines 1 and 12 have been allocated a confidence grade of B3, which is the same as last year, and continues to be appropriate given that the methodology has remained unchanged. Having said that, the completion of the ADAI project to improve the accuracy of the GIS system may mean that a B2 confidence grade is now appropriate.

We are satisfied that the B3 confidence grade applied to Line 11 is appropriate.

Given the discrete data entities, the A1 grades applied to Lines 13-17 and 18-20 are considered appropriate.

8. Consistency Checks

The Company provided further data and responses to queries following our initial audit. Following corrections to line totals, additional checks were carried out on revised tables and commentaries. Cross checks were made against previous table data to confirm consistency of results.

The number of bursts per 1000km is used in the estimation of DSOU within Table 10; we confirm the value recorded in this table has been used correctly.

Date: 29 July 2013
Prepared by: HMS

Table 11a – Water Service Activities

Commentary by REPORTER

1. Background

This table provides information on turbidity at water treatment works and is required to enable NIAUR to identify trends, which may indicate declining asset condition at treatment works. The Company is required to analyse turbidity results for each operational water treatment works that produced water for drinking purposes in the calendar year and determine 95 percentile values. The Company should identify and report number of works and their aggregated output (Ml/d) over the calendar year where the 95 percentile is greater than or equal to 0.5 Nephelometric Turbidity Unit (NTU) and less than 0.5 NTU.

2. Key Findings

- There was deterioration in the level of failures in the number of works with 95%ile greater than or equal to 0.5 NTU. The proportion of total output volume remains high at almost 77%, primarily due to exceedences at Drumaroad WTW.
- There were no sites with a 95 percentile value >1.0 NTU.
- Adoption of our recommendation that improved accuracy (to 2 decimal places) in turbidity readings has still been in place.

3. Audit Approach

Our audit consisted of a direct interview with the NI Water system holder, a review of the Company methodology, the commentary and the table entries. Table entries were reviewed for consistency with previously audited data and supporting data was inspected for accuracy. Confidence grades were reviewed to ensure compatibility with the methodologies used.

4. Audit Findings

The Company has continued to demonstrate ongoing improvement compared with recent performance. The number of exceedences of the turbidity level limit in AIR13 at all WTWs increasing to 14 compared from 4 in the previous year. Please see the following table for the previous years' performance.

There has been no transfer of any works to the PPP concessionaire during the Report Year. In accordance with the guidelines, all current PPP sites have been excluded from this table. The details of PPP sites are reported in Table 42.

NIW	AIR07	AIR08	AIR09	AIR10	AIR11	AIR12	AIR13
Greater than or equal to 0.5 NTU	15 31%	7 17%	5 14%	3 10%	5 19%	4 17%	14 70%
Total	48	42	35	31	26	24	20
Volume affected	24%	8%	1%	2%	10%	7%	77%

The improvements shown in previous years have been largely due to the commissioning of the new Alpha (PPP) sites and the closure of a number of older and more frequently failing sites, particularly those with borehole sources. However this year, the performance in the number of failure deteriorated significantly.

The 3 sites recorded greater than or equal to 0.5 NTU in 2011 (Rathlin, Caugh Hill and Glenhordial) again failed for 0.5 NTU thresholds in 2012. Another failed work (Lenamore Spring) in 2011 was closed at the end of 2011. There were 10 WTWs reported at exactly 0.5 NTU. These sites were included in Line 1 and are consistent with the Reporting Requirements. The respective output volume remains fairly significant at approximately 77% of the total output volume.

The Company explained that the number of failures to 1 NTU decreased while the number of failures to the threshold of 0.5 NTU increased.

The total number of WTWs counted in lines 1-3 decreased further this year from 24 to 20 this year, a net result of the removal from service of 4 sites (Altmore, Gortlenaghan Borewell, Shanmoy and Lenamore Spring), which closed during 2012.

For clarification, NI Water does not have any sites classified as 'emergency' sites as the Company either has 'operational' or 'mothballed' sites. However, in effect sites such as Cabragh borehole can be temporarily brought online to enhance supply if required. NI Water has a very limited number of sites which could be reactivated to supplement existing supplies in an emergency. Prior to bringing in any source, NI Water will carry out a full Regulation 28 risk assessment by source, and this will be notified to DWI. NI Water advises that they apply to NIEA to surrender the Abstraction Licences for sites taken out of supply and hence they are no longer operational. We also note that such categorisation has no tangible impact on this table.

Checks against source data confirmed that all data has been correctly reported by calendar year.

4.1 Lines 1 and 2 – Turbidity Levels

We reviewed their working documents and confirm that all reported 95 percentile NTU values were within the range 0.5-1.0 and no sites had a 95 percentile NTU value >1.

The output volume is significantly increased by the inclusion of Drumaroad in Line 1, one of NI Water's large sites at 102.55 Ml/d. The net result is a combined output volume of approximately 32% of the total output volume which is a significant proportion of the total distribution input.

We investigated and asked what measures the Company was taking to rectify the issues at each site. NI Water advised as follows:

- Camlough WTW – following marginally passed in AIR12, Camlough has displayed further deterioration in turbidity levels in 2012. The site has failed previously in AIR10 and AIR11. After our AIR12 audit, we were advised by the Company that the decision to either close or refurbish Camlough WTW has been deferred to the

PC15 period for financial reasons. In the meantime, the works will be maintained and operated to comply with industry best practice. Since January 2012 there have been 4 occasions when the Camlough WTW final water turbidity concentration has exceeded the 1NTU limit. It was discovered that the exceedances coincided with the on-off operation of the Newry West pumps causing 'surge' in sample line and lifting of 'sediments'. To minimise this situation it was agreed that Castor Bay & Fofanny supplies to Newry West SR could be cut back to allow increased flow from Camlough and therefore reduce the on-off effects of the pumps. NI Water is still considering the possibility of sampling direct from the CWT – this will be dependent on location acceptability and hydraulic factors.

- Carmoney WTW – this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

- Caugh Hill WTW – as mentioned above, this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

- Clay Lake WTW – as mentioned above, this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

- Derg WTW – as mentioned above, this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

- Dorisland WTW – as mentioned above, this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

- Dungonnell WTW – as mentioned above, this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

- Glenhordial WTW – this site will be monitored as the failure is marginal over the regulatory requirements. The Company explains that they are monitoring the results in current year.

- Killyhevlin WTW – whilst the site did not fail in AIR12, Killyhevlin failed marginally in 2009, 2010 and 2011 with 95%ile values of 0.5NTU, in AIR13 the results came over 0.5 NTU threshold, therefore we recommend that Killyhevlin should be monitored regularly as it is a large site which contributes 8% of overall distribution input. Analysis of the data identified that the NTU values above 0.8NTU were recorded twice. During the May - July 2012 the filters were re-sanded and a new layer of carbon added. This has helped improve overall water quality.

- Killylane WTW – as mentioned above, this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

- Lough Bradan WTW – as mentioned above, this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

- Rathlin Borehole WTW – the smallest of NI Water's works, Rathlin, supplies water for an island community from a local borehole. Unlike other boreholes sources which are being systematically closed down, there are few options available for alternative supplies and hence NI Water has no plans to replace the current arrangements. During 2012 an extra membrane was put in place (in series with existing one) to improve particulate removal.

- Seagahan WTW – as mentioned above, this site is failed marginally at 0.5NTU. The Company explains that they are monitoring the results in current year.

All of the 4 sites included in Line 1 last year remain on the list, except Lenamore Springs which was closed at the end of 2011.

We subsequently reviewed the Company's methodology and spreadsheet calculations behind the line totals. In general, the methods used for excluding sites (no exclusions in AIR13) and the formulae used to analyse and calculate the line totals were found to be correct and in accordance with the Reporting Requirements. The PPP sites have also been correctly excluded from their calculations.

4.2 Line 3 – Turbidity Not Recorded

Line 3 typically includes sites which are temporarily out of service for the majority or all of the year or sites which have been activated or abandoned during the Report Year. The Company include those sites which supply for part of a year, providing the defined criteria are met, but only include sites which are still in active service at the calendar year-end. Where sites are wholly abandoned during the year, NI Water excludes them on the basis that they have been permanently removed from supply and are hence no longer reportable.

Our checks against the source data confirmed that all sites reported in Line 3 have been correctly excluded (nil entry in 2012) on the basis of having been previously abandoned.

4.3 Line 4 – Total

The total number of WTWs operational during the Calendar Year and related output for Calendar Year are confirmed as the correct summation of the individual totals in Lines 1-3. This appears to concur with information reported in Table 12, when accounting for the differences due to reporting years.

The total output volume of 319.18 Ml/d from NI Water sites totals decreased slightly (6.2%) to the 340.25 Ml/d reported last year.

4.4 Other Performance Indicators

NI Water informed us that they have not identified any significant problems with the turbidity parameter during the Report Year. We reviewed the sampling data and can confirm that the performance has improved on 2009 levels and that overall compliance of turbidity (99.83%) remains high with the PC13 target value of 99.55%.

The Company advised that enhanced monitoring is installed where a possible problem is foreseen to ensure effective and proactive monitoring in key areas.

5. Company Methodology

The Company confirmed that its methodology remains unchanged from the previous year.

Turbidity data is collated directly from field sample data and output data based on average daily flows into distribution. All data is collated and analysed by calendar year in accordance with the Reporting Requirements and as agreed with the DWI. The different timescale explains why the distribution data may differ from other tables.

Sampling is programmed in LIMS and downloaded onto PDA for field technicians. Typically, samples are taken daily at each WTW on the basis of output volume and can be up to 365 data available per site. For smaller sites, samples are taken weekly or so. The Company keeps a record of every sample taken and categorise it according to its purpose and by date. They can then accurately exclude all non-scheduled samples which may include data errors by category and assess relative gaps in data for exclusion against the criteria. The Company advised that as sampling is generally carried out daily at all monitored sites, there are typically no non-routine samples.

The 95 percentile figure is calculated using the standard Excel function rather than the pre-defined method in the Reporting Requirements. We have previously carried out a comparative calculation using the defined method and found the difference in predicted percentiles to be insignificant.

Our review of the Company's methodology confirmed that the Company has adopted methods that are compliant with the Reporting Requirements and has applied suitable criteria for excluding non-routine sampling and works with insufficient or long gaps in data.

6. Company Assumptions

The methods employed use accurately recorded and documented data obtained from flow meters and sampling methods. There are therefore few assumptions to be made other than the standard logic that the results obtained from sampling are true representation of the whole.

We previously recommended that *'… the uncertainty in Lines 1 and 2 would be significantly reduced if readings could be taken to 2 decimal places'*. The Company explained that the submissions to DWI only require data with 1 decimal place and NI Water currently fulfils the requirements of ISO 17025 as well as DWTS. NI Water's Scientific Services has stated within their quality documentation that they will report to 1 decimal place and this has been accepted by their accreditation to meet the above requirements, therefore NIW Scientific Services does not provide 2 decimal place data for NI Water samples. Please note that according to the Company, NIW Scientific Services does provide 2 decimal place data on PPP samples.

For example, Fofanny WTW saw 0.48 NTU, which should really be 0.5 NTU and this would be included in Line 1. Since NI Water observed the significant deterioration of their performance in AIR13, we still believe that the 2 decimal place would reflect in the judgement of failure or improvement in turbidity performance.

Where the accuracy of turbidity data is to only 1 decimal place, the Company assume that an overall 95 percentile value of 0.5 is at the threshold 0.5NTU limit and include it in Line 1. Where the level is below the level of detection (e.g. <0.1NTU) the Company assume a value of 0.05. As this only affects the very lowest values, this has no overall impact to the calculated 95 percentile values.

7. Confidence Grades

NI Water assigned the confidence grades for all lines at A3. We feel this remains appropriate given the continued accuracy of the NTU value to 1 decimal place and the significant scope for fluctuation in the line total depending on the allocation of sites with exactly 0.5NTU.

We note that the uncertainty in Lines 1 and 2 would be significantly reduced if readings could be taken to 2 decimal places. We therefore continue to encourage the Company to improve the accuracy of turbidity sampling as and when opportunities arise and particularly at marginal sites listed above.

8. Consistency Checks

We discussed our findings directly with the Company and cross-checked our results to ensure validity. Cross checks were also carried out against Tables 9 and 12 to confirm consistency.

Date: 29 July 2013
Prepared by: HMS

Table 12 – Water Explanatory Factors

Commentary by REPORTER

1. Background

This table is used in water service operating efficiency studies. The information collected in this table is used in NIAUR's operating efficiency studies. It provides explanatory factors for the number of sources, proportion of supply by source type, amount of pumping required for treatment and distribution, and the relative complexity of a company's water treatment works. Changes in these factors can have a significant impact on the Company's costs.

2. Key Findings & Recommendations

- NI Water has changed the methodology used in the counting of impounding reservoirs and river abstractions supplying some WTWs. The new method moves away from the guidelines issues by the Regulator, and results in the counting of some sources previously excluded.
- The programme of removal of service of low-treatment level works supplied by borehole sources has concluded and only one such source now remains.
- No changes to treatment levels at existing works, all changes to line totals resulting from closures of works.
- Positive steps taken to improve pump head data reliability via new telemetry systems at key pump sites.
- There has been a significant reduction the calculated Average Pumping Head which suggests that more work could still be done to check the accuracy of some data.

3. Audit Approach

The audit comprised an interview with the relevant NI Water and PPP System Holders and deputies, a review of the Company methodology for data collection, an analysis of the source data and a comparison with last year's table entries.

4. Audit Findings

The table is sub-divided into 3 sections relating to PPP only, NI Water only and the combined total outputs.

4.1 Block A – Lines 1 to 4 - Source Type

NI Water Inputs

The data in this table has changed significantly from last year, mainly because of a change in approach by NIW to the way that they count the number of water sources, particularly impounding reservoirs, feeding their water treatment works.

During the past year, they have asked the WTW plant managers to produce diagrams explaining the sources for each works. This has highlighted a number of errors in data previously reported, and has also led NI Water to believe that the reporting requirements issued by the Regulator results in under-reporting of the number of impounding reservoir sources. The main point of contention concerns impounding reservoirs which are fed by further upstream reservoirs, and whether all reservoirs in the system should be counted or whether only the final reservoir that feeds the works should be counted. The following is a commentary on the changes made by NI Water.

Caugh Hill WTW: - In previous years, Caugh Hill WTW was listed as having only a feed from Altnaheglish IR. Further investigation has found that it also has a separate independent river source from the River Glenedra that is used intermittently depending on quality and quantity of river water available. Counting both sources separately is in accordance with the guidelines from the Regulator. There is a third potential independent source from the Cairnsburn River that is only used in drought conditions and has not been employed since 1995. This source has not been counted. Caugh Hill is the reason why the number of river abstraction sources reported in Line 2 has increased to 7 compared to 6 in the previous year.

Fofanny WTW: - Fofanny WTW is fed directly from three independent impounding reservoirs (Lough Island Reavey IR, Spelga IR, and Fofanny IR). Previously, only one source was reported. Although Lough Island Reavey is NIW's second largest Impounding Reservoir by volume (9092 Ml), it had been excluded from previous reports as it was believed that it only supplied Fofanny WTW via another source. The plant manager has now reported that this is not the case. All three impounding reservoir sources are now reported, and as each can feed the WTW independently, this is in accordance with the guidance issued by the Regulator.

Drumaroad WTW: - Drumaroad WTW is fed by Silent Valley IR, which is all that has been counted as a single source in previous years. This year, NI Water has also counted Ben Crom IR which supplies Silent Valley. As Ben Crom does not feed Drumaroad WTW directly, including it is counter to the guidance issued by the Regulator. The argument of the Company is that Ben Crom with a capacity of 7718 Ml is actually their third largest impounding reservoir after Silent Valley and Lough Island Reavey and should be counted in the annual returns.

