# ELECTRICITY INDUSTRY PARTICIPATION CODE
# DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

## PORIRUA CITY COUNCIL
## AND GENESIS ENERGY LIMITED

Prepared by: Steve Woods

Date audit commenced: 10 February 2020

Date audit report completed: 29 July 2020

Audit report due date: 06 March 2020

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## EXECUTIVE SUMMARY

This audit of the **Porirua City Council (PCC)** DUML database and processes was conducted at the request of **Genesis Energy Limited (Genesis)**, in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied.

The audit was conducted in accordance with the audit guidelines for DUML audits version 1.1.

The scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information.

A RAMM database is managed by PCC in relation to this load. The database is remotely hosted by RAMM Software Ltd.

Field work and new light installations are carried out by Downer, and the recently completed PCC LED upgrade was completed by Northpower and Fulton Hogan. All contractors update the database using Pocket RAMM. Park lights are managed by the parks team.

As recorded in the previous audit report and in this audit report, the database contains a large number or errors. PCC intends to conduct a full field audit once the new maintenance contract is in place, which starts on 01/07/20. The full field audit will not include parks or property lights.

Database accuracy is described as follows:

| Result | Percentage | Comments |
|---|---|---|
| The point estimate of R | 103.5 | Wattage from survey is higher than the database wattage by 3.5% |
| $R_L$ | 99.4 | With a 95% level of confidence it can be concluded that the error could be between -0.6% and 8.5% |
| $R_H$ | 108.5 | |

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.6% lower and 8.5% higher than the wattage recorded in the DUML database. Non-compliance is recorded because the potential error is greater than 5.0%.

In absolute terms the installed capacity is estimated to be 8.0 kW higher than the database indicates.

There is a 95% level of confidence that the installed capacity is between 1.0 kW lower to 21 kW higher than the database.

In absolute terms, total annual consumption is estimated to be 34,400 kWh higher than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 5,600kWh p.a. lower to 87,600 kWh p.a. higher than the database indicates.

Submission is calculated using “Profile night hours” for some ICPs. The use of “Profile night hours” leads to inaccurate consumption information. “Profile night hours” are the CST profile hours, which are sunset and sunrise hours published by the Astronomical Society rounded to the nearest half hour. The CST profile rules do not allow these on/off times to be used to calculate consumption information. The CST profile on/off times can be used to apportion consumption, but the times are too inaccurate to be used for any other purpose. For December 2019 the difference between “Profile night hours” and actual hours derived from a datalogger measuring the on/off signals is 3.2%. Discussion was held regarding the use of annual burn time of 4,271 hours per annum or 11.7 hours per day. I clarified that the 4,271 figure is used in the statistical sampling tool in order to obtain an annualised accuracy estimate; this figure is not intended to

be used to calculate monthly submission totals. Furthermore, the CST profile doesn't allow this figure to be used.

As this audit report was nearing completion, PCC provided the results of a full field survey of Parks and Property lights. This audit found that there were 440 lights, 324 more than are recorded in the RAMM database. The field survey results are not yet in a format where the total watts can be easily derived, but if I use the average wattage of the Parks and Property lights that are in RAMM (102 watts) there is under submission of 141,000 kWh per annum. This finding doesn't change the audit risk ratings because they are already recorded as "high" for accuracy related non-compliances. PCC intends to populate the RAMM database with the Parks and Property field survey results.

The future risk rating of 32 indicates that the next audit be completed in three months. This may not be sufficient time to resolve the matters raised and I recommend the Authority considers a next audit date of December 2020 to allow the new field contract to come into force, the full field audit to be conducted and the Parks and Property data to be populated.

## AUDIT SUMMARY

### NON-COMPLIANCES

| Subject | Section | Clause | Non-Compliance | Controls | Audit Risk Rating | Breach Risk Rating | Remedial Action |
|---|---|---|---|---|---|---|---|
| Deriving submission information | 2.1 | 11(1) of Schedule 15.3 | Potential under submission of 8,016 kWh p.a. due to incorrect on/off times.<br>Potential over submission of 35,258 kWh p.a. due to incorrect wattages.<br>Incorrect use of CST profile.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections.<br>Database is not confirmed as accurate with a 95% level of confidence as recorded in section 3.1. | Weak | High | 9 | Investigating |
| Location of each item of load | 2.3 | 11(2)(b) of Schedule 15.3 | One item of load does not have sufficient location information to enable it to be readily locatable. | Strong | Low | 1 | Investigating |

| Subject | Section | Clause | Non-Compliance | Controls | Audit Risk Rating | Breach Risk Rating | Remedial Action |
|---|---|---|---|---|---|---|---|
| Description and capacity of load | 2.4 | 11(2)(b) of Schedule 15.3 | 36 lights have insufficient information to determine the light type.<br>67 lamp wattages were recorded as zero.<br>Two gear wattages were recorded as zero. | Moderate | Low | 2 | Investigating |
| All load recorded in database | 2.5 | 11(2A) of Schedule 15.3 | 12 additional lamps in the field that were not recorded in the database | Moderate | Low | 2 | Identified |
| Database accuracy | 3.1 | 15.2 and 15.37B(b) | 4,238 examples of incorrect or incomplete description or capacity information.<br>Database is not confirmed as accurate with a 95% level of confidence.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections. | Weak | High | 9 | Identified |
| Volume information accuracy | 3.2 | 15.2 and 15.37B(c) | Potential under submission of 8,016 kWh p.a. due to incorrect on/off times.<br>Potential over submission of 35,258 kWh p.a. due to incorrect wattages.<br>Incorrect use of CST profile.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections. | Weak | High | 9 | Identified |

| Subject | Section | Clause | Non-Compliance | Controls | Audit Risk Rating | Breach Risk Rating | Remedial Action |
|---|---|---|---|---|---|---|---|
| | | | Database is not confirmed as accurate with a 95% level of confidence as recorded in section 3.1. | | | | |
| | | | | | | **Future Risk Rating** | **32** |

| **Future risk rating** | 0 | 1-4 | 5-8 | 9-15 | 16-18 | 19+ |
|---|---|---|---|---|---|---|
| **Indicative audit frequency** | 36 months | 24 months | 18 months | 12 months | 6 months | 3 months |