Lough Macrory WTW: - The situation with Lough Macrory WTW is similar to that with Dromaroad WTW. The WTW is supplied by Lough Macrory IR, which is in turn supplied by the upstream Fingrean IR. In previous years, only Lough Macrory was counted in accordance with the guidance issued by the Regulator. NI Water now considers that both IRs should be counted as Lough Fingrean is significantly larger that Lough Macrory in terms of volume.

Dorisland WTW: - Dorisland WTW is supplied from Dorisland IR, and in previous year's was counted as having this single source. However, Dorisland IR is itself supplied by a network of six additional upstream reservoirs (Lough Mourne IR, Copeland IR, Lower South Woodburn IR, Upper South Woodburn IR, Middle South Woodburn IR, North Woodburn IR). NI Water argues that these are all strategic assets with associated operational and maintenance costs, and should be included in

annual returns. As with Drumaroad and Lough Macrory WTWs, this represents a departure from the guidance issued by the Regulator.

It might perhaps assist in illustrating the issues involved in calculating the number of sources if diagrams illustrating the arrangement of the sources to each of the above WTWs were added to the Commentary.

In Line 1, the Company is now reporting 23 impounding reservoir sources. If counted in accordance with the guidance from the Regulator, this number would be 15, and increase from last year due to the revised count of independent sources at Fofanny WTW.

In Line 2, the Company reports 7 river abstraction sources, an increase of 1 compared to last year due to the independent river abstraction from the River Glenedra to Caugh Hill WTW now being counted.

In line 3, the Company reports that it now has only 1 borehole source in use (Rathlin Island), compared to 4 reported last year. The three borehole sources that have been decommissioned are Gortlenaghan, Shanmoy and Lenamore Spring. Due to the island location of Rathlin, and the lack of alternative sources, there are no plans to close this last remaining borehole source.

In line with the guidelines, the Company has included a table of sources, detailing all the changes to water sources and treatment types that have occurred throughout the year. A separate table is included of distribution inputs. The table indicates an increase in the number of active sources this year from 24 to 31 due to the change in methodology for counting of impounding reservoir sources. If the same methodology was used as in previous years, the number of active sources would be 23 (15 impounding reservoirs, 7 river abstractions, and 1 borehole).

The Company provided a breakdown of distribution input in their commentary. The total of 559.39Ml/d represents a 4.4% increase on last year.

In line with our request, the Company has continued to report on the overall numbers of decommissioned and abandoned sites and categorise them by their ability to be brought back into service. The Company reports that there are currently 39 mothballed borehole sources and 23 abandoned WTWs in their commentary. Lenamore Spring, which was classified as the last remaining “Emergency” borehole site, wsa closed during AIR13, reducing the number of “emergency” sites to 0. Although not considered true ‘emergency’ sites, mothballed sites have been successfully brought back into service in the past and the potential remains for them to return to service in future should that be necessary. However NI Water advised that most are neither necessary not particularly suitable as backup sources due to their low output volumes and that there is generally good resilience provided otherwise through interconnectivity of the distribution network.

All 23 WTWs listed as abandoned would not be available for operation without major investment and are essentially considered inoperable.

With reference to the totals reported in Lines 1-4, we can confirm that the relevant source type and distribution inputs have been correctly assigned and totalled for

each line. The proportional split of distribution input remains very similar to last year due to the already very low proportion from borehole sources. Borehole sources now account for an insignificant proportion of total distribution input, with the majority (78%) coming from impounding reservoirs.

The Company confirmed that there have been no drought conditions experienced during the Report Year.

PPP Inputs
PPP are responsible for the operation of 4 WTWs at Moyola, Dunore Point, Ballinrees and Castor Bay and report on the basis of these 4 works.

Similar to NIW, PPP has also changed the methodology for counting or sources. This effect is seen at Ballinrees WTW where they have now included 2 additional sources from Altikeeragh IR and the River Bann. Both of these sources flow into Ballinrees IR rather than supplying the WTW directly, and in previous years have been omitted in accordance with the guidance from the Regulator. This year, both have been included, increasing the number of impounding reservoir sources from 1 to 2 (line 1), and the number of river abstraction sources from 3 to 4 (line 2).

In the case of the river supply from the River Bann, PPP argue that it should be counted as a separate independent source as the potential exists to supply Ballinrees WTW directly from the river rather than through Ballinrees IR.

If the number of sources were to be counted in accordance with the guidance issued by the Regulator, then the number of sources would remain the same as last year – 1 impounding reservoir source and 3 river abstraction sources. There are no PPP borehole sources.

PPP confirmed that abstractions from Lough Neagh are treated as individual river abstractions as confirmed with NIAUR.

Average flow to supply from PPP sources was 237.2Ml/d. The proportional distribution input is reported as 93.4% from river abstractions, and 6.6% from impounding reservoirs. The proportion from river abstractions is increased from last year with it was 90.4%.

Total
The total is the correct summation of the NI Water and PPP inputs. Checks against source data indicated that distribution inputs have been correctly assigned.

4.2 Block A - Line 5 – Average Pumping Head

The Company has reported a significant reduction in the calculated average pumping head (NIW only) of -18% to 127.7m.hd (following a 3.7% reduction in the previous year). The total average pumping head including PPP data is reported as 139.6m.hd for AIR13.

The Company provides a detailed breakdown and explanation of the changes in their commentary which we reviewed and verified against the source data and calculation.

The data used in this calculation comes from a variety of sources. The accuracy of the calculation depends on (a) the accuracy of the list of pumps, (b) the accuracy of the average flow recorded for each pump, and (c) the accuracy of the pumping head estimated or recorded for each pump.

In previous years, spot checks by the Reporter found some errors in the list of pumps, with some duplication of entries, and inclusion of pumping stations which had been decommissioned. Errors previously found have now been corrected. However, there remain some concerns about the completeness of the list of pumps. There is an asset identification project ongoing in NI Water and it would assist greatly if pumps could be identified by a unique asset number rather than by name. However, it is understood that this capability is not yet available.

Changes to the list of pumps since the previous year have been listed in the Commentary. However, the master list of pumps would benefit from improved change control procedures to understand when and why changes have been made to the spreadsheet list. In response to a question from the Reporter, NI Water said that they are aware of approximately 50 pumps that are not currently included in the list, mostly small booster pumps.

Information on flow rates from pumps comes from a variety of sources, including telemetry data, field test data, and data from network models. In accordance with the advice of the Reporter in previous years, NIW is increasingly using telemetry data, particularly for larger pumping stations. However, telemetry data is still only available for 21% of pump sets.

Information on pumping heads also comes from a combination of telemetry data, field test data, and data from network models. Some network models are more than 10 years old and are in need of updating. The increased use of real data is one of the reasons for the downwards trend in APH as the theoretical method used to calculate lift heads was rather conservative.

The significant year to year variations in the calculated Average Pumping Head indicates that there are problems in the methodology for how it is calculated. We would suggest a step by step plan to try to identify the most significant sources of error, and a plan to try to improve the quality of the data. It would be useful to cross check of the calculated values for some of the largest pumping stations against measured power consumption for the pumps (where appropriate electricity sub metering data is available). The purpose of the Average Pumping Head calculation is to serve as an explanatory factor for power costs, therefore it is logical to carry out cross checks of theoretical pumping head calculations against power consumption on some sites to check how good the correlation actually is.

The following is some of the steps which should be taken (some of which are already being implemented:

- Each pump to have a unique asset number rather than relying on name of pumps
- List of pumps to be reassessed to ensure that it is complete and does not contain any duplication
- When updated list has been compiled and checked, introduce a change control

procedure to create an audit trail for future changes so that the reasons for significant changes to APH can be understood

- Continue with programme to install telemetry monitoring of flow and head on all pumps with significant flow and/or head so that more accurate real data is compiled
- Carry out spot field checks to ensure accuracy of telemetry information
- Older network models to be updated to provide more accurate data for smaller pumping stations without telemetry (programme starting this year)
- Where electrical sub-metering is available for pumping stations, carry out cross check of theoretical power requirement of the pumps against actual electricity consumption.

NIW calculate average pumping head on a single spreadsheet covering all relevant supply and distribution pumps in the Company's network. Checks confirmed that the spreadsheet appeared logical and robust. The method for calculating pumping head is in accordance with the reporting guidance.

4.3 Block B - Lines 6 to 12 – Treatment Type

NI Water Inputs
The number of water treatment works (WTWs) reported this year is 20, a net reduction of 4 from last year. The 4 sites that are now excluded are Altmore (W3), Gortlenaghan (SD), Shanmoy (SD) and Lenamore Spring (SD). These were all decommissioned during AIR12 and are correctly excluded this year.

Treatment levels for all sites remain the same as for last year.

PPP Inputs
All 4 works operated by PPP have ozone or GAC on site and are correctly classified as W4 level treatment. No change from previous year.

Total
In total, 24 WTWs were operational during the Report Year. The line totals are confirmed as the correct summation of the NI Water and PPP inputs. Our checks against the source data confirmed the correct calculation and translation of data.

As a result of the Company's ongoing planned removal from service of relatively low-treatment level works with borehole sources, the combined numbers of WTWs in lines 6-8 have continued to reduce this year from 4 to 1, with only Rathlin remaining below treatment level W3. This site contributed an insignificant proportion of the Company's total distribution input with the percentage of flow receiving W4 level treatment remaining consistent with recent years at 66.1%.

4.4 Line 13 – Potable Mains

NI Water Inputs
The total length of potable mains has increased from 26,488.03km to 26,691.79km largely in line with reported changes in new and abandoned mains. This is extracted directly from the Company's GIS systems and differs only slightly from the total

lengths of main reported in Table 11 (26,499.03 km for AIR12 and 26,700.79 km for AIR13). The increase in total length from last year has been distributed across all size bands. Our checks confirmed that the total excludes PPP-owned assets and 276km of compensatory and raw water mains.

PPP Inputs
PPP report 16.42km of main in Band 3 which relates directly to the 600mm diameter trunk main from Castor Bay to Forked Bridge. No change from previous year.

Total
The total 26,708.21 km is the correct summation of the NI Water and PPP inputs.

5. Company Methodology

The Company uses several spreadsheets to analyse and summarise the relevant data concerning sources, treatment works and pumping stations which is required for inclusion within Table 12. The main change to methodology this year relates to the way that source types are counted as outlined in Section 4.1 above. The new methodology moves away from the guidelines issued by the Regulator, but the Company explains in its methodology why it has done so.

Distribution input is based on data obtained from Leakage Section. The distribution output from the works and applied volume within the distribution network are therefore very similar. Where not available, NI Water may obtain data from other less reliable sources as explained in their commentary.

The methodologies and spreadsheets were reviewed against the Reporting Requirements and we can confirm that the Company has correctly excluded sources from which no water has been abstracted during the Report Year. The Company has also correctly excluded non-potable water volumes. Several manual adjustments to data have been made which have been highlighted in their commentary and are considered appropriate.

Calculations for Line 5 Average Pumping Head are primarily based on data and results obtained from network models, although measured operational data is used for some of the more significant pump sets. Recent improvements have seen the installation of telemetry based flow and pressure monitoring systems at PPP sites and a number of NI Water sites, to provide data at a number of key sites. The system is referred to as 'Telemweb' at NI Water sites. Pressure values are typically based on the annual average of a set of readings from pressure monitors installed at the pump delivery and discharge points so to calculate the difference in pump pressure. Results from telemetry systems are generally consider the most accurate, followed by data from operational samples, registered pump parameters, DZS model results and GIS levels. Flow data for distribution pumps are primarily based on annually averaged flow measurements from works outputs. However, the majority of the data, including pressure heads and flow data for pumps within the distribution system are based on data from the network models. The calculation is therefore reliant on the condition and accuracy of the network models.

Currently NI Water relies on several sub-consultants to develop and manage their network models. NI Water issues a strict set of guidelines to ensure continuity

between models. Each model is based on a comprehensive set of pressure and flow readings from a set of strategically positioned temporary loggers. Typically data is collated at 15min intervals for a full day which is then used to calibrate the model. Ground levels are based on information extracted from the Company's GIS systems.

Once the model is created, NI Water does not typically take further field measurements or re-visit the model to re-calibrate. As some of models are now over 10 years old, now that NI Water has completed the programme of building models for all zones, they are starting a new programme to update some of the oldest and least accurate models.

Where models are incomplete, NI Water looks to obtain field data on pumps, but advised that such data is usually unavailable or not sufficiently reliable and hence most data in these areas are omitted from the calculation.

The spreadsheet to calculate the pumping head is managed by a single document controller and updated each year via distribution of relevant sections to other sub-consultants. NI Water confirmed that the spreadsheet utilises unique ID codes to avoid duplication and that internal checks are carried out each year to assess any changes. The calculations are based on data covering the whole distribution network and calculated in proportion to 100% of distribution input.

The Company provide a detailed and comprehensive explanation of their Line 5 methodology in their commentary, including comments on shortcomings and possible future improvements. The Company does not import or export any water and hence no account is made in the calculations.

The totals for Line 13 are taken directly from the Company's GIS system. Pipes that are unidentified (which account for <0.5% of the total) are assigned to Band 1 as the most likely category to ensure the total matches the total length of mains reported in Table 11 Line 12. The remaining mains have no documented size records and therefore are only likely to be confirmed if actually encountered in the field or removed through abandonment.

6. Company Assumptions

For calculating average pump head, the Company makes several key assumptions:

- network models are accurate and up to date representations of the actual pipe network and pump condition. In particular, the flow applied to each pump set is representative of the actual flow in that particular year.
- where applied, pumps operate in line with parameters recorded on nameplates.
- where applied, ground levels are representative of the operational head level
- no leakage occurs in the system
- where data is not known, the Company excludes the pump from the calculation. The applied data is therefore assumed to be representative of the whole.

For Line 13, unidentified pipes are assumed to be included in size Band 1 as the

most likely size category.

7. Confidence Grades

There are no changes to confidence grades this year. The assignment of B2 confidence grades to Lines 1-4 is considered appropriate on the basis of the reliability and accuracy in the calculation of proportional distribution input. Even with recent improvements, the B4 grade for Line 5 is still considered appropriate given the estimations and levels of uncertainty associated with the pump head data.

8. Consistency Checks

Cross checks were made with total lengths in Table 11 to confirm consistency. PPP data was cross checked with Table 42.

Date: 29 July 2013
Prepared by: HMS

Table 13 – Non financial measures – Sewerage properties and population

Commentary by REPORTER

1. Background

This table reports on the properties connected during the year, billing information and average report year population estimates for the sewerage service.

2. Key Findings

- We were able to reconcile the property numbers reported to the Rapid extract presented by NI Water.
- However, there remain some anomalies in NI Water's new connections data. Please refer to our Table 7 commentary for detail.
- The calculation for sewerage connected population changed to include non-resident population.
- Although the difference is immaterial, the calculation for sewerage population is not correct.
- We believe that the confidence grades should remain consistent with those agreed in Undertaking A.
- NI Water's commentary does not address all of Reporting Requirements:
    - Significant changes in data reported over the previous year
    - Highlight any changes in methodology over the previous year
    - Provide the additional information on customer numbers for the respective groups.

3. Audit Approach

The audit consisted of an interview with the NI Water system holders to discuss the methodology and data that has been used to populate this table as well as plans for improving the data in future years.

4. Audit Findings

4.1 General

The key source of information for the new connections and property data is the customer billing database, RapidXtra. This is an automated system where customer information is updated through various means including customer contact. The Company reports that data on property counts and classifications are reported monthly and reconciled with other data collection activities, such as the test metering project. During the audit we sought an update on various issues which had been raised in previous AIR and other reviews. The following provides an overview of the

discussions held with NI Water, however please refer to our Table 7 commentary in detail.

Whilst we acknowledge that the information needed to populate this table was prepared as the Methodology Statement which was not submitted to the Regulator unlike Table 7, the Company did not comment as required on significant changes in data, changes in methodology and did not provide additional information. We strongly recommend that NI Water checks the Reporting Requirement every year and include the commentaries required. NI Water confirmed that further information (similar to that included for the Table 7 Commentary) will be included in AIR14.

Test Meters
NI Water outlined that their test meter project is ongoing with accounts being assessed and reclassified as appropriate. The Company advised that the survey of all 10,898 test meter accounts has completed in 2011/12, 39 still need to be confirmed and uploaded to Rapid.

Site Meters
The Company explained that as part of their ongoing data checks the number of site metered properties (multiple properties being charged through a single meter) is currently being investigated and verified. To ensure these are not double counted the Company has excluded these meters from their Table 7 property counts. We understand this approach is consistent to that adopted in previous submissions.

4.2 Properties

Line 1 – Household properties connected during the year
This line reports the number of new household properties added within the Company's area of supply. We confirm the total number of connections reported in this line is consistent with the extract from Rapid provided by NI Water.

We note an increase of 454 (or 15%) new connections when compared to the 11/12 Report Year. We believe that a slight increase or decrease in recent years is due to slow economic recovery and this will continue for a few years.

Line 2 – Non-household properties connected during the year
This line contains the number of new non-household properties added within the Company's area of supply during the Report Year. We confirm the total number of connections reported in this line is consistent with the extract from Rapid provided by NI Water.

We note that the number of non-household properties has decreased significantly by 113 properties or 48% from that reported in AIR12. We believe that a slight increase or decrease in recent years is due to slow economic recovery and this will continue for a few years.

4.3 Billing

As NI Water did not submit their methodology statement to accompany with their commentary on a year on year reconciliation for the billing figures, we include them here.

Line 3 – Households billed unmeasured sewage

We note a small increase of 5,312 (1%) reported in this line since AIR12. The Company was able to demonstrate the consistency of the number reported in this line to extracts from their property records on Rapid.

This line is calculated as the average of occupied domestic unmeasured plus the occupied test meters plus those household properties which are connected for sewerage only. These are explained in detail in the Company's Methodology Statement, which we repeat here.

Household billed unmeasured sewerage	31 March 2012	31 March 2013
Unmeasured HH	565,207	566,915
HH Sewerage only	6	6
Test meter measured HH	865	294
Measured HH	16,989	21,115
Site meters	424	432
Unmeasured HH – not charged	0	1
Total	583,491	588,763
Average	**586,127**	

Line 4 – Households billed measured sewage

Whilst NI Water has been installing meters on all new household connections since April 2007, customers are not being billed on a measured basis. As such, all household properties should be reported as unmeasured.

Line 5 – Households billed sewage

This is a calculated line, the sum of Lines 3 and 4.

Line 6 – Non-households billed unmeasured sewage

As same as above, the figure reported in this line is derived as shown in the following table.

Non household billed unmeasured sewerage	31 March 2012	31 March 2013
Unmeasured NHH	9,556	8,916
Average	**9,236**	

As expected we note that the number of non-households billed for unmeasured water within the supply area has decreased steadily during the year. Indeed, the number of properties has decreased by 873 (9%) from that reported previously.

The Company explained that this was a result of their non-household metering programme. We reviewed the Company's progress in delivering this programme and our commentary on this is provided in Table 8.

	AIR13 (000's)	PC13 2012/13 (000's)	PS 2013-14 (000's)
Unmeasured Household	586.127	585.114	576.635
Measured Household	0	0	0
Unmeasured Non-Household	9.236	9.309	9.096
Measured Non-household	23.014	24.146	22.876
Void Properties	44.637		

Note that the figure for AIR is April-March average, and PC13 is November-October average while PS is 1st of December figure. The divergences in 3 submissions are largely a result of submission dates. Nevertheless, the three submissions are reasonably well aligned with relatively small percentage differences.

Line 7 – Non-households billed measured sewage
As same as above, the figure reported in this line is derived as shown in the following table.

Non household billed measured sewerage	31 March 2012	31 March 2013
Measured NHH	22,876	23,151
Average	**23,014**	

There are 14 sewerage only customers according to the Rapid report as at 31 March 2013. We believe that these properties should be included.

Line 8 – Non-households billed sewage
This is a calculated line and is the sum of Lines 6 and 7.

Line 9 – Void properties
NI Water stated that they have interpreted this line as the average number of properties within their supply area which are connected to the sewerage system but do not receive a charge as there are no occupants. We found NI Water had taken the gross number of properties reported on Rapid (inclusive of measure household test meters), shown in the table below.

Connected property sewerage	31 March 2012	31 March 2013
Unmeasured HH	596,6996	597,730
HH Sewerage only	6	6
Test meter measured HH	875	299
Measured HH	20,406	24,722
Site meters measured HH	513	520
Unmeasured HH – not charged	0	1
Unmeasured NHH	16,823	16,015
NHH Sewerage only	19	19
Measured NHH	25,472	25,902
Total	660,813	665,214
Average	**663,014**	

The figure reported in this line is derived as subtracted the number of occupied properties reported in Lines 5 and 8 from the gross number of properties connected to sewerage service.

Voids	Average of 2012/13
Connected property	663,014
Line 5	586,127
Line 8	32,250
Total	**44,637**

We note that the void property numbers is increased by 32 (or 0.1%).

The Trade effluent customers are correctly excluded from this table. We note that Non Household Test Meter customers, Non Household Site Meter customers and Unmeasured Non Household – not charged customers are not reported anywhere in this table which accounts for circa 15,000. We believe that this is not a small number of customers therefore we recommend NI Water to seek the regulatory guidance on this.

4.4 Line 10 – Population

NI Water did not provide the methodology to derive the sewerage population, which is calculated as:

(Table 7 Line 17 + non-resident population) x (Table 13 Line 5 + Line 8 + Line 9) / (Table 7 Line 7 + Line 11)

First, NI Water calculated the percentage of property connected to sewerage service using the following table.

	AIR12	AIR13	Average
Connected property to Sewerage	658,151	663,014	660,583
Connected property to Water			
Table 7 Line 7	713,341	721,698	
Table 7 Line 11	93,072	92,466	
Sub total	806,413	814,164	810,289
% of sewerage property over water property	= 660,583 / 810,289 * 100		**81.52%**

Therefore, the population connected to sewerage service is calculated as follow. The Company noted that they included the non residential population in AIR13.

	Population
Water population (T7 L17)	1,819.470
% sewerage property	81.52%
	1,483.232
Non resident (T17a L2)	28.792
Total	**1,512.024**

However, as per AIR12 we found that NI Water uses the average of AIR12 and AIR13 figures, rather than using the beginning and end of year 2012/13.

	31 March 2012	31 March 2013	Average
Connected property to Sewerage	660,813	665,214	663,014
Connected property to Water			
Table 7 Line 7	717,954	725,442	
Table 7 Line 11	92,413	92,518	
Sub total	810,367	817,960	814,164
% of sewerage property over water property	= 663,410 / 814,164 * 100		**81.43%**

Therefore the sewerage population figure should be

	Population
Water population (T7 L17)	1,819.470
% sewerage property	81.43%
	1,481,594
Non resident (T17a L2)	28.792
Total	**1,510.386**

Although the difference is very small, the Company's methodology is not strictly correct. NI Water confirmed that they will revise this methodology for AIR14.

5. Additional Information

Although the Reporting Requirements state that NI Water should provide the additional information on customer numbers for 1st April, 1st December 2012 and 31 March 2013, as par Table 7, the Company has not commented. We provide this information here.

Property numbers	1 Apr 2012	1 Dec 2012	31 Mar 2013	2012/13 Average
Unmeasured household	583,491	581,420	588,763	586,127
Unmeasured non household	9,556	9,096	8,916	9,236
Measure non household	22,876	22,876	23,151	23,014
Voids	44,890		44,384	44,637

6. Confidence Grades

As we discussed in our Table 7 commentary, we challenged a number of aspects relating to new connections data and the system to derive the Table 7 figures. We did not review or challenge the Company for Table 13, however we believe that since the property numbers connected to water service are not accurate, we do not consider the property numbers connected to sewerage service are accurate. Therefore, we believe that the confidence grades should remain aligned to those agreed during the Undertaking A review.

Date: 29 July 2013
Prepared by: HMS

Table 14 – Non financial measures – Sewage collected

Commentary by REPORTER

1. Background

This table records the sewage volumes collected from measured and unmeasured households and non-households, together with the volumes of trade effluent, cesspool and septic tank waste.

2. Key Findings

- The confidence grades for Lines 1 to 3 were improved from C3 to A2, and Line 7 was also improved from C3 to B3 in AIR12. However, we believe the confidence grades should remain as those assigned in AIR11.

3. Audit Approach

The audit consisted of an interview with the NI Water system holders to discuss the methodology and data that has been used to populate this table as well as plans for improving the data in future years.

4. Audit Findings

4.1 Volume unmeasured household sewage (Line 1)

This line summarises the volume of water delivered to household properties billed for unmeasured water that is returned to the sewerage system.

We note a small decrease in volume of 3.03 Ml/d or 1% reported in this line.

The Company has assumed that volumes returned to sewer are 95% of the volume of water delivered, factored by the percentage of the number of households billed for water against the number of households billed for sewerage services.

The Company calculates this number from the billed unmeasured household supply volume (Table 10 line 4), the number of households billed for unmeasured sewage (Table 13 line 3) and the number of households billed for unmeasured water (Table 7 line 3) and we confirm that this calculation has been made correctly.

4.2 Volume unmeasured non-household sewage (Line 2)

This line summarises the volume of water delivered to non-household properties, billed for unmeasured water that is returned to the sewerage system.

The Company informed us that this volume is calculated by assuming a 95% return to sewer of the volume delivered to non-households, factored by the percentage of the number of non-households billed for water against the number of non-households billed for sewerage services.

The Company calculates this number from the Billed unmeasured non-household supply volume (Table 10 line 5), the number of non-households billed for unmeasured sewage (Table 13 line 6) and the number of non-households billed for unmeasured water (Table 7 line 8) and we confirm that this calculation is correct.

We note that this volume has decreased significantly during the year, reducing by 0.57 Ml/d which equates to a circa 9% decrease. This is consistent with the decreases observed in the unmeasured property base.

4.3 Volume unmeasured sewage (Line 3)

This line is derived by summing lines 1 and 2.

4.4 Volume measured household domestic sewage (Line 4)

This line summarises the volume of measured household domestic sewage effluent discharged to the sewerage area and billed. As customers are not being charged on a measured basis this line is reported as zero.

4.5 Volume measured non-household domestic sewage (Line 5)

This line summarises the volume of water delivered to measured non-households returned as domestic sewage (not trade effluent) to the sewer in the sewerage area and billed. We challenged the Company to provide an audit trail to substantiate the volume reported and the Company advised that this volume was based on their 'Actuals' report.

We note that there has been a decrease of 0.66 Ml/d or 2% in the volume compared with that reported in 2011/12. The Company explained that the sewerage volume is lower than last year due to the continued economic downturn.

We note that the volumes reported in the Principal Statement submission and AIR submission are based on the same data, except the PS includes forecast data for 4 months of the year, while AIR is actual. Therefore the reported figures in 2 submissions are similar.

The volumes reported are somewhat lower than reported in the Company's Principal Statement submission. The volume reported in the Principal Statement submission was 11.377 Mm3 (31.17 Ml/d) which is circa 13% lower than that reported within AIR13. NI Water explained that PS assumed the hospital sewerage would be transferred to trade effluent by the end of March 2013. This would account for circa 1.5 Mm3 (or 4.11 Ml/d) but it did not happen. We checked the Company's claim and this explanation is reasonable.

4.6 Volume trade effluent (Line 6)

As in previous years, the names of individual traders have been taken from the Primary Source of Trade Effluent Customers (PSTEC) data base, which is updated regularly by NI Water. In AIR12 there were 507 consented traders. This number has

increased to 518 for AIR13 due to the addition of mostly car washes and small volume discharges.

Actual Trade effluent volumes have been obtained from the Billing Section. Of the 518 Consented premises 109 (21%) used consented rather than actual volumes. This is a decrease from AIR12 where 24.7 % of consented volumes were used. The improvement is attributable to concerted efforts to consent, low volume strength premises such as car washes. The Company is currently pursuing a policy to endeavour to reduce the number of premises utilising consented volumes.

As previous year's, large volume and high risk customers meter readings are taken and where there are no meters the discharge volume is calculated by taking water supplied minus allowances as in line with Ofwat guidance. NI Water assumes that 95% of water delivered is returned to the sewerage system. Domestic water consumption is deducted from water supplied to trade premises i.e. 25 litres per person per day and 50 litres per person per day where there is a canteen on site.

The volume of trade effluent for AIR13 is 34.12 Ml/d which is a 9.5 % increase from AIR 12 31.15 Ml/d.

AIR12 contractual changes classed, for the first time, supernatant liquors produced by sludge treatment activities at PPP plant at Duncrue as Trade Effluent. The five stream discharges are being charged at an agreed administrative charge rather than full Mogden formulae.

Due to a miscalculation, the volume attributed to the incinerator for AIR12 should have been recorded as 19.49Ml/day as opposed to 14.26Ml/day. This would have resulted in the overall volume equating to 36.39 Ml/day for AIR12 (as opposed to the reported volume of 31.15 Ml/day). In effect there is a reduction in volume of 6.2% (equating to 2.27 Ml/day). The miscalculation resulted from a monthly discharge volume figure been taken as a meter reading, this gave a much lower annual discharge volume for the W1A Trade Effluent Discharge (20333m^3 instead of 1931064m^3).

This reduction of 2.27 Ml/day was predominantly due to the decrease in the incinerator volume from 19.49 Ml/day to 17.43 Ml/day (a decrease of 2.06 Ml/day).
It should be noted that the volume from the incinerator accounts for 51% of the total trade effluent volume.

AIR12 Incinerator volume Ml/d		**AIR12 Overall volume Ml/d**		**AIR13 reported volume Ml/d**	**Variance reported AIR13/AIR12**
Reported	Actual	Reported	Actual		34.12 – 31.15
14.26	19.49	31.5	36.39	34.12	-2.27

The reported increase from AIR 12 is in reality a net decrease of 2.27Ml/d.

In AIR13 [x] contributed additional volume as new processes were identified as trade effluent. This is offset by Sludge treatment liquors at Duncrue which equated to 17.43 Ml/d. Subtracting this figure from total AIR13 Trade Effluent flow of 34.12 Ml/d indicates that despite some major

traders installing a combination of onsite treatment and reducing volumes, coupled with the closure of a creamery the remaining volume of 16.69 Ml/d (34.12 – 17.43 Ml/d) is attributable to discharges from other traders and is consistent with the AIR12 return of 16.85 Ml/d.

Currently there are 518 traders, an increase of 11 from AIR12 (507). Analytical samples are taken from traders and analysis stored on the Laboratory Information Management System. At sites where BOD strength is not available charges are based on assumed standard strength of 189 mg/l. For AIR 13 standard strength was obtained by averaging the last five years weighted average monthly inlet concentrations from twelve major works rather whereas previous returns were based on one year's standalone information. For AIR13 BOD has decreased from 193 mg/l to 189 mg/l. Despite the average weighted concentration of settled COD and BOD reducing the concentration of Suspended Solids increased from 212 to 224 mg/l.

For a small number of new traders which have not been sampled the BOD was calculated using consented COD figure and a conversion factor of 1.24 derived from five year average data.

Period	Ave weighted settled COD mg/l	Ave weighted SS mg/l	Ave weighted BOD mg/l
AIR13 overall ave for 2008-12	235	224	189
AIRas overall average for 2007-11	247	212	193

COD: BOD = 1.24

As recommended in our AIR10 commentary, for NI Water to provide a consistent approach they have divided all trade flows by 365 irrespective of whether the trader only operates Monday to Friday. Investigations in AIR13 indicated that only 23 of the 518 consented traders actually operate 365 days per year. This equates to only 4.4% of the total number of traders having a cumulative discharge volume of 0.45Ml/d which equates to 1.3% of the total volume.