## RECOMMENDATIONS

| Subject | Section | Description | Recommendation |
|---|---|---|---|
| | | | |

## ISSUES

| Subject | Section | Description | Issue |
|---|---|---|---|
| | | Nil | |

# 1. ADMINISTRATIVE

## 1.1. Exemptions from Obligations to Comply with Code

### Code reference

*Section 11 of Electricity Industry Act 2010.*

### Code related audit information

*Section 11 of the Electricity Industry Act provides for the Electricity Authority to exempt any participant from compliance with all or any of the clauses.*

### Audit observation

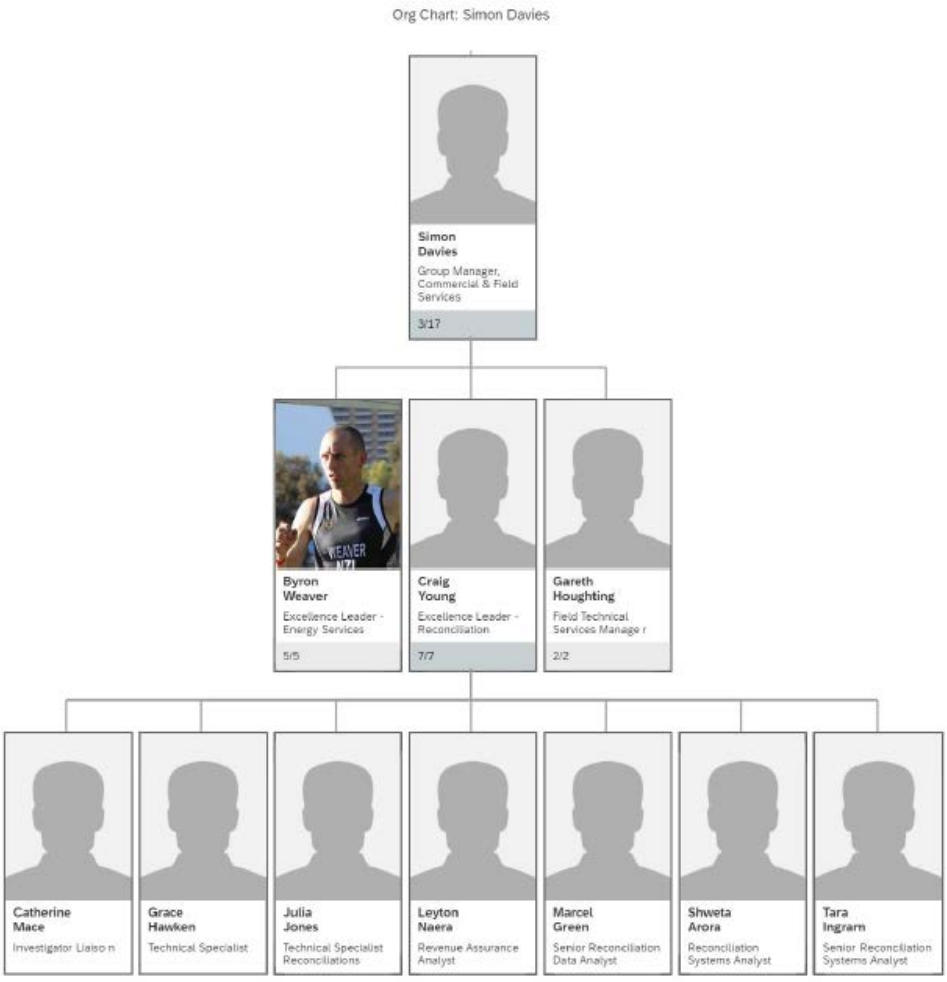
The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

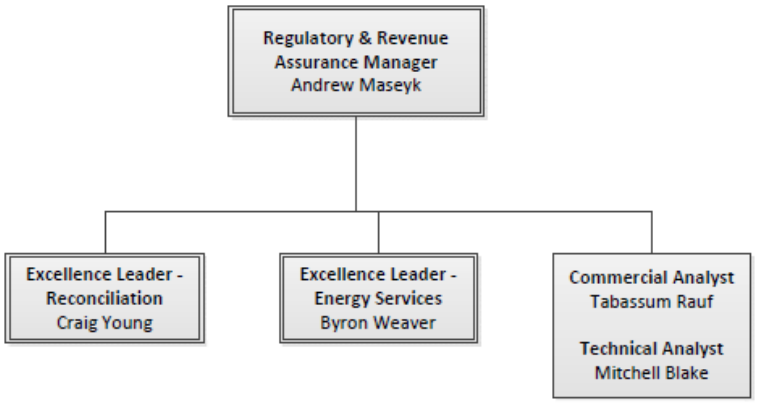
### Audit commentary

There are no exemptions in place relevant to the scope of this audit.

## 1.2. Structure of Organisation

Genesis provided a copy of their organisational structure.



## 1.3. Persons involved in this audit

Auditor:

**Steve Woods**

**Veritek Limited**

**Electricity Authority Approved Auditor**

Other personnel assisting in this audit were:

| Name | Title | Company |
|---|---|---|
| Craig Young | Excellence Leader - Reconciliation | Genesis Energy |
| Grace Hawken | Technical Specialist - Reconciliation Team | Genesis Energy |
| Jane Pearson | RAMM Technician | Porirua City Council |

## 1.4. Hardware and Software

The SQL database used for the management of DUML is remotely hosted by RAMM Software Ltd. The database is commonly known as "RAMM" which stands for "Roading Asset and Maintenance Management".

PCC confirmed that the database back-up is in accordance with standard industry procedures. Access to the database is secure by way of password protection.

## 1.5. Breaches or Breach Allegations

There are no breach allegations relevant to the scope of this audit.