As detailed, the vast majority of traders operating 365 days are hospitals or ancillary units. The exception being [x], which has a relatively small volume 4929m^3/year and loading of 1.43 tonnes BOD/year.

365 Day Traders			
[x]	[x]	[x]	[x]
[x]	[x]	[x]	[x]
[x]	[x]	[x]	[x]
[x]	[x]	[x]	[x]
[x]	[x]	[x]	[x]

[x]	[x]	[x]	

4.7 Volume waste water returned (Line 7)

This line is derived by summing lines 3, 4, 5 and 6.

4.8 Volume of Road Drainage (Line 8)

The Company had provided a volumetric estimate for the volume of road drainage returned and within their commentary provide an overview of their methodology.

We have not sought to verify the assumptions made within the methodology applied but note it is based on a number of third party data sources and assumptions.

5. Company Assumptions

Lines 1 to 2 – unmeasured volumes

The Company assumes a 95% return to sewer of volume.

Line 8 – Volume of Roads Drainage returned

As detailed within the Company's commentary a number of assumptions have been used to derive the volume reported. As stated above we have not sought to verify the accuracy of the assumptions used.

6. Confidence Grades

We understand the improvements of the Confidence Grades in last year are based on a reflection of the improvement in confidence grades for Tables 7 and 13. Whilst we acknowledge some improvements, unmeasured sewage volumes are based on several assumptions and figures used elsewhere in the Return. We therefore believe that the confidence grades should remain consistent with those assigned in AIR11.

Please refer to our Table 7 commentary for further detail on confidence grades.

Date: 29 July 2013
Prepared by: HMS

Table 15 – Sewage Treatment

Commentary by REPORTER

1. Background

This table collects details on sewage loads, sewerage service facilities and sewage sludge disposal. The information in this table is used to assist in operating efficiency studies.

2. Key Findings & Recommendations

- Changes in the methodology and the sites included in the analysis have resulted in a material change in the trade effluent loads reported.
- Allowing for a miscalculation of the incinerator volume in AIR12, there was no discernible difference in the overall BOD loading, as the revised loading was 5380 tonnes/year compared to the reported 5357 tonnes/year.
- Ongoing investigations into actual trade volumes from Hospitals indicate that in some instances the trade discharge element is greater than the anticipated 5%.
- NI Water is continuing to invest in flow and load surveys and analysis to improve their understanding and the accuracy of their estimates.
- There is a small (1.9%) increase in sludge produced for the year compared to the previous reporting year.
- The volume of grit and screenings from the PPP sites has been reported for the first time.
- Confidence grades for the reported values could be higher than reported for some lines as the methodologies is place are sound and in line with industry practice.

3. Audit Approach

The responsibility for the compilation of table 15 is split between a number of system holders, all of whom was audited. The Company methodologies were examined and the sources of data were reviewed.

4. Audit Findings – Sewage Treatment

4.1 Sewage – Loads (Lines 1-7)

Line 1 – Trade Effluent Load (NI Water & PPP)
Since 2008/2009 traders have paid Trade Effluent charges. Trade volumes are obtained from the billing section of Customer Services. For AIR13 the names of individual traders have been taken from a new Primary Source of Trade Effluent Customers (PSTEC) database, which is updated regularly by NI Water.

Data is based on either outflow trade meters; where fitted, or water meter readings; allowing for domestic use and evaporation losses. Where no data is available, volumes are based on maximum consented volumes.

Analytical data is used to determine loadings. Where this is not available, standard strength was obtained by averaging the last five years weighted average monthly inlet concentrations from twelve major works. This is in contrast to previous years, where one years' standalone information was used. For AIR13, BOD has decreased from 193mg/l to 189mg/l.

For a small number of new traders, that hadn't been sampled, the BOD was calculated using consented COD figure and a conversion factor of 1.24 derived from five year average data.

AIR13 indicates a 10% decrease in loading from that reported in AIR12. The decrease (from 5357 to 4819 tonnes/year), is predominantly due to a reduction in the incinerator loading of 542 tonnes/year (1952 down to 1410 tonnes/year). The BOD loading from the incinerator accounts for circa 29% of the total trade effluent BOD loading.

Prior to AIR12 supernatant liquors being discharged to the network for treatment at Belfast wastewater treatment facility, were not classed as Trade effluent. This was due to the fact contractual charge implications had prevented the discharges being considered as Trade Effluent. Resolution of this issue for AIR13 has resulted in consented discharges from the PPP treatment centre, incurring an agreed administrative charge rather than full Mogden formula and inclusion as a trade loading.

The remaining 19 tonnes/year reduction is attributed to a number of traders installing treatment to reduce strength, for example, [x] reducing by 93.9% to 2.82 tonnes/year and [x] reducing by 34.4% to 172.24 tonnes/year. In addition, a number of traders have closed accounting for 82.53 tonnes/year. The 453.56 tonnes decrease is balanced by the addition of two new traders, contributing 62.91 tonnes/year, plus an additional 373.1 tonnes/year from four existing premises. In total, these changes account for 17.5 of the 19 tonnes/year.

As highlighted above, the Sludge Treatment Centre contributed 1410 tonnes as against the AIR12 loading of 1952 tonnes/year, leaving a contribution from the remaining traders of 3408.37 tonnes. The policy change to adopt only 5% of discharge from hospitals as trade effluent is being reviewed to take account of all trade effluent processes. This is based on the fact 32.5% of the discharge volume from [x] has been identified as trade effluent.

As recommended previously, NI Water has provided a consistent approach by dividing all trade flows by 365 irrespective of whether the trader only operates for 5 out of seven days. As reported in Table 14 Line 6, only 23 of the 518 consented traders actually operate 365 days per year, and these premises account for only 30.68 tonnes/year, i.e. 0.6% of the total loading and 0.45Ml/d (or 1.3%) of the total volume.

The volume of trade effluent for AIR13 is 34.12 Ml/d which is a 9.5% increase from the AIR12 volume of 31.15 Ml/d. However as detailed in Table 14 Line 6 summary the reported increase from AIR12 is in reality a net decrease of 2.27Ml/d.

Due to a miscalculation, the volume attributed to the incinerator for AIR12 should have been recorded as 19.49Ml/day as opposed to 14.26Ml/day. This would have resulted in the overall volume equating to 36.39 Ml/day for AIR12 (as opposed to the reported volume of 31.15 Ml/day). In effect there is a reduction in volume of 6.2% (equating to 2.27 Ml/day). The miscalculation resulted from a monthly discharge volume figure being taken as a meter reading, this gave a much lower annual discharge volume for the W1A Trade Effluent Discharge (20333m^3 instead of 1931064m^3).

This reduction of 2.27 Ml/day, as summarised below, was predominantly due to the decrease in the incinerator volume from 19.49 Ml/day to 17.43 Ml/day (a decrease of 2.06 Ml/day). It should be noted that the volume from the incinerator accounts for 51% of the total trade effluent volume.

Incinerator Volume AIR12 (Ml/d)		Overall Volume AIR12 (Ml/d)		Overall Volume AIR13 (Ml/d)	Variance (Ml/d)
Reported	Actual	Reported	Actual	Reported	(34.12-31.15)
14.26	19.49	31.15	36.39	34.12	-2.27

The trade load discharging to PPP facilities and NI Water facilities has decreased by 7.5 % and 10% respectively. On inspection, it can be seen that no PPP works in the North West area treat any trade discharges. The biggest variances from AIR12 are the trade flows in the North East area, with a 19% decrease in volume discharged by sampled and charged traders and a 22% increase from standard charge traders.

	NIW - WwTWs'		Variance AIR12-AIR13	PPP - WwTWs'	
Traders Area	Ml/day	BOD Tonnes/year		Ml/day	BOD Tonnes/year
North East S & C	19.920	1738.870	-19%	1.68	373.18
North East Std Charge	1.020	64.749	22%	0.24	16.080
North West S & C	4.230	979.760	8%		
North West Std Charge	0.590	39.866	-9%		
South S & C	4.020	934.970	-12%	1.900	636.930
South Std Charge	0.310	20.420	-8%	0.210	14.380
Total	30.090	3778.635		4.030	1040.570
Trade Effluent Total	34.12	Ml/day			
	4819.205	BOD Tonnes/year			

4.1.1 NI Water Data

Lines 2 – 5 - Loads (NI Water only)

The methodology has not changed from previous reports. The data used to populate this table is extracted from a master spreadsheet populated and updated by the Asset Performance Team.

To track changes and keep the process as live as possible, the Asset Performance team monitor and update loads by liaising with various sections i.e. Operational Technical Support, Environment Regulation, Engineering and Procurement and the Rural Wastewater Investment Programme. Trade Effluent information is obtained from NI Water's Trade Effluent Section. The COD:BOD conversion factor was not utilised as BOD is analysed as part of the Trade Effluent analysis suite. Trade effluent information was obtained from NI Water's Trade Effluent Section for each individual consented trader, which enabled easy conversion to PEs. The COD: BOD conversion factor of 2:1 was not used as more accurate flow based information was available.

Loads at NI Water works with a PE greater than 250 are calculated from population figures using the assumed 60g BOD per person per day. Those less than 250 are derived largely from desk-top house count information from Map-Extreme and a broad brushed occupancy rate of three.

A flow and load programme to ascertain actual loadings was initiated in AIR12. Initial surveys due to spikes, spurious readings, and duration of surveys did not provide the necessary degree of confidence. A working group comprising of staff from various operational, scientific and technical support teams, chaired by Asset Performance, are tasked with implementing best practice. To improve confidence in flow and load information for AIR13, NI Water in conjunction with WRc has drafted a document entitled 'Asset Standard for Determination of Flow and Loads for Wastewater Treatment Works and Wastewater Networks'. Protocols developed within this document have been implemented for AIR13.

As reported in AIR12 discharge from hospitals, nursing homes & clinics are no longer considered as Trade Effluent. For the majority of hospitals, 5% of hospital discharges have been included as Trade Effluent. This is due to discharges from x-ray departments and bathing pools. A survey of discharge from [x] found that due to vehicle wash, renal unit osmosis and laboratory discharge, the trade effluent discharges equated to 7% and 32.6% respectively. Further surveys are planned for other hospitals. The PEs for the hospitals have been factored up to 100% of their total discharge to give a more accurate figure of load discharging to the sewerage network.

The AIR12 return reported for the first time on the strength of the supernatant liquors (Trade Effluent) discharging to Belfast WwTW for treatment. As a result the AIR13 population equivalent has reduced from 88095 to 64422.

In AIR12 the flow and load information for Belfast WwTWs, was not of good quality, due to spikes and spurious readings, and as such a theoretical PE of 354,507 was agreed for AIR12. Further surveys coupled with validation and approval by WRc has resulted in a PE of 365,000 for AIR13.

During the AIR13 period, 33 flow and load surveys were carried out, however, only 8 were adopted.

Treatment Works	Adopted Actual PE Output from F&L Survey	AIR12 PE (Based on a Desktop Study)	% Difference (-ve indicates AIR12 PE is higher)
Banbridge (WWTW)	22380	22680	-1.34
Belfast (WWTW)	365000	354507	2.87
Dromore (Down)	7355	7493	-1.88
Dungannon	78942	52319	33.72
Irvinestown	2669	3207	-20.16
Moneyreagh (WWTW)	2380	2274	4.45
Rathfriland (WWTW)	3977	3455	13.13
Tandragee	13659	11074	18.93
		% Average variance.	6.22

The 8 Flow & Load PEs adopted for AIR13 are on average 6.22% higher than the previous AIR12 Desktop PEs. However Dungannon is 33% higher than the previous desktop PE. The reason for the Dungannon WwTWs disparity is that 67% of the load discharging to the treatment facility is trade effluent. Flow & Load Surveys enable shock loads to be calculated which is not possible in a desktop PE. Dungannon has a unique catchment within NI Water having such a high trade loading. If Dungannon was discounted the average variance reduces to 2.29%.

Presently the sample group is too small to justify extrapolating the differences into the larger population of WwTW sites. Adoption of additional Flow & Load Surveys may make this viable.

Of the remaining 25 Flow & Load Surveys carried out during AIR13, 21 were carried out on works having a PE of less than 2000. For these sites the desktop (theoretical) PE was adopted in all cases, mainly as a consequence of the inability of the flow measurement devices to record low flows being received at the WwTWs. Despite this, Flow & Load Surveys are still beneficial at WwTWs under 2000PE by highlighting anomalies such as high infiltration or rogue trade discharges.

The remaining 4 surveys were discounted for reasons such as the positioning of the meter in relation to overflows, high rainfall during the flow and load survey and short duration of the survey.

Of the 16 wastewater treatment works receiving septic tank imports, only four discharge the imports at the head of the works. For AIR13 Lisburn (New Holland) is an addition to other AIR12 sites at Belfast, Glenstall, and Limavady.

Conversion factors, produced by Scientific Services, are used to determine additional PE. No allowance is made for the other 12 sites as imports generally discharge to sludge reception centres prior to transfer for further treatment to PPP works.

AIR12 reported that as part of an on-going meter calibration exercise for the Flow & Load studies it was planned that the supernatant return meters would be checked for accuracy and calibrated if necessary at the 12 WwTWs. As Flow & Loads were required at all WwTWs identified for upgrade during PC15, these checks have not

taken place. It is envisaged that this work will commence in AIR14. All lines indicate a slight increase from AIR12 data.

Line 3 - Primary treatment
Although equating to less than one percent of the total load this line has the recorded the greatest increase (47.8%). This is primarily attributed to Killough (Retention tank) being previously incorrectly designated as a Sea Outfall.

Line 4 - Preliminary treatment
The slight increase which equates to a population increase of 1055 is attributed to Whitehead pumping to Ballystrudder, and Glenarm pumping to Tully Road Head Works.

Line 5 - NIW only Total load entering system
A comprehensive protocol has been developed to ascertain the total theoretical PE which is used to derive a theoretical total load. Summation of loads receiving, preliminary, primary and secondary treatment, aligns with this figure. Previous reports have recommended that NI Water corrects possible over-estimations due to the inclusion of offices/commercial premises. Pointer information incorporates both commercial and unknown properties and the proportionality of residential to non-residential is unclear. Due to this uncertainty both elements are included when deriving PEs and BOD loading. The load attributed to non indigenous and commuting are also excluded. In AIR13 there is a very slight reduction from AIR12 of 2.04%, indicating that the methodology of deriving data (allowing for upgrades and closures) is robust.

The tabulated data below indicates locations which are having the greatest influence on total load entering the system. Negative values indicate an increase in load for AIR13.

Name of Works	PE Change	Comments
Dungannon	-26623	A Flow & Load was carried out at this site and following an APT review this was adopted for AIR13
Belfast (WWTW)	-10493	A Flow & Load was carried out at this site and following an APT review this was adopted for AIR13
Ballystrudder (Retention Tank)	-4536	It was confirmed that Whitehead now pumps to this WWTWs
Whitehead (WWTW)	4536	It was confirmed that this WWTWs now pumps to Ballystrudder
Newry (WWTW)	4214	Pe Updated with latest AIR13 Trade Information
Maghaberry	3288	A population appraisal was carried out at this site and following an APT review this was adopted for AIR13
Portavogie(Retention Tank)	3115	This WWTWs is now a pumpaway to Ballyhalbert Victoria

The Confidence grade C5 is based on work carried out with [x] who developed a Growth Model for NI Water. The Company recognises the need to improve

confidence grades by targeted flow and load surveys. To date NI Water has carried out a number of flow and load studies of which only eight have been incorporated within AIR13. To eradicate idiosyncrasies associated with flow and load survey output interpretation within NI Water, a Flow and Load Survey Group has been established to discuss and agree on the outputs from the backlog of surveys carried out to date and those to be carried out in the future. The experience held by the individuals involved in the Group (with process, operational, engineering and procurement and asset performance backgrounds) will enable sound decisions to be made regarding the adoption of the Flow and Load Survey outputs.