## 1.6. ICP Data

| ICP Number | Description | Registry profile | Number of items of load | Database wattage (watts) |
|---|---|---|---|---|
| 0000023024WE5D5 | PCC Property – TKR0331 | CST | 17 | 3,570 |
| 0001255308UN5C4 | MASTER ICP PCC Streetlight – TKR0331 | CST | 3,785 | 166,360 |
| 0001256873UNFA3 | MASTER ICP PCC Streetlight – PNI0331 | CST | 1,351 | 52,869 |
| 0000161078CKA46 | MASTER ICP PCC PARKS # PNI0331 | CST | 34 | 2,313 |
| 0000161079CK603 | PCC PARKS #TKR0331 TOTAL ASSETS | CST | 62 | 5,726 |
| **Total** | | | **5,249** | **230,838** |

## 1.7. Authorisation Received

All information was provided directly by Genesis or PCC.

## 1.8. Scope of Audit

This audit of the PCC DUML database and processes was conducted at the request of Genesis, in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied.

The audit was conducted in accordance with the audit guidelines for DUML audits version 1.1.

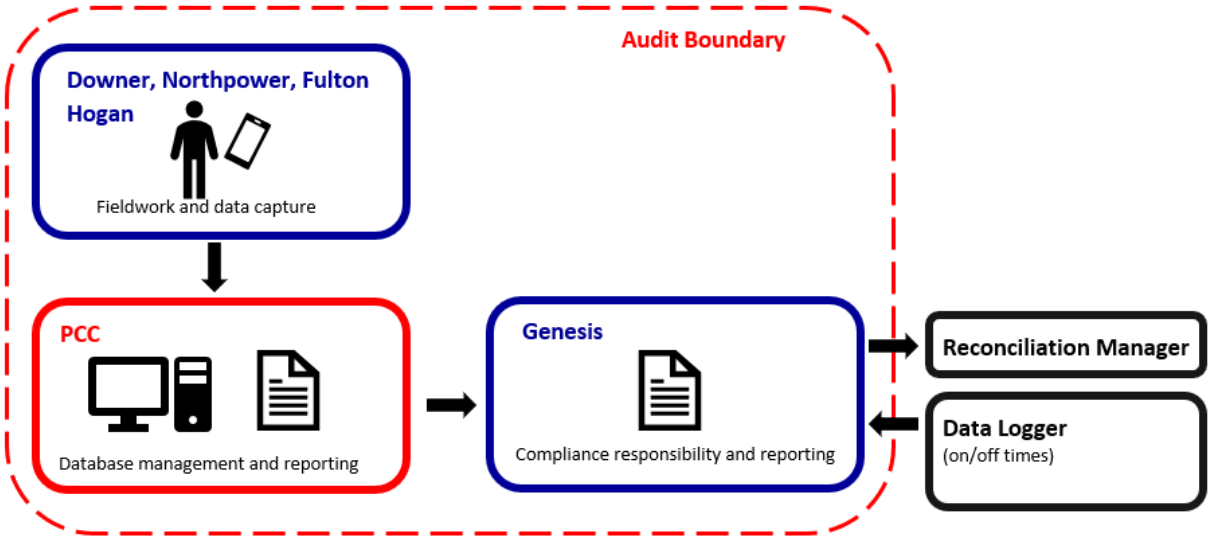
The scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information.

A RAMM database is managed by PCC in relation to this load. The database is remotely hosted by RAMM Software Ltd.

Field work and new light installations are carried out by Downer. Pocket RAMM is used to update the database. The recently completed PCC LED upgrade was completed by Northpower and Fulton Hogan.

Park lights are managed by the parks team.

The diagram below shows the audit boundary for clarity.




The field audit was undertaken of a statistical sample of 347 items of load.

## 1.9. Summary of previous audit

The previous audit was completed in August 2019 by Steve Woods of Veritek Limited. Seven non-compliances were identified, and one recommendation was made. The statuses of the findings are described below.

| Subject | Section | Clause | Non-compliance | Status |
|---|---|---|---|---|
| Deriving submission information | 2.1 | 11(1) of Schedule 15.3 | Potential over submission of 62,220 kWh p.a. due to incorrect on/off times.<br>Potential under submission of 18,977 kWh p.a. due to incorrect wattages.<br>Incorrect use of CST profile.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections.<br>Database is not confirmed as accurate with a 95% level of confidence as recorded in section 3.1. | Still existing |
| ICP identifier and items of load | 2.2 | 11(2)(a) and (aa) of Schedule 15.3 | 48 items of load do not have an ICP number recorded. | Cleared |
| Location of each item of load | 2.3 | 11(2)(b) of Schedule 15.3 | One item of load does not have sufficient location information to enable it to be readily locatable. | Still existing |
| Description and capacity of load | 2.4 | 11(2)(b) of Schedule 15.3 | 26 lights have blanks in all fields containing lamp descriptions.<br>69 lights have zero lamp wattages recorded.<br>4 lights have zero gear wattages recorded. | Still existing |
| All load recorded in database | 2.5 | 11(2A) of Schedule 15.3 | Eight additional lamps in the field were not recorded in the database. | Still existing |

| Subject | Section | Clause | Non-compliance | Status |
|---|---|---|---|---|
| Database accuracy | 3.1 | 15.2 and 15.37B(b) | 1,261 examples of incorrect or incomplete description or capacity information.<br>Database is not confirmed as accurate with a 95% level of confidence.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections.<br>Some light owner discrepancies. | Still existing |
| Volume information accuracy | 3.2 | 15.2 and 15.37B(c) | Potential over submission of 62,220 kWh p.a. due to incorrect on/off times.<br>Potential under submission of 18,977 kWh p.a. due to incorrect wattages.<br>Incorrect use of CST profile.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections.<br>Database is not confirmed as accurate with a 95% level of confidence as recorded in section 3.1. | Still existing |

| Subject | Section | Clause | Recommendation | Status |
|---|---|---|---|---|
| ICP identifier and items of load | 2.1 | 11(2)(a) and (aa) of Schedule 15.3 | Confirm whether lights with missing ICP numbers and owner of "Private" are being reconciled as standard unmetered load or whether shared unmetered load should be created for these lights. | Still existing in relation to private lighting, but I have concluded that the resolution of this matter is not the responsibility of Genesis. |

## 1.10. Distributed unmetered load audits (Clause 16A.26 and 17.295F)

### Code reference

*Clause 16A.26 and 17.295F*

### Code related audit information

*Retailers must ensure that DUML database audits are completed:*

1. *by 1 June 2018 (for DUML that existed prior to 1 June 2017)*
2. *within three months of submission to the reconciliation manager (for new DUML)*
3. *within the timeframe specified by the Authority for DUML that has been audited since 1 June 2017.*

### Audit observation

Genesis have requested Veritek to undertake this streetlight audit.