Line 6 and 7 – Equivalent Populations (NI Water Only)
Not all wastewater treatment works have Water Order Numerical Consents. Some have only descriptive consents which explain the variance between lines 6 and 7 in Table 15. Of the 1018 WwTW reported, only 230 have Water Order Numerical Consents.

Population figures are gathered on a theoretical basis. The confidence grade against these lines is C5, as they refer solely to WwTWs loading, and the majority of the WwTWs' PEs are based on a theoretical desk top approach, with some substantiation at a small number of works through on-site house counts. Implementation of a Best Practice Flow and Load survey programme will improve confidence year on year with associated increase in confidence from the current C5 grade.

Of the existing 1018 sites (a reduction of five from AIR12), 230 have numeric consents which is a reduction of one from AIR12. Comparing population equivalents with AIR12 there is an increase of 34320. Upgrading and greater emphasis on flow and load data, has resulted in increases as reported in Table 15 Lines 2, 5, 6 and 7 accounts for the percentage increase.

The confidence grade against these lines, as per previous years, is C3. As these lines are a measurement of a combination of WwTW's loading and particular treatment processes at the treatment facility, this grade is reasonable as the treatment processes at the WwTWs, whether secondary, primary or preliminary treatment is unambiguous.

4.1.2 PPP Data

Line 2 - Load receiving secondary treatment (PPP only)
Line 2 complies with the requirements of Table 15 to collect information of various types and sizes. The works are categorised by the highest level of treatment provided, which is a simplistic assessment of the population that receives primary, secondary treatment etc. It is not a detailed assessment of the load for each type of treatment.

The Biological load receiving secondary treatment to the PPP facilities has decreased from 7834.5 tonnes in AIR12 to 6594.9 tonnes for AIR13. The fairly significant reduction is attributed mainly to the reduction in tonnes/BOD/year observed at Ballynacor (3464.2 to 2244 tonnes/BOD/year). Ballynacor is part of the OMEGA Consortia and sampled 52 times per year. The samples for BOD analysis

are submitted on selected dates as per the Sampling Schedule agreed between NIEA & NI Water Contract Management Team on a yearly basis.

As the BOD data is not taken on a daily basis, the daily BOD load is calculated for the days in which BOD data is available. An average daily BOD Load to the works is then calculated and multiplied by the number of days in the reporting period to obtain the total load received at the works over this period.

Investigations indicated that during AIR12, Ballynacor treated on average 9465 Kg/BOD/day, which is in excess of the design criteria of 8076 kg/ BOD/day.

For AIR13 the daily average was 6148 kg/BOD/ day which aligns with design, this is reflected when compared to previous annual returns in the table below. There is no rational explanation for the previous year's higher than average figure AIR13 reflects a return to normality.

Private Finance carry out design due diligence. Unless there was a significant material change, which has not occurred, it is unlikely that treatment facility would require treating loads in excess of design.

Ballynacor Tonnes BOD /Year.			
AIR10	AIR11	AIR12	AIR13
2290	2468	3333	2244

As detailed below in the table below, loads treated at North Down, Richill, Ballyrickard increased while loads to Armagh and Kinnegar decreased. The load treated at Armagh has reduced for the third year in succession

Name of Treatment Works	Average Daily BOD Load (Kg/d)		Calculated total load (tonnes/ BOD/year)		Equivalent Population	
	AIR 12	AIR13	AIR 12	AIR13	AIR 12	AIR13
North Down WWTW	3902	4286	1428.1	1564.4	65033	71433
Armagh WWTW	1404	1252	513.9	457	23400	20867
Richhill WWTW	157	196	57.5	71.5	2616	3267
Ballyrickard WWTW	1632	1793	597.3	654.4	27200	29883
Ballynacor WWTW	9465	6148	3464.2	2244	157750	102467
Total			**6061**	**4991.4**	**276000**	227917
Kinnegar WWTW		**4393**	1773.5	1603.5	80759	73219
Grand Total			**7834.5**	**65949.9**	**356759**	301136

All 6 PPP facilities have secondary treatment, and information is based on sampling dictated by Environment Agency requirements. On one establishment at Kinnegar, monitoring is carried out daily with the Omega consortia works sampling weekly. The data sets are therefore as robust and secure as line determination permits.

At Kinnegar the BOD is measured daily, and converted into a daily loading; to provide an annual loading for BOD. Loadings for Omega Works equate to 4991.4 tonnes/annum and Kinnegar 1603.5 tonnes/annum, providing an overall PPP total of 6594.9 tonnes/BOD/year.

The decreased load receiving biological treatment is reflected by sludge produced as this has decreased AIR12 7.573 ttds versus AIR13 6.309 ttds (Table 42 line 40).

Line 3 - Total load receiving preliminary treatment (PPP only)
A zero return has been reported for Line 3, as all six PPP facilities are secondary treatment works.

Line 4 - Total load receiving preliminary treatment (PPP only)
A zero return has been reported for Line 4, as all six PPP facilities are secondary treatment works.

Line 5 – Total load entering the sewerage system (PPP only)
Prior to AIR11 this line was reported as “not applicable” as it was considered that the PPP Contractors did not operate the catchments. To align with a previous Reporter recommendation that the load from PPP facilities should be incorporated, the Asset Management Section has used the PPP WwTW PE (derived from measured flow at each of the six PPP WwTWs). Flow and load data equates to 6594.9 tonnes

BOD/year which is a decrease from AIR12 when 7834.5 tonnes BOD /year was reported. This information has not been collected from the PPP Contractors as they do not manage the catchments associated with the PPP Facilities. The data has been derived by NI Water on the same methodology as Table 15 Line 5 (NIW Only).

Lines 6 and 7 - Equivalent Population served (Resident) (PPP only)

The equivalent population served by the treatment facility, utilises calculated load data from the two PPP operations, based on 60g/h BOD.

As Kinnegar is a standalone facility and is sampled daily on a 24hr composite sample basis, the recorded results can be classed as very accurate. Omega comprises of 5 sites where at least weekly sampling is recorded, while this is not as accurate as Kinnegar it still gives a good representation of the load process by the facilities.

Both lines 6&7 are the same as all 6 works have numerical consents.

4.2 Sewerage Service Facilities (Lines 8 – 9)

4.2.1 NI Water Data

Line 8 – Number of sewage treatment facilities (NI Water only)
The reported number of WwTWs on this line (1018) differs from the total of 1028 reported in Table 17c, as the former does not include the screened outfalls (2 No.) and the unscreened outfalls (8 No.), as per the definition for this line.

The table below shows the changes in numbers of WwTWs since AIR12 for Line 8.

Name of Works	CAR ID	Change in Nr of STWs	Comments
Ballyavelin Road (133-135)	S04123	Reduction	It was confirmed that WWTWs is a Private WWTWs
Ballybogie Road(7-9)	S04875	Reduction	It was confirmed that this WWTWs now gravitates to Culmore
Castledawson	S01609	Reduction	This WWTWs is now a pumpaway to Magherafelt
Castlewellan Road (Dromore)	S02892	Reduction	It was confirmed that WWTWs is private
Clanabogan South WwTW	S05568	Addition	It was confirmed that this WWTWs was adopted by NIW for AIR13
Cross Lane 9-22 ST	S05572	Addition	This WWTWs replaced an existing WWTWs - Cross lane (9-22) under RWIP
Cross Lane(9-22)	S02427	Reduction	This WWTWs was replaced by a New WWTWs - Cross lane 9-22 ST (SO5572)
Diviny	S02403	Reduction	This WWTWs was replaced by a new WWTWs - Diviny New ST
Diviny NEW ST	S05546	Addition	This WWTWs replaced an existing WWTWs - Diviny under RWIP

Name of Works	CAR ID	Change in Nr of STWs	Comments
Goragh Road	S02287	Reduction	It was confirmed that WWTWs is private
Killough (Retention Tank)	S00275	Addition	These WWTWs was previously incorrectly designated as a Sea Out Unscreened. It was confirmed there is a Prim tank on-site.
Mullaghbane (Forkhill)	S02279	Reduction	It was confirmed that this WWWTWs is now a pumpaway to Mullaghbane (Forkhill)
Rathfriland Road	S02157	Reduction	It was confirmed that WWTWs is private
The Oyster Yard WWTW	S05533	Addition	It was confirmed that this WWTWs was adopted by NIW for AIR13
Whitehead (WWTW)	S00452	Reduction	It was confirmed that this WWTWs now pumps to Ballystrudder
		Net Reduction	**5**

The confidence grade for line 8 remains as A2. In AIR13 a small number of WwTW's have been removed from the list due to realisation of private ownership, or where individuals have installed their own septic tank, rendering the facility serving only one property. There is also the possibility that a number of small WwTW's are under the ownership of the NI Housing Executive or may have become private due to customers installing their own private septic tanks or converting 2 houses into 1.

Line 9 – Treatment Capacity available (NI Water only)
During AIR13, due to upgrading, the provision of additional design information, and changes to Water Order Consents, the design capacity has increased from AIR12.

However confidence in the data is low. This is primarily due to older NI Water facilities treatment capacity being based on industry standard design criteria. Of the 1018 facilities reported, 699 have PE's of less than 100 which are generally served by septic tanks and the number of WwTW with greater than 100PE but less than 250 is 82.

Although the new PPP facilities have a confidence grade of B3, the disproportionate effect of the NI Water data results in a much lower grade of D3 overall.

4.2.2 PPP Data

Line 8 - Number of sewage treatment facilities (PPP only)
We confirm there are six PPP facilities, identical to that reported in AIR12.

Line 9 - Treatment capacity available (PPP only)
Data is based on the actual design specification and there is no change from AIR12. Omega has a contract capacity of 19.6 tonnes and Kinnegar 10.8 tonnes (30.4 tonnes in total). Based on Line 2 data, the daily load receiving secondary treatment equates to18.06 tonnes BOD/day indicating a presumed overall head room of 12.34 tonnes BOD/day

The reported value is a design value. No investigation into performance or as constructed capacity has been undertaken to revise this value. No outages have been reported during the year to reduce the figure.

4.3 Sludge Disposal (Lines 14-16)

4.3.1 NI Water Data

Lines 14–17 - Sludge Disposal
The Company confirmed that the procedures in place for the disposal of sludge are well controlled and robust. All sludge produced by NI Water has been transported to PPP incineration facilities for disposal. As all sludges are disposed of through incineration or are disposed of in an appropriate manner by the PPP contractor during incinerator outage, there is not a concern that the control measures in place may allow some unsatisfactory disposal to occur.

The mass of sewage sludge disposed in the year has remained relatively constant over the past few years, reflecting both stable operations of the system and a relatively constant population, as well as good data recording facilities that have been in place for some time, allowing accurate capture of the mass of sewage sludge produced. The reported figure in line 15 is 32 ttds compared to 31.4 ttds last year.

The Company continues to have a well controlled management system for controlling sludge movements both as liquid and cake through use of a GPS logging system and the recent introduction of weighbridges at the 8 cake transfer sites.

The Company has included the weight of grit and screenings in the reported data (0.8ttds) which accounts for the difference between produced and transferred to PPP. This value is calculated from skip volumes using a 30% dry solid conversion, which is appropriate.

4.3.2 PPP Data

Line 14 - Percentage Unsatisfactory Sludge Disposed (PPP only)
The Company has reported that no unsatisfactory sludge has been disposed of during the year.

Whist the Sludge Disposal Contractor is self regulating, the protocol in place and third party involvement by the Department of Agriculture, who carries out soil analysis and identifies package numbers, provides security.

Line 15 - Total Sludge Produced (PPP only)
The volume of sludge produced, even after including grit and screenings from Omega and Kinnegar for the first time, is less than that reported AIR12.

The Changes in sludge produced data reflect the loads delivered to the PPP contractor from the NI Water sewer network, outside the PPP contractor's control. There are minor additions for Screenings and Grit which were not previously reported by the Contractors.

The variations are tabulated below;

PPP Production	AIR13	AIR12	AIR11	AIR10
Armagh WwTW	0.535	0.570	0.759	0.84
Richhill WwTW	0.065	0.066	0.213	0.21
Ballynacor WwTW	2.069	3.330	2.468	2.29
Ballyrickard WwTW	1.158	1.225	1.627	1.717
NDA WwTW	1.628	1.559	1.753	1.654
Kinnegar WwTW	0.726	0.823	0.792	0.7
Omega Screenings and Grit	0.106			
Kinnegar Screenings and Grit	0.022			
Totals	6.309	7.573	7.612	7.411

A large proportion of the sludge produced is pressed at Ballynacor. The cake that is then transferred to Duncrue Street for incineration is weighed via a weighbridge and dry solids content of each load is measured. This process gives a high confidence in the recorded values.

Sludge leaving Kinnegar is measured by the PPP contractor. Cross-check samples are taken by NI Water for independent analysis, again indicating a high level confidence in the recorded values.

Monthly reports produced by the PPP contractor for sludge produced and processed are scrutinised by NI Water on a monthly basis with numeric checks and cross checks, as the validated reports are the method of payment to the PPP contractor.

During AIR12 we questioned if grit and screenings had been included in the reported values of ttds produced in the year. The company advised that this value is zero as all skips at the PPP sites had not been emptied in the report year. Given the capacity of the PPP sites and population served compared to NI Water sites a value equivalent to 20% of the NI Water value for grit and screenings disposed of would have been expected (approx 0.1ttds). For AIR13, NI Water monitored the total grit and screenings leaving PPP premises. This amounted to 0.128ttds which mirrors the anticipated 0.1ttds in AIR12.

Line 16 - Total sewage sludge received from NI Water (PPP only)
This is a repeat of the NI Water table line 16 – sludge transferred to PPP.

Line 17 – Total sewage sludge disposal (PPP only)
This is the correct sum of lines 15 and 16.

4.3.3 Total

Line 14 - Percentage Unsatisfactory Sludge Disposed (NI Water + PPP)
NI Water reported zero unsatisfactory sludge disposals.

Line 15 - Total Sludge Produced (NI Water + PPP)
We confirm that the procedures in place for the disposal of sludge are well controlled and robust. All sludge produced by NI Water has been transported to PPP incineration facilities for disposal. As all sludges are disposed of through incineration or are disposed of in an appropriate manner by the PPP contractor during incinerator outage, there is not a concern that the control measures in place may allow some unsatisfactory disposal to occur.

Sludge cake is produced from 8 NI Water sites and transported to the PPP Contractor for incineration. Liquid sludge is also transported to the PPP Contractor (at Ballynacor & Duncrue Street, Belfast) where the Contractor measures and processes the liquid sludge as well as Indigenous sludge from Belfast WwTW).

The mass of sewage sludge disposed in the year has remained relatively constant over the past few years, reflecting both stable operations of the system and a relatively constant population, as well as good data recording facilities that have been in place for some time, allowing accurate capture of the mass of sewage sludge produced. The reported Sludge production for line 15 is 32 ttds compared to 31.4 ttds last year. This figure includes 0.8 ttds of screenings and grit sent to landfill.

The Company continues to have a well controlled management system for controlling sludge movements, both as liquid and cake through use of a GPS logging system, and the recent introduction of weighbridges at the 8 cake transfer sites.

The Company has included the weight of grit and screenings in the reported data (0.8ttds) which accounts for the difference between produced and transferred to PPP. This value is calculated from skip volumes using a 30% dry solid conversion, which is appropriate.

NI Water has a robust methodology for calculating lines 15 to 17. The assumption is made that transfer of sludge to the PPP contractor for incineration allows zero to be entered into Line 15 (unsatisfactory disposal) with an A1 confidence grade. Other checks and balances carried out by NI Water strengthen this assumption.

Line 17 - Total Sludge Disposed (NI Water +PPP)
The value is equal to reported volume produced.

5. Company Methodology

5.1 Sewage – Loads (NI Water Only)

Line 1 – trade effluent
For the larger industrial traders where discharge flow meters are fitted and operating, this data has been used. Where no discharge meters are fitted, discharge volumes are based on metered water supplied, with the normal adjustment for domestic and process use onsite.