### Audit commentary

This audit report confirms that the requirement to conduct an audit has been met for this database within the required timeframe.

### Audit outcome

Compliant

## 2. DUML DATABASE REQUIREMENTS

### 2.1. Deriving submission information (Clause 11(1) of Schedule 15.3)

**Code reference**

*Clause 11(1) of Schedule 15.3*

**Code related audit information**

*The retailer must ensure the:*

- *DUML database is up to date*
- *methodology for deriving submission information complies with Schedule 15.5.*

**Audit observation**

The process for calculation of consumption was examined and the application of profiles was checked. The database was checked for accuracy.

**Audit commentary**

Genesis reconciles this DUML load based on RAMM extracts provided by PCC monthly and night hours or data logger hours as described in the table below.

| ICP Number | Description | Registry profile | Submission profile | On hours based on |
|---|---|---|---|---|
| 0000023024WE5D5 | PCC Property – TKR0331 | CST | CST | Profile night hours |
| 0001255308UN5C4 | MASTER ICP PCC Streetlight – TKR0331 | CST | CST | Data logger on hours |
| 0001256873UNFA3 | MASTER ICP PCC Streetlight – PNI0331 | CST | CST | Profile night hours |
| 0000161078CKA46 | MASTER ICP PCC PARKS # PNI0331 | CST | CST | Profile night hours |
| 0000161079CK603 | PCC PARKS #TKR0331 TOTAL ASSETS | CST | CST | Profile night hours |

The use of "Profile night hours" leads to inaccurate consumption information. "Profile night hours" are the CST profile hours, which are sunset and sunrise hours published by the Astronomical Society rounded to the nearest half hour. The CST profile rules do not allow these on/off times to be used to calculate consumption information. The CST profile on/off times can be used to apportion consumption, but the times are too inaccurate to be used for any other purpose. The reason for this is that if the "on" time is 18.20 and the off time is 07.13, the "Profile night hours" will have values from 18.00 to 07.30. The on/off times used may vary from the actual on/off times by up to 29 minutes at each end of the period.

Consumption for ICP 0001255308UN5C4 is calculated based on "actual" on/off times derived from a datalogger measuring the on/off ripple signals. The other ICPs have the consumption calculated from the CST profile hours. The total hours for December 2019 are 304.81, but the CST profile hours are understated as 295 hours, which is 3.2% too low.

I recalculated the consumption for December 2019 using the database wattage and an "on-time" of 304.81 hours. The table below shows a comparison between my calculation and the actual submission for December 2019.

| ICP Number | Genesis kWh | Recalculated kWh | Difference | Potential annual difference |
|---|---|---|---|---|
| 0000023024WE5D5 | 1,060 | 1,097 | 37 | 444 |
| 0001255308UN5C4 | 49,747 | 49,747 | 0 | 0 |
| 0001256873UNFA3 | 15,625 | 16,172 | 547 | 6,564 |
| 0000161078CKA46 | 687 | 710 | 23 | 276 |
| 0000161079CK603 | 1,758 | 1,819 | 61 | 732 |
| **Total** | **66,877** | **69,545** | **668 (under submission)** | **8,016** |

Because there are some missing and incorrect lamp and gear wattages recorded in RAMM, Genesis reviews and updates the data prior to submission:

1. Sodium lamps with zero gear wattage are updated to default gear values.
2. Lamps with zero lamp wattage are updated to 150W. If there is sufficient information in the model fields to determine they are likely to be LEDs, the gear wattage is populated with zero, otherwise default gear wattage for a 150 W sodium lamp is applied.
3. Two items of load with zero wattage in the database were in the field audit and both were 26 watt LEDs, not 150 watts.

Sources of inaccuracy are as follows:

| Issue | Estimated volume information impact (annual kWh) |
|---|---|
| Lamp wattages of zero were recorded for 67 lights (1.3%). It's not possible to determine the correct wattage but only 3% of lights in the database are not LED. Genesis has estimated the wattage at 150 but a more accurate figure is likely to be approx. 44 watts based on the average watts of the total database. | Estimated 30,000 of over submission due to high estimates for missing wattage. |
| Gear wattages of zero were incorrectly recorded for 2 lights. | 111 kWh of under submission |
| 130 lights had incorrect gear wattages recorded in the database. | 5,369 kWh of over submission |

On 18 June 2019, the Electricity Authority issued a memo confirming that the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed; and

- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot and this practice is non-compliant. The database contains a "light install date" and a "lamp install date" but there is not a field for "livening date" for newly connected lights. When a wattage is changed in the database due to a physical change or a correction, only the record present at the time the report is run is recorded, not the historical information showing dates of changes.

**Audit outcome**

Non-compliant

| Non-compliance | Description |
|---|---|
| Audit Ref: 2.1<br>With: Clause 11(1) of Schedule 15.3<br><br>From: 01-Aug-19<br>To: 19-Feb-20 | Potential under submission of 8,016 kWh p.a. due to incorrect on/off times.<br>Potential over submission of 35,258 kWh p.a. due to incorrect wattages.<br>Incorrect use of CST profile.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections.<br>Database is not confirmed as accurate with a 95% level of confidence as recorded in section 3.1.<br>Potential impact: High<br>Actual impact: High<br>Audit history: Multiple times<br>Controls: Weak<br>Breach risk rating: 9 |
| **Audit risk rating** | **Rationale for audit risk rating** |
| **High** | The controls over the database are rated as weak, due to the large number of discrepancies identified during the field count and analysis of the RAMM database extract.<br>The audit risk rating is high based on kWh variances detailed above. |

| Actions taken to resolve the issue | Completion date | Remedial action status |
|---|---|---|
| Genesis has sort Logger information for burn hours and revisions will occur for historical periods.<br>Genesis continues to provide feedback on Porirua CC asset information to influence change. | | Investigating |
| **Preventative actions taken to ensure no further issues will occur** | **Completion date** | |

| | | |
|---|---|---|
| Continuation of discussions between Genesis and Porirua to influence information accuracy within their database. Genesis has discussed the new connections process with the council and advised, they need to ensure ownership is bestowed on the developer until the project is complete. Genesis has advised the council that the network also needs to play their part in the new connection/Development process and ensure the Trader is advised prior to livening any assets. Genesis has | | |

## 2.2. ICP identifier and items of load (Clause 11(2)(a) and (aa) of Schedule 15.3)

**Code reference**

*Clause 11(2)(a) and (aa) of Schedule 15.3*

**Code related audit information**

*The DUML database must contain:*

- *each ICP identifier for which the retailer is responsible for the DUML*
- *the items of load associated with the ICP identifier.*

**Audit observation**

The database was checked to confirm the correct ICP was recorded against each item of load.

**Audit commentary**

All items of load where Genesis is responsible have the ICP populated.

49 items of load are recorded as "Greater Wellington Regional Council". ICP 0000160523CK83F has been created for Greater Wellington Regional Council and it has a different Trader, however it only has 11 lights attributed to it in the registry, not 49 lights. This ICP is not recorded in the database. A separate audit is underway for the Greater Wellington Regional Council for the different Trader.

239 items of load have a "light owner" of "Private". They now do not have an ICP recorded in the database. These are not the responsibility of Genesis and will need to be resolved by other parties. 115 items of load are within the hospital grounds and it's likely a database will need to be created for these. The remainder may need to have shared unmetered load ICPs created by the Distributor. 92,000 kWh per annum is not submitted by any party as a result of the private lights being unaccounted for.

**Audit outcome**

Compliant

## 2.3. Location of each item of load (Clause 11(2)(b) of Schedule 15.3)

**Code reference**

*Clause 11(2)(b) of Schedule 15.3*

**Code related audit information**

*The DUML database must contain the location of each DUML item.*

**Audit observation**

The databases were checked to confirm the location is recorded for all items of load.

### Audit commentary

The database contains fields for the street address and also GPS coordinates.

26 items of load do not have GPS coordinates. Of these only one item of load does not have sufficient other information to enable it to be located. It's the same item of load recorded during the last audit and is shown in the table below.

| House Address | Pole Number | Side | Offset | Northing | Easting |
|---|---|---|---|---|---|
| JOHN BURKE DRIVE | | Unknown | 0 | 0 | 0 |

### Audit outcome

Non-compliant

| Non-compliance | Description |
|---|---|
| Audit Ref: 2.3<br>With: Clause 11(2)(b) of Schedule 15.3<br>From: 01-Aug-19<br>To: 19-Feb-20 | One item of load does not have sufficient location information to enable it to be readily locatable.<br>Potential impact: Low<br>Actual impact: Low<br>Audit history: Multiple times<br>Controls: Strong<br>Breach risk rating: 1 |
| **Audit risk rating** | **Rationale for audit risk rating** |
| **Low** | Controls are rated as strong and the impact as low, because only one exception was identified. |

| Actions taken to resolve the issue | Completion date | Remedial action status |
|---|---|---|
| Genesis will re-request the information for the one lamp be located and updated | | Investigating |
| **Preventative actions taken to ensure no further issues will occur** | **Completion date** | |
| Genesis review the asset information and provide exception feedback to the customer. | | |

## 2.4. Description and capacity of load (Clause 11(2)(c) and (d) of Schedule 15.3)

### Code reference

*Clause 11(2)(c) and (d) of Schedule 15.3*

### Code related audit information

*The DUML database must contain:*

- *a description of load type for each item of load and any assumptions regarding the capacity*
- *the capacity of each item in watts.*

### Audit observation

The database was checked to confirm it contained a field for lamp type and wattage capacity and included any ballast or gear wattage and that each item of load had a value recorded in these fields.

### Audit commentary

Lamp description information is contained within the lamp make model field, and four other model fields. Analysis of the database found:

- 36 lights have insufficient information to determine the light type,
- 67 lamp wattages were recorded as zero, and
- two gear wattages were recorded as zero.

The accuracy of lamp descriptions, wattages and ballasts is recorded in **section 3.1**.

### Audit outcome

Non-compliant

| Non-compliance | Description |
|---|---|
| Audit Ref: 2.4<br>With: Clause 11(2)(b) of Schedule 15.3<br>From: 01-Aug-19<br>To: 19-Feb-20 | 36 lights have insufficient information to determine the light type.<br>67 lamp wattages were recorded as zero.<br>Two gear wattages were recorded as zero.<br>Potential impact: Low<br>Actual impact: Low<br>Audit history: Multiple times<br>Controls: Moderate<br>Breach risk rating: 2 |
| **Audit risk rating** | **Rationale for audit risk rating** |
| **Low** | The controls are rated as moderate because most lamps have description and wattage information recorded but there is room for improvement. PCC has been working to populate the missing information.<br>The audit risk rating is low based on the small volume of lights affected. |

| Actions taken to resolve the issue | Completion date | Remedial action status |
|---|---|---|
| Genesis will re-request the information for the lamps detailed information to be updated asap | | Investigating |
| **Preventative actions taken to ensure no further issues will occur** | **Completion date** | |
| Genesis review the asset information and provide exception feedback to the customer. | | |

## 2.5. All load recorded in database (Clause 11(2A) of Schedule 15.3)

### Code reference

*Clause 11(2A) of Schedule 15.3*

### Code related audit information

*The retailer must ensure that each item of DUML for which it is responsible is recorded in this database.*

### Audit observation

The field audit was undertaken of a statistical sample of 347 items of load. The sample was selected from five strata, as follows:

- Roads A-D
- Roads E-K
- Roads L-O
- Roads P-S
- Roads T-Z

### Audit commentary

The field audit discrepancies were provided in a separate spreadsheet and can be summarised as follows:

- 59 incorrect wattages,
- 12 additional fittings, and
- one fitting in the database but not in the field.