For sites where neither discharge flow nor water supply data is available, discharge volume has been estimated as 100% of the consented volume.

No conversion from COD to BOD is required for this data as the trade effluent group analyse effluent for BOD, as well as COD which is used for charging.

Line 2 to 13 – sewage loads and treatment facilities
We reviewed in detail the asset performance master spreadsheet which is used to populate this and other tables. The spreadsheet allows the basic data on each WwTW to be entered such as works name, design PE, treatment process etc, and then the data can be manipulated to populate the various parts of the tables. The spreadsheet also covers Tables 17b, 17c and 17d as they contain comparable information. Inputs to the spreadsheet are gathered from a variety of information sources as shown below.

- Environmental Regulation Team: Updated consents and regulatory obligations.
- Operations Technical Support: STW improvements and changes to treatment process.
- Engineering & Procurement: New works, extensions and modifications.

Population data is gathered on a theoretical basis from properties in the catchment and standard occupancy assumptions. It is planned to check and improve this data with a series of flow and load surveys in the future to improve the confidence grade in Lines 6 & 7. Tourist populations are excluded as required, based on the proportion of PE in hotels, caravans and tent pitches.

We were advised that it is possible for a number of issues to arise which create uncertainty within the dataset. For example, a septic tank serving two houses is classified as a single sewage works. However, if one property is then sold, the septic tank is only then serving one house and is no longer designated a sewage works. Such updates are not always discovered, hence a small reduction in the confidence grade. Small septic tank WwTW's can also be easily overlooked as overgrown underground structures giving further uncertainty.

Treatment capacity available (Line 9) is calculated from design capacity in terms of population equivalent served, converted to BOD load.

Data reported has been reconciled with the previous Reporting Year, with full details stated in the Company commentary.

We reviewed a number of spreadsheets and data checks carried out by the Asset Performance Team, together with confirmatory emails on data queries and checks.

The general reductions in loads and population equivalents served in the NIW only Table 15 are matched by equivalent increases in the data for PPP Table 15.

5.2 Sewage – Sludge Disposal

NI Water has a robust methodology for calculating Lines 15 to 17. The assumption is made that transfer of sludge to the PPP contractor for incineration allows zero to be entered into Line 15 (unsatisfactory disposal) with an A1 confidence grade. Other checks and balances carried out by NI Water strengthen this assumption.

The volumes produced and transferred (Lines 15 & 16) are reported as the same value less screenings and grit and are based upon robust measurements and logging of liquid sludge by meter, and cake by weighbridge, coupled with the measured average %ds.

The most inaccurate aspect of the methodology is the measurement of grit and screenings, where a standard assumed 30%ds is used across the board to convert weighbridge measurements into ttds.

The methodology for deriving the PPP volume is similar to the NI Water methodology, whereby recorded wet tonnes are converted to ttds using measured average percentage dry solids.

6. Assumptions

It is assumed that the mass of sludge produced is the same as that disposed of, given that there is negligible sludge storage within the system.

Refer also to our commentary on Tables 17d and 17g for further assumptions that have been made in the background data used to estimate populations, loads and sludge volumes.

7. Confidence Grades

For Line 1, a confidence grade of B2 was considered appropriate for this data. Whilst acknowledging year on year improvements, policy changes, increased consents and the accuracy of meter readings, it was agreed that the confidence grade should remain as B2. We confirm the protocols and checks reviewed support this grade.

For Lines 6 & 7 (PPP data), a confidence grade of B2 has been proposed which is an increase from B2 in AIR11. Data is based upon weekly 24hr composite samples, hence the proposed CG is considered appropriate.

For Lines 14 to 17 the contributors to NI Water and PPP entries have differing approaches to representing confidence grades for these lines. The approach to NI Water entries has been that the methodologies in place are consistent and robust resulting in high confidence grades. The only exception to this is the lines which include calculated tonnes of grit and screenings where it is recognised that the inclusion of the assumed 30%ds for conversion introduces a higher level of inaccuracy.

Calculation of the PPP entries follow the same level of vigour and consistency in the methodology, however the line owners have also taken into consideration the available accuracy of measurement into account. For instance where every load of sludge cake is weighed and sampled to provide %ds for calculation of ttds, it may be considered that a very high confidence grade could be attributed to the data, but instead an allowance has been made that %ds is variable throughout a load and that onsite measurement and even lab testing has inaccuracies so a high confidence grade can never be given to this type of information. The audit team feel this is a

presenting the data as being of poorer quality than it is. Although the measurement of sludge using dry solids conversion and extrapolated sampling has a degree of error the method is best practice and aligns with other UK water company methods. Added to this it can be considered that frequent sampling although containing an inherent margin of accuracy for each sample should, over the period of a year, even out these errors to produce a total value with a good confidence grade.

For Line 14, as no unsatisfactory sludge has been disposed of, and protocols are robust and data secure, we would accept that an A1 confidence grade is acceptable. The Company has adopted A1 for NI Water table and A2 for PPP table; A2 overall. We accept the issue that sludge cannot be measured to an accuracy of <1% hence A2 has been used but feel in this case reporting of zero can be A1.

For Line 15, 16 & 17 as discussed above, the methodologies and record keeping systems in place would suggest a high confidence grade for the data. For both NI Water and PPP entries the volumes of sludge excluding screenings and grit appear to be recorded with an 'A' confidence grade for the methodology element to an accuracy (as a yearly average)of +/- 5%; hence A2 would be appropriate for these elements. The introduction of grit and screenings which does rely upon an element of estimation reduces the confidence grade from 'A' to 'B', however because the volumes are small the percentage error resulting from this is small and the overall reporting value is probably still within the '2' band and B2 would be appropriate. Also for Line 16 totals transferred and received NI Water/PPP the confidence grade can be taken as high as this element does not include the grit and screenings part. A summary of the confidence grades presented by the Company and the Reporter' opinion is as follows.

Line		NIW Data	Reporter	PPP Data	Reporter	Total	Reporter
14	% Unsatisfactory	A1	A1	A2	A1	A2	A1
15	Total Sludge produced	B2	B2	B3		B3	B2
16	Total Transferred / Received	B2	A2	B3	A2	-	-
17	Total Disposed of	B2	B2	B3	B2	B3	B2

Date: 29 July 2013
Prepared by: HMS

Table 16 – Sewerage Service Activities

Commentary by REPORTER

1. Background

Network activities provide a good measure of work achieved, provided that they can be related to associated investment. The investment breakdowns included in these reporting requirements provide this linkage, with the separation of base service expenditure from that related to enhancements on table 36.

2. Key Findings

- Reconciliation of lines 1 & 2 with 14 & 15 does not follow the table definition, instead adjustments are made in line with the Company GIS database which is appropriate and consistent with AIR12.
- There is an inconsistency between the reporting of WwTW IDs in line 17a but excluding WwTW UID's from line 16a, however reporting is consistent with AIR12.
- No drainage area plans have been completed in this year and there is only one ongoing at present. This is a consequence of the expiry of the previous framework for studies and a delay until recently in procurement of a new framework.
- The number of reported collapses and blockages are improving year on year, but are still very high when compared to E&W water companies. We consider a targeted SMRP would help to further improve performance.
- The Company are now able to report on the time required to repair a blockage (Lines 13a-13c), and have reported that circa 6% of total blockages in 2012/13, required in excess of 6 hours to repair.
- As the methodology for lines 12 to 13c is now able to differentiate between failures on the main sewer and failures on laterals, we are inclined to support an improvement in the confidence grade to B3.

3. Audit Approach

The responsibility for the compilation of table 16 is held by a single manager who collates information from a number of contributors. The manager and contributors to the various lines were audited. The systems and methodologies used to gather data were reviewed.

4. Audit Findings

4.1 General

The methodologies for collection of data into the table are unchanged from last year and continue to give generally good data with only minor short comings.

4.2 Asset Balance (Lines 1 to 2) (NI Water only)

The total length of sewers at the start of the report year is consistent with the asset balance at the end of the previous year (lines 14 and 15, column 4) and was carried forward correctly.

NI Water, unlike other water companies, is responsible for most lateral sewers as well as main sewers. Only the main sewers are included in the lengths reported in lines 1 and 2 as there are very few laterals mapped. The laterals that are mapped within GIS are clearly distinguished from main sewers and are excluded from these totals.

4.3 Changes during Report Year (Lines 3 to 11) (NI Water Only)

Entries for lines 3 to 11 are an amalgamation of data from different sections of NI Water; Engineering and Procurement (E&P), Network Sewerage, Developer Services and Asset Management.

Line 3 – New Critical Sewers
New critical sewers are added onto the Company's GIS system in two ways, through adoptions by Developer Services and completion of capital projects by E&P.

Sewers laid by E&P are new public sewers within roads and other public areas. Information is captured on the Company's CPMR database which has been designed with regulatory reporting in mind. Data is entered by contractors via a portal to the database and is approved by the appropriate project manager. The data collection by this process is quite extensive; drop-down boxes are used to define critical and non critical sewers. Approval by the project manager and the link to contractor payments helps with data verification. The accuracy of the information entered by contractors is re-checked at the end of each project against as-built drawings.

New sewer systems have separate foul and stormwater drainage, and the lengths of both pipes are counted.

Developer Services maintain a database of new adoptions which feed into the GIS database of sewer records. The methodology is unchanged from last year. Lengths are taken from as-built drawings, with a representative sample surveyed on site to check accuracy.

There has been a change this year in the methodology for classification of sewers between critical and non-critical in response to previous auditor comments. Previously Developer Services relied on size of sewer being greater than 450mm dia as the main classification criteria for critical. However, now the guidelines of the WRc Sewerage Rehabilitation Manual are now being followed in relation to all parameters. As this is the first year using the new classification system, there may be some sewers being placed in the wrong classification while users become familiar with the new system.

The length of new critical sewers has increased significantly this year from 4.62km to 33.50km. This increase has come mainly in the Developer Services area. It is not

clear if the increase is due to the change in methodology for classification of sewers – the combined total length of critical and non-critical sewers for this year is similar to last year, it is only the proportion of critical sewers that is higher.

Line 4 – Critical Sewers Inspected by CCTV
There were 1.709km of critical sewer inspected by CCTV/Man Entry by E&P, 29.159km of critical sewer inspected by Networks Sewerage and 20.920km by Asset Performance. The overall total of 51.79km is similar to the AIR12 total of 53.18km.

The sewer inspected by E&P generally relates to new sewers inspected following their construction. The lengths inspected are captured in the Company's CPMR database, where the contractor also makes the classification into critical and non-critical sewers using guidance from a drop down list.

The information gathered by Networks Sewerage means that it is not possible to classify whether the sewers that were inspected by CCTV were critical or non critical, therefore it is assumed that the proportion of sewers inspected by CCTV that are critical is the same as the proportion of NI Water's sewer stock that is critical. This method of calculation is consistent with that used in previous years.

Line 5 – Critical Sewers Renovated
There was only 0.952km of critical sewers renovated by E&P in the reporting year, compared to 2.55km last year. The classification into critical and non-critical sewers is made by the delivery teams.

There has been a small length (462m) of critical sewers renovated by Network Sewerage in the reporting year. The data is provided by the sewer maintenance contractors.

Line 6 – Critical Sewers Replaced
There was 1.04km of critical sewers replaced by E&P in the reporting year. The classification into critical and non-critical sewers is made by the delivery teams. This makes up the entire entry for line 6.

Line 7 – Abandoned Critical Sewers and Other Changes
A zero entry has been reported for this year for this line. This is based on reports from Engineering Procurement and Networks Sewerage, based on physical abandonment of sewers during the year. However, the methodology does not appear to pick up on other factors listed in the guidance which might result in a reduction in overall length of critical sewers e.g. sewers re-classified as non-critical, corrections from previous data errors, or improvements in digitising accuracy.

Line 8 – New Non-critical Sewers
As with line 3 (new critical sewers) new non-critical sewers are added onto the Company's GIS system in two ways, through adoptions by Developer Services and completion of capital projects by E&P.

There were 12.792km of non-critical sewers laid by E&P and 132.607km of non-critical sewers adopted by Developer Services. The commentary relating to line 3 applies to this line also because of the complementary nature of the information. The

identification of critical and non-critical sewers by Developer Services is now in accordance with the WRc Sewerage Rehabilitation Manual

Line 9 – Non-Critical Sewers Renovated
There was only 1.03km of non-critical sewers renovated by E&P during the Report Year along with a small amount (1.281km) by network sewerage.

Line 10 – Non-Critical Sewers Replaced
There were 19.29km of non-critical sewers replaced by E&P during the Report Year which made up the whole line total. This is a significant increase on last year when only 1.02km was replaced. The increase is mainly due to one project (Benone Area Sewerage).

Although Network Sewerage reported zero for this line the lower confidence grade for collection of their information has reduced the overall value for the line entry.

Line 11 – Abandoned Non-critical Sewers and Other Changes
A zero entry has been reported for this year for this line. This is based on reports from Engineering Procurement and Networks Sewerage, based on physical abandonment of sewers during the year. However, the methodology does not appear to pick up on other factors listed in the guidance which might result in a reduction in overall length of critical sewers e.g. sewers re-classified as critical, corrections from previous data errors, or improvements in digitising accuracy.

4.4 Sewer Collapses and Blockages (Lines 12 to 13c) (NI Water Only)

There were 74 collapses per 1000km and 1364 blockages per 1000km reported in 2012/13. Rising main failures account for 3.8% of collapses.

Whilst steadily improving, the above figures are still very high when compared to water companies in England and Wales. As highlighted in our commentary for Table 16a, NI Water is now able to separately identify blockages occurring on the public main sewer, public laterals and private laterals, and have been reporting on this basis since April 2013. However, the blockage data collected for the first two months of 2013/14 suggests that very few blockages actually occurred on a public lateral, which is in contrast to our previously assumed explanatory factor. On this basis, it appears that NI Water is an outlier and experiences a significantly higher number of blockages than comparable E&W water companies. We consider that the lack of a targeted and focussed sewer replacement programme (SMRP) has contributed to the disproportionately large number of blockages reported in the year. We recommend that NI Water considers the implementation of a large scale, widespread, targeted SMRP, whereby a prioritised replacement programme is based on blockage hotspots.

In order to report on the time to repair blockages in Table 16 L13a-13c, NI Water now runs a monthly report in Ellipse which confirms the length of time a sewer blockage job took to be completed. We found that the Ellipse system provides details of all work requests raised, relating to blockages.

In completing our review, we noted a discrepancy in the total number of blockages reported during the year when compared to the actual contractor invoices. For 2012/13, Ellipse identified 23,714 blockages, whilst the paid invoices confirmed 20,801 blockages. We queried the basis of this variance and the Company advised the Ellipse figures also include follow-on work orders attached to original work requests and work requests raised and subsequently cancelled.

We undertook a detailed review of the Ellipse blockage data for two of the months in 2012/13 (April and September) and were able to identify a number of follow on / cancelled jobs which accounts for the variance. We also identified a number of other anomalies with the data that required manual adjustment, including;

- A large number of jobs with a negative time entry were apparent, i.e. the job was completed before it was raised. We found that these jobs were raised by the Field Manger in the field and completed before the job was raised on Ellipse. We reviewed a selection of these, which account for circa 5% of the total monthly work requests, and note that they appear to have been completed within 6 hours.
- Conversely, there were also a number of jobs that were raised and then cancelled, but were not closed out in Ellipse, thus recording a large job duration (in excess of 70m hours). These entries also account for circa 5% of the total monthly work requests.

4.5 Asset Balance at March 31 (Lines 14 to 15) (NI Water Only)

Based on the formulae, lines 14 & 15 should be the summation of data entries from lines 1 & 2 and lines 3 to 11. However, NI Water does not follow this approach, instead opting to adjust lines 14 and 15 to corrected figures obtained from their GIS database. This approach has allowed them to report the correct entries in lines 3 to 11 and also a more appropriate value for the total lengths reported in lines 14 and 15. As such, this is considered a reasonable and pragmatic approach.