This clause relates to lights in the field that are not recorded in the database. The field audit found 12 additional lights. This is recorded as non-compliance.

The count differences where lights were present in the database but not recorded in the field, and wattage differences are discussed in **section 3.1**.

### Audit outcome

Non-compliant

| Non-compliance | Description |
|---|---|
| Audit Ref: 2.5<br>With: Clause 11(2A) of Schedule 15.3<br><br>From: 01-Aug-19<br>To: 19-Feb-20 | 12 additional lamps in the field that were not recorded in the database.<br>Potential impact: Low<br>Actual impact: Low<br>Audit history: Multiple times<br>Controls: Moderate<br>Breach risk rating: 2 |
| **Audit risk rating** | **Rationale for audit risk rating** |
| **Low** | Controls are rated as moderate, as they are sufficient to ensure most lights are recorded in the database.<br>The impact is rated as low, as only 12 lights were missing from the database, leading to a potential under submission of 4,890 kWh per annum. |

| Actions taken to resolve the issue | Completion date | Remedial action status |
|---|---|---|
| Genesis have re-request the information for the lamps detailed information to be updated asap. | 01/07/2020 | Identified |
| **Preventative actions taken to ensure no further issues will occur** | **Completion date** | |
| Continuation of discussions between Genesis and Porirua to influence information accuracy within their database. Genesis has discussed the new connections process with the council and advised, they need to ensure ownership is bestowed on the developer until the project is complete. Genesis has advised the council that the network also needs to play their part in the new connection/Development process and ensure the Trader is advised prior to livening any assets. | unknown | |

## 2.6. Tracking of load changes (Clause 11(3) of Schedule 15.3)

**Code reference**

*Clause 11(3) of Schedule 15.3*

**Code related audit information**

*The DUML database must track additions and removals in a manner that allows the total load (in kW) to be retrospectively derived for any given day.*

**Audit observation**

The process for tracking of changes in the database was examined.

**Audit commentary**

The RAMM database functionality achieves compliance with the code.

The change management process and the compliance of the database reporting provided to Genesis is detailed in **sections 3.1** and **3.2**.

**Audit outcome**

Compliant

## 2.7. Audit trail (Clause 11(4) of Schedule 15.3)

**Code reference**

*Clause 11(4) of Schedule 15.3*

**Code related audit information**

*The DUML database must incorporate an audit trail of all additions and changes that identify:*

- *the before and after values for changes*
- *the date and time of the change or addition*
- *the person who made the addition or change to the database.*

**Audit observation**

The database was checked for audit trails.

### Audit commentary

The database has a complete audit trail.

### Audit outcome

Compliant

## 3. ACCURACY OF DUML DATABASE

### 3.1. Database accuracy (Clause 15.2 and 15.37B(b))

### Code reference

*Clause 15.2 and 15.37B(b)*

### Code related audit information

*Audit must verify that the information recorded in the retailer's DUML database is complete and accurate.*

### Audit observation

The DUML Statistical Sampling Guideline was used to determine the database accuracy. The table below shows the survey plan.

| Plan Item | Comments |
|---|---|
| Area of interest | PCC streetlights in the Porirua area |
| Strata | The database contains 5,249 items of load in the PCC area.<br>The processes for the management of all PCC items of load is the same. I selected the following strata:<br>• Roads A-D<br>• Roads E-K<br>• Roads L-O<br>• Roads P-S<br>• Roads T-Z |
| Area units | I created a pivot table of the roads in each database and used a random number generator in each spreadsheet to select a total of 56 sub-units. |
| Total items of load | 347 items of load were checked. |

Wattages were checked for alignment with the published standardised wattage table produced by the Electricity Authority.

The change management process to track changes and timeliness of database updates was evaluated.

### Audit commentary

A field audit was conducted of a statistical sample of 347 items of load. The "database auditing tool" was used to analyse the results, which are shown in the table below.

| Result | Percentage | Comments |
|---|---|---|
| The point estimate of R | 103.5 | Wattage from survey is higher than the database wattage by 3.5% |
| $R_L$ | 99.4 | With a 95% level of confidence it can be concluded that the error could be between -0.6% and 8.5% |
| $R_H$ | 108.5 | |

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19 and the table below shows that Scenario C (detailed below) applies.

The conclusion from Scenario C is that the variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.6% lower and 8.5% higher than the wattage recorded in the DUML database. Non-compliance is recorded because the potential error is greater than 5.0%.

In absolute terms the installed capacity is estimated to be 8.0 kW higher than the database indicates.

There is a 95% level of confidence that the installed capacity is between 1.0 kW lower to 21 kW higher than the database.

In absolute terms, total annual consumption is estimated to be 34,400 kWh higher than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 5,600kWh p.a. lower to 87,600 kWh p.a. higher than the database indicates.

| Scenario | Description |
|---|---|
| A - **Good accuracy, good precision** | This scenario applies if:<br>(a) $R_H$ is less than 1.05; and<br>(b) $R_L$ is greater than 0.95<br>The conclusion from this scenario is that:<br>(a) the best available estimate indicates that the database is accurate within +/- 5 %; and<br>(b) this is the best outcome. |
| B - **Poor accuracy, demonstrated with statistical significance** | This scenario applies if:<br>(a) the point estimate of R is less than 0.95 or greater than 1.05<br>(b) as a result, either $R_L$ is less than 0.95 or $R_H$ is greater than 1.05.<br>There is evidence to support this finding. In statistical terms, the inaccuracy is statistically significant at the 95% level |

| | |
|---|---|
| C - **Poor precision** | This scenario applies if:<br>(a) the point estimate of R is between 0.95 and 1.05<br>(b) $R_L$ is less than 0.95 and/or $R_H$ is greater than 1.05<br>The conclusion from this scenario is that the best available estimate is not precise enough to conclude that the database is accurate within +/- 5 % |

**Lamp description and capacity accuracy**

All lamps have a gear wattage and lamp wattage recorded, but some were incorrectly recorded:

- 130 incorrect gear wattages, and
- 4,003 incorrect lamp description or wattage.