Reconciliation of the asset balance correction is needed as the Company continues to update and improve its GIS database.

The total length of sewers at the end of the reporting period is 15254.37km, an increase of 1.1% from AIR12 and largely in line with new sewer activity. The proportion of critical sewers has stayed relatively static at 24.3%.

4.6 Intermittent Discharges (lines 16a, 16b, 17a and 17b) (NI Water Only)

NI Water has used the value of UIDs reported in AIR11 as a baseline for reporting UIDs in subsequent years. Line 16a, number of UIDs excluding CSOs is the AIR11 reported value less the number removed from the network through capital projects. The AIR 11 value is an estimate calculated by applying the percentage of NIEA classified UIDs to the total number of IDs. There has been no change in the percentage used since last year as NIEA have not classified any additional Ids in this period. Although there has been some further reconciliation of ID numbers in lines 17a & b this approach would appear appropriate.

The information for line 16a and 17a (historic from AIR11) is only based upon combined pumping station overflows. Foul-only pumping station overflows are not included as they do not have a formal NIEA classification. Similarly overflows within the boundaries of WwTWs are not included in line 16a as it is expected that any improvements to overflows at works are expected to be included in improvements at works, the total number of overflows at works are however included in line 17a. This approach is consistent with previous year's reporting.

Information for lines 17a and 17b is extracted from the Asset Performance Team Data which is updated throughout the year. Changes are only made to the database when signed up to by the business unit which allows robust control of the information. Details of the additions and removals are fully documented in Company commentary.

The Regulator guidance on the preparation of lines 16a and 17a is not explicit but NI Water has continued their methodology from last year which includes WwTW and foul only PS overflows in the total for line 17a but excludes unsatisfactory WwTW and foul only overflows from the total for line 16a. There is a possible discrepancy in information, but year on year reporting is consistent. An estimate of the number of foul-only pumping station UIDs and WwTW UIDs is not known.

4.7 Drainage Area Plans (lines 18 and 22) (NI Water Only)

The Company uses a definition of all networks greater than 250PE for line 20, total number of drainage areas. This would appear a reasonable approach and results in 256 being reported for the line, a decrease of 5 from last year as a result of completion of a number of pump away schemes. The Company's ongoing programme of studies is based upon drainage areas with a resident population greater than 1000 and hence they have only 109 areas out of the 256 in their programme.

The Company has not completed any DAP studies in the Report Year and have returned a one in line 19 for studies in progress. This lack of investment is a result of the expiry of the previous 5 year framework for drainage areas studies in 2010 and the delay in its renewal until recently because of procurement issues.

The Company has used a 2003 baseline for reporting model builds including all those built or maintained after this date.

The percentage completion has increased very slightly since last year because of the decrease in drainage areas from 261 to 256. The percentage of population and properties covered by the completed studies has decreased slightly due to an increase in connected population during the last year without any corresponding increase in number of completed studies.

The confidence grades associated with the lines are appropriate. Line 18 has an appropriate A1 associated with the zero entry. The confidence grade for line 22 has been maintained at B3 the same as last year when it was increased as a reflection of the improved accuracy of table 13, connected population.

4.8 Nominated Sewerage Service Outputs (lines 23 to 30) (NI Water Only)

Line 23 – The Company has reported the completion of 38 UIDs in this year. The Company maintains a spreadsheet of outputs against their plan, this is populated from their Captrax database which collates information on capital schemes. The Commentary from the Company admits that one of the outputs claimed last year (Caw Park CSO was claimed in error), and a number of outputs which were completed in previous years but not yet claimed have been added to the AIR13 total. The total completed to date under the PC10 programme is 101. This exceeds the revised PC10 target of 68. A list of the completed outputs has been included in the Company's Commentary, but the list still contains Caw Park CSO, which is why there are 102 outputs listed rather than 101.

Line 24 – For line 24 (delivery of improvements to WwTW through nominated schemes as part of a defined programme of work) NI Water is reporting 12 outputs for this year. They have also revised upwards the claimed outputs for the two previous years covered by PC10. The number of outputs claimed for 2010/11 has increased from 20 to 29, and the number of outputs claimed for 2011/12 has increased from 7 to 15. These increases arise from two changes to methodology, firstly the inclusion of a number of previously unclaimed outputs, and secondly the inclusion of a number of WwTW of PE greater than 250 which were completed in the Rural Works Improvement Programme (RWIP).

The Company is now reporting a total of 56 outputs delivered in PC10, of which 38 are nominated outputs, 7 are additional outputs, and 11 are small WwTW completed under the RWIP.

Four of the previously unclaimed outputs were completed in 2010 (Annaghmore WwTW, Derrytrasna WwTW, Dungiven WwTW, Martinstown WwTW). NI Water argues that these 4 sites should be included as PC10 outputs because they had significant capital spend in 2010 even though they were not part of the PC10 programme. The other three additional outputs are improvements that have been delivered to WwTW which were not listed in the PC10 programme. These additional outputs have not yet been approved through the PC10 Change Control Protocol. Neither has the 11 small WwTW projects on sites with greater than 250PE which were delivered under the RWIP.

The guidance issued by the Regulator states that Line 24 should only list those projects which are included in the PC10 Annex N1 02.00 or which have been agreed by stakeholders through the PC10 Change Control Protocol. The inclusion of these additional sites in Line 24 is therefore in contradiction to the guidance of the Regulator. Sticking to the guidance, and to the methodology used for reporting in previous years, the number of nominated outputs completed this year was 10, bringing the total completed to date in PC10 to 38.

Line 25 – Investments in improvements to small WwTW. The definition for 'small' wastewater treatment works is taken as <250PE which is those included in the rural wastewater improvement programme, this is as previous Annual Information Returns. The spend obtained from the Company's accounting system using and applicable filter and has been adjusted for COPI to 07/08 prices which is correct.

5. Company Methodology

5.1 Asset Balance (lines 1 to 2)

These lines are equal to lines 14 and 15 of the previous year's return.

5.2 Changes during Report Year (lines 3 to 11)

Information is collected from a variety of sources to complete these lines.

A combination of Engineering and Procurement (EP), Developer Services (DS), Networks Sewerage, and Asset Management carry out the activities in lines 3 to 11 for NI Water. The PPP contractors may also carry out these activities. The method of compiling the information is similar to AIR12.

EP collates information from the sewerage infrastructure monthly returns. Data is entered directly by contractors via a portal. The database has been developed with the reporting of AIR returns in mind and has comprehensive data fields to collect appropriate information about new assets. Drop-down boxes are used to allow the selection of critical and non-critical sewers. The information entered by contractors is checked and approved by EP. The information is cross-checked against invoices prepared by the contractor, which ensures that work being completed and invoiced is being reported. A final check of quantities against as-built drawing is made at the end of each project.

The components of lines 3 and 8 (new critical and non-critical sewers) that are the responsibility of DS are those sewers constructed by developers and then adopted by NI Water. Design drawings are submitted by developers for approval by DS. Once as-constructed drawings are submitted (and inspection of the new sewers is passed), DS issues a preliminary adoption certificate and the sewers are mapped in GIS, but marked as "unadopted". Following the defects liability period (12 months) a final adoption certificate is issued by DS and the status of the sewers is changed to "adopted" in GIS. When the final adoption certificate is issued, the details are logged onto a spreadsheet tabulating the diameter and lengths of pipe for each scheme. This information is used to generate the lengths of new sewer for lines 3 and 8.

The collation of information by DS for identification of critical/non-critical is now in accordance with WRc guidelines as discussed in section 4.3 above.

Networks Sewerage and Asset Management contribute data mainly for Line 4 (CCTV Inspection). While the lengths of sewer surveyed may be accurately reported, the split between critical and non-critical sewers is theoretical as the information reported back from site does not identify the type of sewer surveyed. This is one area where the accuracy of reporting could be improved.

5.3 Sewer Collapses and Blockages (lines 12 to 13)

The number of sewer collapses and blockages per 1000km is calculated based on other data as follows:

- line 12 (sewer collapses) = [table 16a line 1 (rising main failures) + table 16a line 2 (gravity sewer collapses)] / [table 16 line 14 (length of sewers at end of year)]
- line 13 (sewer blockages) = [table 16a line 3 (sewer blockages)] / [table 16 line 14 (length of sewers at end of year)]

5.4 Asset Balance at March 31 (lines 14 to 15)

These should be calculated from the previous lines as:

- line 14 = line 1 + line 3 + line 8 – line 7 – line 11
- line 15 = line 2 + line 3 – line 7

However the Company adjusts the entries to allow reconciliation of the sewer stock data recorded on its GIS database as discussed above and as previous AIR returns.

5.5 Intermittent Discharges (lines 16 and 17)

Lines 16a and 16b
The methodology for this line changed from AIR09 to AIR10 following the clarification of a query. In AIR09 the Company reported on the number of UIDs classified by NIEA to date, for AIR10, AIR11 and AIR12 the Company made an estimate of the total number of UIDs based on those classified to date and the total number. A historic percentage generated at AIR10 was used for AIR11. This figure reported for AIR11 has now become a baseline for calculating subsequent years. The change in UIDs during the year has been applied to the values reported last year; this would appear a reasonable approach.

Lines 17a and 17b
The methodology for these lines is unchanged from last year. Rationalisation exercises have been undertaken to identify the incorrect entries such as dual manholes and bifurcations. In addition an independent consultant undertook an exercise to ascertain any additional sewerage system overflows which may exist but for which NI Water has yet to apply for a Water Order Consent. This work was completed in December 2010 but the verification process is still ongoing due to the large amount of data compiled. Those catchments completed have been included in AIR13 (82 in total, including 38 added during year).

5.6 Drainage Area Plans (lines 18 and 22)

Data for these lines is obtained from the maintained plan of drainage studies, and the methodology is unchanged from last year.

5.7 Nominated Sewerage Service Outputs (lines 23 to 30)

Data for line 23 is maintained in a spreadsheet along with beneficial use date, analysis of the spreadsheet is undertaken to determine the return for the table.

Data for lines 24 & 25 comes from CIM based on Q4 cross referenced to PM information on programme dates.

6. Confidence Grades

The Company has assigned a confidence grade of B3 to line 1, repeating the CG for line 17a in last year's return from which line 1 is copied. The confidence grading recognised that the GIS record is not complete, and that there will be some unmapped sewers.

The Company has assigned a lower confidence grade of C3 to line 2, a repeat of the CG assigned to line 15 in AIR12.

The Company has assigned a lower confidence grade of C3 to line 3 compared to B2 last year, the data is a combination of two sources EP and DS. The considered confidence grades of the two data sources are presented in the Company commentary and the lower value reported to represent the line. Unlike previous years when the DS team attached a B2 confidence grade to their own data, this year they used the Asset Information section of NI Water to analyse the sewer lengths, and it was the Asset Information team being less familiar with the methodology that provided the lower C3 confidence grade.

Line 4 is a mixture of A2 from EP, B3 from AM and C4 from Network Sewerage. As the C4 element is the largest, and due to the problems with the methodology mentioned above, this was taken as the overall grade similar to last year.

The Company has assigned a confidence grade of B2 to lines 5 and 7 which is the same as last year.

The Company has assigned a confidence grade of B2 to line 8 last year. However, this year it was reduced to C3 as the grading for the DS element was attached by Asset Information rather than Developer Services themselves (as Line 3).

The confidence grades for lines 9 & 11 remain at B2 as last year which we deem appropriate.

The Company has assigned a confidence grade of B3 to lines 12 and 13, on the basis the data is derived from checked and paid invoices, and relies on the total length of main (L14 CG B3) in its calculation. Now that NI Water is able to assess the number of collapses/blockages occurring on lateral sewers, we are inclined to support an improvement in the confidence grade to B3.

The confidence grade for line 15 has remained at C3 for this year. Although the Company's GIS data still has a high degree of missing information we believe the C3 confidence grade is appropriate.

The Company has assigned a confidence grade of C2 to lines 16a and 16b. This is a repeat of last year and is appropriate as generation of the line data includes estimates of the number of intermittent discharges as well as those listed by NIEA.

Confidence grades remain at B3 for lines 17a and 17b. B3 is appropriate given the ongoing work to improve data and complete the verification of the work carried out by the independent consultant.

Confidence grades vary between A1 and A2 for lines 18-21. Since the data is pure direct measurement we support this grading.

The confidence grade for Line 22 has maintained at B3 which is a reflection of the grading for the population data reported elsewhere in AIR13.

The confidence grade for Line 23 has been reduced this year to B3 from the previous A1. The Company has reassessed the accuracy of the data chain for this line and concluded that B3 is more appropriate. Given the number of errors that have been identified in previously reported outputs, we would agree with this revised grading.

Confidence grades for lines 24-25 are unchanged from last year. Line 24 has been allocated B3 as the company is not confident all data for this line is fully captured and the expected margin of error as a percentage for the low value of the line results in B3. The A2 confidence grade for line 25 is not an A1 despite good data as the reporting metric is investment value which the company considers has potential for inaccuracy greater than 1% which we would concur with.

8. Consistency Checks

- Lines 12 and 13 are consistent with lines 1-3 of table 16a and line 14 of table 16.
- Lines 14 and 15 are not consistent with lines 1, 2, 3, 7, 8 and 11, as discussed in the body of this report but the reason this is understood.

Date: 29 July 2013
Prepared by: HMS

Table 16a – Sewerage Service Serviceability Indicators

Commentary by REPORTER

1. Background

This information in this table is required to measure the level of maintenance activity undertaken within a Company.

2. Key Findings

- NI Water is now able to separately identify blockages occurring on the public main sewer, public laterals and private laterals, and have been reporting on this basis since April 2013.
- For the first two months of 2013/14, NI Water confirmed that only 17 of the 1809 blockages reported, actually occurred on a public lateral, which is in contrast to our assumed explanatory factor for the disproportionately high number of blockages reported.
- Whilst collapse/blockage performance is improving year on year, we consider that a large scale, widespread, prioritised sewer replacement programme based on blockage hotspots, would further improve performance.
- The Company has reported a total of 10,333 equipment failures repaired in the year. This is a small reduction on last year.

3. Audit Approach

The responsibility for the compilation of table 16a is split between 2 system holders, each of whom was audited. The audit consisted of an interview with the line owners to discuss the methodology and data used to generate this table.

4. Audit Findings

4.1 General

NI Water has historically reported a higher number of blockages than comparable companies in E&W, which we attributed to the fact NI Water's total number of blockages was inclusive of blockages on public laterals that were excluded from E&W figures.

We have previously recommended that NI Water develops systems to enable the identification of critical and lateral sewers and thus identify what proportion of collapses and blockages occur on public laterals, and confirm that work has progressed to identify critical and lateral sewers and that these layers have been added to NIW's Corporate Asset Register. Work is also progressing on identifying sewer repairs as a result of CCTV surveys. As such, NI Water is now able to separately identify blockages occurring on the public main sewer, public laterals and private laterals, and have been reporting on this basis since April 2013.

We reviewed the blockage data collected for the first two months of 2013/14 and found that only 17 of the 1809 blockages reported to date, actually occurred on a public lateral, which is in contrast to our assumed explanatory factor. On this basis, it appears that NI Water is an outlier and experiences a significantly higher number of blockages than comparable E&W water companies.

During our AIR13 audit of Table 3 (Internal Flooding), we identified a section of main that was subject to frequent repeat blockages, suggesting structural issues with the sewer, and based on the large number of blockages reported year on year, it would appear that poor condition mains may be widespread. We also note that NI Water only has a small sewer replacement programme (SMRP) for PC10 (64km). We consider that the lack of a targeted and focussed SMRP has contributed to the disproportionately large number of blockages reported in the year (circa 21,000). We recommend that NI Water considers the implementation of a large scale, widespread, targeted SMRP, whereby a prioritised replacement programme is based on blockage hotspots.

4.2 Sewers – Maintenance (lines 1 to 4)

Line 1 – Rising main failures
There were 41 rising main failures (Line 1) recorded in the reporting year, 57% higher than that reported in AIR12.

Line 2 – Gravity sewer collapse
There were 1081 gravity sewer collapses (Line 2) recorded in the reporting year, 9% lower than that reported in AIR12.

Line 3 – Sewer blockages
There were 20,801 sewer blockages (Line 3) recorded in the reporting year, 3,643 (15%) fewer than reported in AIR12. We found that performance is generally improving year on year, with NI Water reporting circa 7,000 fewer blockages than in 2008/09. The Company accounts for this improvement through a more proactive approach to maintenance, however, we consider a targeted sewer replacement programme, driven by blockage hotspots would further improve performance.

In order to report on the time to repair blockages in Table 16 L13a-13c, NI Water now runs a monthly report in Ellipse which confirms the length of time a sewer blockage job took to be completed. We found that the Ellipse system provides details of all work requests raised relating to blockages. Although not directly related to this table, we reviewed the Ellipse blockage data for 2012/13 and noted a discrepancy in the total number of blockage reported during the year when compared to the actual contractor invoices. For 2012/13, Ellipse identified 23,714 blockages, whilst the paid invoices confirmed 20,801 blockages. We queried the basis of this variance and the Company advised the Ellipse figures also include follow-on work orders attached to original work requests and work requests raised and subsequently cancelled.

Line 4 – Equipment failures repaired
In terms of equipment failures, the systems used for managing and recording M&E maintenance were upgraded at the end of 2008 and are operating well. Initial problems with remote field communications have been overcome by improvements

to band width and are performing well. Further development is required to enhance the ability of the systems to differentiate between failures which cause a detrimental impact on service to customers or the environment and those which do not, and the Company is continuing to review actions in this area. The current system relies on the information reported back by Work Controllers, and they are gradually getting better at recording the reasons for failures. Manual review of the monthly return figures is used to filter the information for the AIR return.

The return figure for 2013 is 10% less than 2012. This reduction is partly attributed to the very wet weather experienced in 2011/12 which may have resulted in a higher than normal result for AIR12, and partly to improvements in the maintenance programme which is using data from the Mobile Work Management system to target improvements on equipment which has been causing the most problems in previous years. High rainfall puts an increased load on the sewage pump stations which translates into increased equipment failures, so a certain amount of fluctuation in the number of failures can be expected year to year.

5. Company Methodology

5.1 Rising Main Failures, Gravity Sewer Collapses, Sewer Blockages (lines 1 to 3)

Network failure data is collated by the Networks Sewerage field managers using checked and paid invoices from the sewer maintenance contractor under the '309 contract'. The base data that is collected differentiates between rising main failures, gravity sewer collapses and sewer blockages. This data is submitted on a monthly basis to the three network area managers and then to the Networks Sewerage Business Unit.

5.2 Equipment Failures Repaired (line 4)

The Company recorded the relevant information for this category in the Mobile Work Management (MWM) system. Data is gathered on sewage pumping stations, terminal pumping stations, CSOs etc, but is still not recorded for non-electromechanical equipment such as storage tanks or hydrobrakes.

The systems are currently unable to differentiate between a pump failure and the outcome of that failure i.e. whether there was a detrimental impact. Pump blockages are also recorded even if the blockage was due primarily to a flash flood rather than an actual pump failure.

A description of the process which gathers the information regarding failure and repair is best illustrated by e.g. a pump failure as follows:

- Failure is recorded by either telemetry (approximately 90% of cases) or by a mobile operator site visit (10% of cases).
- Alert is passed to the Function Supervisor in the Work Control Centre. Details are passed out to the mobile technicians via 'toughbooks'. These are mobile laptops fitted with wireless communication and record details of the failure. The

technician then completes the repair and records job completion and/or any further work requests.

- Data is passed back to the Work Control Centre and recorded via Ellipse.

The system has been observed in operation at company work control centre at previous audits and is unchanged this year.

5.3 Information Analysis

Implementation of the 'Ellipse' system for collecting data at the end of 2008 has improved the collection of data. The work management system and associated 'toughbooks' are working well.

The Company is using the data gathered to target problem areas with high failure rates to see if there are fundamental causes which can be addressed to reduce recurrences.

The Company is also using the failure data pro-actively to drive planned maintenance regimes. Thus high failure rates in equipment may result in an increased planned maintenance frequency, or vice versa. Also, more modern pump sets that are less prone to blockage and ragging are being reviewed and installed where appropriate.

The Company is introducing improved control systems and optimisation systems where possible to prevent blockages. These systems detect increased motor electrical current usage from a partial blockage and instigate a brief temporary pump reversal to attempt to unblock the pump before full blockage occurs and intervention is required. Installation of these new 'intelligent pumping station' control systems is ongoing, with known problem sites being targeted, and it is hoped that the benefits will start to be seen in reduced numbers of equipment failures in future years.

6. Assumptions

No significant assumptions to report.

7. Confidence Grades

The Company has assigned a confidence grade of B2 to lines 1 to 3 on the basis the data is derived from checked and paid invoices. Whilst quality of the reported data is good, it did not differentiate between failures on the main sewer and failures on laterals, and as such is not strictly in accordance with the reporting requirements. As such the reported confidence grade should be consistent with Table 16 Lines 12 and 13, with a view to upgrading for AIR14.

The Company has assigned a confidence grade of B2 to Line 4. The data quality is good however failures from non-electromechanical systems are not recorded. There is some inability of the system to identify when a failure caused a detrimental impact to service which relies upon manual intervention to filter results. On this basis we support the confidence grade assigned.

8. Consistency Checks

- line 2 = table 16 line 12 multiplied by table 16 line 14 divided by 1,000 minus table 16a line 1
- line 3 = table 16 line 13 multiplied by table 16 line 14 divided by 1000

Date: 29 July 2013
Prepared by: HMS

Table 16b – Sewerage Service Serviceability Indicators

Commentary by REPORTER

1. Background

This table illustrates sewage treatment works performance in relation to consent standards for biochemical oxygen demand (BOD), suspended solids (SS) and ammonia (NH_3). The performance estimate made enables the trend in performance to be identified and serviceability assessments to be made.

2. Key Findings

- Steady performance across all indicators at NI Water sites.
- Improvement in ammonia performance at PPP sites, while BOD and SS performances at PPP sites are stable.
- Lines 3, 6 and 9 should be copied from Table 15 Line 8 as per the Reporting Requirements.

3. Audit Approach

The audit consisted of discussions with the line owner to understand the methodology. Inspection of the data held within the Laboratory Information Management System (LIMS) and review of how this is extracted for the purposes of generating the data for this table, and a review of the spreadsheet that is used to carry out the analysis for this table.

4. Audit Findings

4.1 General

There have been no significant changes to the data sources or methods used to calculate the line totals this year. We found no errors in the Company's calculations.

None of the 6 PPP sites has been excluded from all performance tables for AIR12. All PPP sites have been included with 2008 data based on the pre-upgrade status when under NI Water ownership.

For clarity, the Company includes a list of approximately 700 small sites which are excluded on the basis of size banding.

The Company has a number of sites without relevant numerical consents (i.e. relating to BOD, SS, NH_3) which are not monitored and not recorded in LIMS. However, these sites are predominantly all Band 1 or 2 sites and hence excluded on the basis of size banding anyway and hence have no impact on the line totals. These sites are included in 653 Band 1 sites, 5 Band 3 & 4 sites listed in their commentary.

NI Water has provided performance charts to indicate change over time in each indicator since AIR08. AIR08 did not have full 3-year data therefore, NI Water would

leave AIR08 figure out from the graphs or use dashed line between AIR08 and AIR09 so that the data from AIR08 could be seen as not directly comparable.

Although the charts indicate an overall improvement in all parameters compared to last year, these annual movements are considered insignificant when compared to the range of data points over the last 3 years, all of which are typically within +/-2%, and a number of other potential influencing factors including:

- Potentially moving baseline due to ongoing and periodic tightening of consent levels
- Site closures and temporary usage
- Impact of temporary consent relaxations
- Seasonal variations (e.g. extreme weather events)
- Other network events (e.g. abnormal effluent discharges)

Furthermore, the Company informed us that the actual number of sites failing consent levels has actually fallen slightly from FY09/10 levels. Whilst we have not verified this claim, we agree that the results are probably more indicative of a relatively steady and consistent performance, and recognise that real trends may only become apparent in future years as the historical data set grows.

The Company's performance against specific parameters is discussed in more detail in the following sections.

We identified that the Company had not referred to operating costs in their commentary and requested an explanation. NI Water advised that they believe the requirements are being addressed by the 'Cost to Serve' Project which automates coding of jobs within the financial systems enabling more detailed and site and job specific information on running costs. The Company also advised that details of this have been fully disclosed in Tables 17b-f and did not feel the need to repeat these details here which we accept.

4.2 BOD Performance

NI Water Only

The Company provide a detailed list of all excluded sites in their commentary which we reviewed with the Company. Of the 70 NI Water sites excluded for BOD, 3 are listed as being out of service at 31st March 2013. Checks against the source data confirmed that all 3 sites were taken out of service during FY12/13 and it was noted that these sites were compliant prior to exclusion. The remainder have all been correctly excluded due to size banding. No NI Water sites have been excluded for insufficient data.

Predicted performance indicates a slight improvement across all event indicators ranging from 89.7% to 97.7%, ranging from 2-4% increases of previous years' results. The changes cannot be considered significant at this stage as stated in Section 4.1.

PPP Only
Predicted performance for BOD for all 6 PPP sites has improved from event indicators ranging from 71.7% to 72.7% to within the range 72.7% to 74%. We expected higher performance as the rolling 3 year data set gradually removes lower performance results from the pre-upgrade status at the sites. The Company explains that in 2010, 5 PPP sites were assessed for projected compliance, with one site excluded due to insufficient data. In 2011, this 6 site was now included. These 2 years differ due to an increase in sites reported on of 20%, along with the different compliance characteristics of the new site. The performance has been stable since last year with approximately +/- 2%, where the same data sets are available for 2 years. However we feel that having 2 year data, it is inappropriate to see any trend in performance.

The decimal place for Line 1 Columns 2 and 3 is 1, therefore NI Water requires to update the figures.

Total
We can confirm that final totals are a correct conglomeration of the previous tables.

4.3 SS Performance

NI Water Only
The Company provided a detailed list of all excluded sites in their commentary which we reviewed with the Company. Of the 70 NI Water sites excluded for SS, 3 are listed as being out of service at 31st March 2013. Checks against the source data confirmed that all 3 sites were taken out of service during FY12/13 and it was noted that these sites were compliant prior to exclusion. The remainder have all been correctly excluded due to size banding. No NI Water sites have been excluded for insufficient data.

Predicted performances slightly declined in the Event indicators a (max > 2) and b (95%ile > 1) ranging from 91.1% to 94.2%. On the other hand, the Event indictor c (Mean > 0.5) very slightly improved, although levels of all 3 indictors remain within +/- 1% of previous years' results. The changes cannot be considered significant at this stage as stated in Section 4.1.

PPP Only
Predicted performance for all 6 PPP sites remained same at 68.3% in all categories. The Company explained that this is because in 2010, 5 PPP sites were assessed for projected compliance, with one site excluded due to insufficient data. In 2011, this 6 site was now included. These 2 years differ due to an increase in sites reported on of 20%, along with the different compliance characteristics of the new site. The performance has been stable since last year, where the same data sets are available for 2 years. However we feel that having 2 year data, it is inappropriate to see any trend in performance.

Total
We can confirm that final totals are a correct conglomeration of the previous tables.

4.4 Ammonia Performance

NI Water Only
Predicted performance indicates a slight improvement across all event indicators ranging from 88.3% to 95.4%, although levels remain within +/-1% of previous years' results. The changes cannot be considered significant at this stage as stated in Section 4.1.

PPP Only
We have seen a significant improvement to 100.0% in AIR13 as the 2008 data is omitted from the data set and all of 6 sites are included in the data.

Total
We can confirm that final totals are a correct conglomeration of the previous tables. We notice that the Line 7 is incorrect. It should be 109.

5. Company Methodology

There are no significant changes to the Company methodology this year. The Company continues to report on results from the last 3 years in accordance with the guidelines.

For consistency across tables, the population equivalents used to allocate size bands are based on population equivalents at 31st March 2013 taken from the AIR13. However, the performance data used to calculate the event forecasts is based on the calendar year. Whilst in theory this means that the two data sets are misaligned, in practice, as the totals use a set calculation based on a rolling 3 years of data, the overall impact is considered insignificant. NI Water excludes works that were out of service on 31st March 2013, even though a full set of data may exist for the respective calendar year to ensure continuity between tables. We agree with this approach as a reasonable compromise and expect any discrepancy to be well within the limits of the assigned confidence grade.

The Company identifies all STWs that it is responsible for and downloads the current and historical consent conditions for each STW from LIMS, then excludes some from the analysis for the following reasons:

- no numerical consent (includes sites that only have urban wastewater treatment directive consents)
- size band 1 or 2 (ie <500 PE)
- insufficient data (if less than the specified 3 years of data needed with 6 or more samples in each year)
- site taken out of service within the financial year (on the basis that the table is providing a prediction of future compliance rather than past performance)

For the remaining STWs, the analysis is carried out in accordance with the guidance set out by NIAUR; although the Company elects to use the equivalent excel function for calculating the 95 percentile. The calculation process is a mechanical one,

identical to previous years, and we can confirm that it complies with the procedure set out in the guidance.

We can also provide the following clarifications:

- sample data is downloaded from LIMS, which holds all test results
- tests are carried out by NI Water accredited laboratories
- information in LIMS has been through various quality control procedures, both in the laboratory and entering the data. Any results that are abnormally high are retested. If the second test supports the first test result, then the first result stands. Otherwise, with further evidence, the result is changed
- changes to results in LIMS are clearly identified with the original result, the new result, the date of the change and the reason for the change.
- only samples that were taken for regulatory compliance monitoring purposes are used in the analysis. Ad-hoc samples that might have been taken for other reasons (e.g. by operations for process monitoring) have not been included in the analysis
- the sample data is divided by the consent condition that was in place at the time that the sample was taken to produce a normalised value, therefore any changes to consent conditions are accounted for.

6. Assumptions

Results that are “below the limit of detection” are assigned a value equal to half the limit of detection.

The performance data taken from the calendar year is assumed to be representative of the period to the end of the Report Year.

7. Confidence Grades

The Company has assigned a confidence grade of A2 to all lines. On the basis of the data collated and pre-defined methods for calculating line totals, we believe this to be appropriate and justified.

8. Consistency Checks

PPP table Line 1 Columns 2 and 3 should be 74.0.

Total table Line 7 should be 109.

Lines 3 and 6 – Reporting Requirement states that Lines 3 and 6 are copied from Table 15 Line 8, which is not consistent for NI Water and subsequently Total table. The tables should be as follow.

		NIW	Total
A	**Sewage Treatment works - BOD**	**Nr**	**Nr**
1	Equivalent population band 3 to 6	173	179
2	Excluded STWs	845	845
3	Total STWs	1,018	1,024

		NIW	Total
B	**Sewage Treatment works – SS Performance**	**Nr**	**Nr**
1	Equivalent population band 3 to 6	173	179
2	Excluded STWs	845	845
3	Total STWs	1,018	1,024

Line 9 – Reporting Requirement states that Line 9 is copied from Table 15 Line 8, which is not consistent for NI Water and subsequently Total table. The tables should be as follow.

		NIW	Total
C	**Sewage Treatment works – NH3 Performance**	**Nr**	**Nr**
1	Equivalent population band 3 to 6	103	109
2	Excluded STWs	915	915
3	Total STWs	1,018	1,024

Date: 29 July 2013
Prepared by: HMS