In addition to this as recorded in **section 2.4**:

- 36 lights have insufficient information to determine the light type,
- 67 lamp wattages were recorded as zero, and
- two gear wattages were recorded as zero.

I haven't attempted to calculate the exact impact of these discrepancies, but I have recorded the audit risk rating as high due to the large numbers.

**Address accuracy**

The field audit did not identify any location discrepancies.

**ICP number and owner accuracy**

All items of load where Genesis is responsible have the ICP populated.

**Change management process findings**

The RAMM database used for submission is managed by PCC. The streetlight contractors update the database using Pocket RAMM.

I conducted a walkthrough of the new connection process. The lights are recorded in RAMM when an "as built" plan is provided to Downer.

The current monthly report is provided as a snapshot and this practice is non-compliant. The database contains a "light install date" and a "lamp install date" but there is not a field for "livening date" for newly connected lights. Lights can be livened prior to "vesting" and PCC will not take responsibility for the consumption until "vesting" occurs. The new connections process will need to be revised and it's possible separate ICPs may be required for the developer in situations where lighting is livened but is not the responsibility of PCC. When a wattage is changed in the database due to a physical change or a correction, only the record present at the time the report is run is recorded, not the historical information showing dates of changes.

Festive lighting is no longer connected.

Outage patrols are not conducted now that most lights are LED.

**Audit outcome**

Non-compliant

| Non-compliance | Description |
|---|---|
| Audit Ref: 3.1<br>With: Clause 15.2 and 15.37B(b)<br><br>From: 01-Aug-19<br>To: 20-Feb-20 | 4,238 examples of incorrect or incomplete description or capacity information.<br>Database is not confirmed as accurate with a 95% level of confidence.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections.<br>Potential impact: High<br>Actual impact: High<br>Audit history: Multiple times<br>Controls: Weak<br>Breach risk rating: 9 |
| **Audit risk rating** | **Rationale for audit risk rating** |
| **High** | The controls over the database are rated as weak, due to the large number of discrepancies identified during the field count and analysis of the RAMM database extract.<br>The audit risk rating is high based on kWh variances. |

| Actions taken to resolve the issue | Completion date | Remedial action status |
|---|---|---|
| Genesis have re-request the information for the lamps detailed information to be updated asap | 01/07/2020 | Identified |
| **Preventative actions taken to ensure no further issues will occur** | **Completion date** | |
| Continuation of discussions between Genesis and Porirua to influence information accuracy within their database. Genesis has discussed the new connections process with the council and advised, they need to ensure ownership is bestowed on the developer until the project is complete. Genesis has advised the council that the network also needs to play their part in the new connection/Development process and ensure the Trader is advised prior to livening any assets. | unknown | |

## 3.2. Volume information accuracy (Clause 15.2 and 15.37B(c))

### Code reference

*Clause 15.2 and 15.37B(c)*

### Code related audit information

*The audit must verify that:*

- *volume information for the DUML is being calculated accurately*
- *profiles for DUML have been correctly applied.*

### Audit observation

The submission was checked for accuracy for the month the database extract was supplied. This included:

- checking the registry to confirm that the ICP has the correct profile and submission flag, and
- checking the database extract combined with the on hours against the submitted figure to confirm accuracy.

### Audit commentary

Genesis reconciles this DUML load based on RAMM extracts provided by PCC monthly and night hours or data logger hours as described in the table below.

| ICP Number | Description | Registry profile | Submission profile | On hours based on |
|---|---|---|---|---|
| 0000023024WE5D5 | PCC Property – TKR0331 | CST | CST | Profile night hours |
| 0001255308UN5C4 | MASTER ICP PCC Streetlight – TKR0331 | CST | CST | Data logger on hours |
| 0001256873UNFA3 | MASTER ICP PCC Streetlight – PNI0331 | CST | CST | Profile night hours |
| 0000161078CKA46 | MASTER ICP PCC PARKS # PNI0331 | CST | CST | Profile night hours |
| 0000161079CK603 | PCC PARKS #TKR0331 TOTAL ASSETS | CST | CST | Profile night hours |

The use of "Profile night hours" leads to inaccurate consumption information. "Profile night hours" are the CST profile hours, which are sunset and sunrise hours published by the Astronomical Society rounded to the nearest half hour. The CST profile rules do not allow these on/off times to be used to calculate consumption information. The CST profile on/off times can be used to apportion consumption, but the times are too inaccurate to be used for any other purpose. The reason for this is that if the "on" time is 18.20 and the off time is 07.13, the "Profile night hours" will have values from 18.00 to 07.30. The on/off times used may vary from the actual on/off times by up to 29 minutes at each end of the period.

Consumption for ICP 0001255308UN5C4 is calculated based on "actual" on/off times derived from a datalogger measuring the on/off ripple signals. The other ICPs have the consumption calculated from the CST profile hours. The total hours for December 2019 are 304.81, but the CST profile hours are understated as 295 hours, which is 3.2% too low.

I recalculated the consumption for December 2019 using the database wattage and an "on-time" of 304.81 hours. The table below shows a comparison between my calculation and the actual submission for December 2019.

| ICP Number | Genesis kWh | Recalculated kWh | Difference | Potential annual difference |
|---|---|---|---|---|
| 0000023024WE5D5 | 1,060 | 1,097 | 37 | 444 |
| 0001255308UN5C4 | 49,747 | 49,747 | 0 | 0 |
| 0001256873UNFA3 | 15,625 | 16,172 | 547 | 6,564 |
| 0000161078CKA46 | 687 | 710 | 23 | 276 |
| 0000161079CK603 | 1,758 | 1,819 | 61 | 732 |
| **Total** | **66,877** | **69,545** | **668 (under submission)** | **8,016** |

Because there are some missing and incorrect lamp and gear wattages recorded in RAMM, Genesis reviews and updates the data prior to submission:

1. Sodium lamps with zero gear wattage are updated to default gear values.
2. Lamps with zero lamp wattage are updated to 150W. If there is sufficient information in the model fields to determine they are likely to be LEDs, the gear wattage is populated with zero, otherwise default gear wattage for a 150 W sodium lamp is applied.
3. Two items of load with zero wattage in the database were in the field audit and both were 26 watt LEDs, not 150 watts.

Sources of inaccuracy are as follows:

| Issue | Estimated volume information impact (annual kWh) |
|---|---|
| Lamp wattages of zero were recorded for 67 lights (1.3%). It's not possible to determine the correct wattage but only 3% of lights in the database are not LED. Genesis has estimated the wattage at 150 but a more accurate figure is likely to be approx. 44 watts based on the average watts of the total database. | Estimated 30,000 of over submission due to high estimates for missing wattage. |
| Gear wattages of zero were incorrectly recorded for 2 lights. | 111 kWh of under submission |
| 130 lights had incorrect gear wattages recorded in the database. | 5,369 kWh of over submission |

On 18 June 2019, the Electricity Authority issued a memo confirming that the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed; and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot and this practice is non-compliant. The database contains a "light install date" and a "lamp install date" but there is not a field for "livening date" for newly connected lights. When a wattage is changed in the database due to a physical change or a correction, only the record present at the time the report is run is recorded, not the historical information showing dates of changes.

### Audit outcome

Non-compliant

| Non-compliance | Description |
|---|---|
| Audit Ref: 3.2<br>With: Clause 15.2 and 15.37B(c)<br><br>From: 01-Aug-19<br>To: 20-Feb-20 | Potential under submission of 8,016 kWh p.a. due to incorrect on/off times.<br>Potential over submission of 35,258 kWh p.a. due to incorrect wattages.<br>Incorrect use of CST profile.<br>The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.<br>Livening dates not recorded for new connections.<br>Database is not confirmed as accurate with a 95% level of confidence as recorded in section 3.1.<br>Potential impact: High<br>Actual impact: High<br>Audit history: Multiple times<br>Controls: Weak<br>Breach risk rating: 9 |
| **Audit risk rating** | **Rationale for audit risk rating** |
| **High** | The controls over the database are rated as weak, due to the large proportion of discrepancies identified during the field count and analysis of the RAMM database extract.<br>The audit risk rating is high based on kWh variances detailed above. |

| Actions taken to resolve the issue | Completion date | Remedial action status |
|---|---|---|
| Genesis have acquired logger information which will be used to measure on/off times.<br>Genesis have spoken to PCC in regard to tracking of changes, however this is either a limitation of their RAMM system or user. | | Identified |
| **Preventative actions taken to ensure no further issues will occur** | **Completion date** | |
| Genesis continues to liaise with PCC where they have one dedicated staff member to action preventative measures. It is Genesis belief that these are being conducted where possible and resourcing issue plays a part in this management. | | |

## CONCLUSION

As recorded in the previous audit report and in this audit report, the database contains a large number or errors. PCC intends to conduct a full field audit once the new maintenance contract is in place, which starts on 01/07/20. The full field audit will not include parks or property lights.

Database accuracy is described as follows:

| Result | Percentage | Comments |
|---|---|---|
| The point estimate of R | 103.5 | Wattage from survey is higher than the database wattage by 3.5% |
| $R_L$ | 99.4 | With a 95% level of confidence it can be concluded that the error could be between -0.6% and 8.5% |
| $R_H$ | 108.5 | |

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.6% lower and 8.5% higher than the wattage recorded in the DUML database. Non-compliance is recorded because the potential error is greater than 5.0%.

In absolute terms the installed capacity is estimated to be 8.0 kW higher than the database indicates.

There is a 95% level of confidence that the installed capacity is between 1.0 kW lower to 21 kW higher than the database.

In absolute terms, total annual consumption is estimated to be 34,400 kWh higher than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 5,600kWh p.a. lower to 87,600 kWh p.a. higher than the database indicates.

Submission is calculated using "Profile night hours" for some ICPs. The use of "Profile night hours" leads to inaccurate consumption information. "Profile night hours" are the CST profile hours, which are sunset and sunrise hours published by the Astronomical Society rounded to the nearest half hour. The CST profile rules do not allow these on/off times to be used to calculate consumption information. The CST profile on/off times can be used to apportion consumption, but the times are too inaccurate to be used for any other purpose. For December 2019 the difference between "Profile night hours" and actual hours derived from a datalogger measuring the on/off signals is 3.2%. Discussion was held regarding the use of annual burn time of 4,271 hours per annum or 11.7 hours per day. I clarified that the 4,271 figure is used in the statistical sampling tool in order to obtain an annualised accuracy estimate; this figure is not intended to be used to calculate monthly submission totals. Furthermore, the CST profile doesn't allow this figure to be used.

As this audit report was nearing completion, PCC provided the results of a full field survey of Parks and Property lights. This audit found that there were 440 lights, 324 more than are recorded in the RAMM database. The field survey results are not yet in a format where the total watts can be easily derived, but if I use the average wattage of the Parks and Property lights that are in RAMM (102 watts) there is under submission of 141,000 kWh per annum. This finding doesn't change the audit risk ratings because they are already recorded as "high" for accuracy related non-compliances. PCC intends to populate the RAMM database with the Parks and Property field survey results.

The future risk rating of 32 indicates that the next audit be completed in three months. This may not be sufficient time to resolve the matters raised and I recommend the Authority considers a nine-month

period to allow the new field contract to come into force, the full field audit to be conducted and the Parks and Property data to be populated.

## PARTICIPANT RESPONSE

Genesis continues to provide feedback on the information required from PCC and the errors that have been identified. PCC only has one staff member that is assigned to manage their streetlighting assets. Genesis provide the audited party with the draft audit with the intension to allow the audited party to provide comments. Not many do. Genesis then initiates conversations around the findings of the audit and engages with the party to establish best practices to make the necessary corrections.

Genesis is required to respond to the non-compliances to establish a compliance plan, however in many cases this is purely based off the trader's perception that the audited party will adhere to the request to correct. Genesis continue review data as required to highlight and provide the party with dataset improvements.