ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

STRATFORD DISTRICT COUNCIL AND GENESIS ENERGY LIMITED

Prepared by: Tara Gannon

Date audit commenced: 12 March 2020

Date audit report completed: 30 March 2020

Audit report due date: 1 April 2020

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EXECUTIVE SUMMARY

This audit of the **Stratford District Council (SDC)** 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 held by SDC, who is Genesis' customer. NPE Tech are responsible for fault, maintenance, and upgrade work for streetlights, and maintain the database.

A monthly report from the database is provided to Genesis by SDC, which is used to calculate submissions. Genesis reconciles the DUML load as NHH using the NST profile. Since the February 2020 submission on and off times have been derived from data logger information. Prior to February 2020, Astronomical Society data was used to determine on and off times. Genesis intends to submit revised submission information using data logger hours for prior periods.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	100.3	Wattage from survey is higher than the database wattage by 0.3%
R_L	99.4	With a 95% level of confidence it can be concluded that the error could be between -0.6% and 2.2%
R_H	102.2	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. The best available estimate indicates that the database is accurate within ± 5.0%.

- In absolute terms the installed capacity is estimated to be 0 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 and 1 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 600 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 1,000 kWh p.a. lower to 3,600 kWh p.a. higher than the database indicates.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed 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 is non-compliant, and Genesis completes revision submissions where corrections are required. Genesis is working to develop event-based calculations, which will enable accurate volume calculations where lamps change part way through a month.

The future risk rating of ten indicates that the next audit be completed in 12 months. SDC intends to resolve the issues identified. Given that the database is accurate and a small number of exceptions were found, I recommend the next audit is completed in 18 months on 01/10/21.

The matters raised are detailed below:

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	One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage, which could result in potential under submission of 354.5 kWh per annum. One light (light ID 118) has a missing gear wattage, which could result in an unknown amount of under submission. A further 200 lights have incorrect gear (total) wattages recorded, including the lamps with missing and invalid zero gear wattages. This may result in under reporting of 2,308 W or 9,857 kWh p.a. based on 4,271 annual burn hours. Ten unmetered decorative lights are not recorded in RAMM. This may result in estimated under submission of 1,700W or 726 kWh p.a. Eight unmetered Christmas lights are not recorded in RAMM. This may result in estimated under submission of 120 W or 50.4 kWh p.a. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.	Strong	Medium	2	Identified
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage. One light (light ID 118) has a missing gear wattage.	Moderate	Low	2	Investigating

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
All load recorded in database	2.5	11(2A) of Schedule 15.3	Ten unmetered decorative lights are not recorded in RAMM. This may result in estimated under submission of 1,700W or 726 kWh p.a. Eight unmetered Christmas lights are not recorded in RAMM. This may result in estimated under submission of 120 W or 50.4 kWh p.a.	Moderate	Low	2	Identified
Database accuracy	3.1	15.2 and 15.37B(b)	One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage, which could result in potential under submission of 354.5 kWh per annum. One light (light ID 118) has a missing gear wattage, which could result in an unknown amount of under submission. A further 200 lights have incorrect gear (total) wattages recorded, including the lamps with missing and invalid zero gear wattages. This may result in under reporting of 2,308 W or 9,857 kWh p.a. based on 4,271 annual burn hours. Ten unmetered decorative lights are not recorded in RAMM. This may result in estimated under submission of 1,700W or 726 kWh p.a. Eight unmetered Christmas lights are not recorded in RAMM. This may result in estimated under submission of 120 W or 50.4 kWh p.a.	Strong	Medium	2	Identified
Volume information accuracy	3.2	15.2 and 15.37B(c)	One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage, which could result in potential under submission of 354.5 kWh per annum. One light (light ID 118) has a missing gear wattage, which could result in an unknown amount of under submission.	Strong	Medium	2	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
			A further 200 lights have incorrect gear (total) wattages recorded, including the lamps with missing and invalid zero gear wattages. This may result in under reporting of 2,308 W or 9,857 kWh p.a. based on 4,271 annual burn hours. Ten unmetered decorative lights are not recorded in RAMM. This may result in estimated under submission of 1,700W or 726 kWh p.a. Eight unmetered Christmas lights are not recorded in RAMM. This may result in estimated under submission of 120 W or 50.4 kWh p.a. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.				
Future Risk Rating						10	

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	Recommendation
Christmas and decorative lights	2.5	Add the Christmas and decorative lights to RAMM. Communicate on and off dates for Christmas lights to Genesis.
Railway subway lights	2.5	Confirm the correct wattages for the railway subway lights on SH2 Broadway (location 11274) and update the database as necessary.
ICP number accuracy	3.1	Check the ICP numbers for the seven items of load connected to 0089352001PC37D (Under Veranda Lights - Romeo Street) which do not appear to be under verandah lights, and four items of load connected to 0080012045PC49C (Carriageway Lighting) which do not appear to be carriageway lights. Update RAMM as necessary.

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

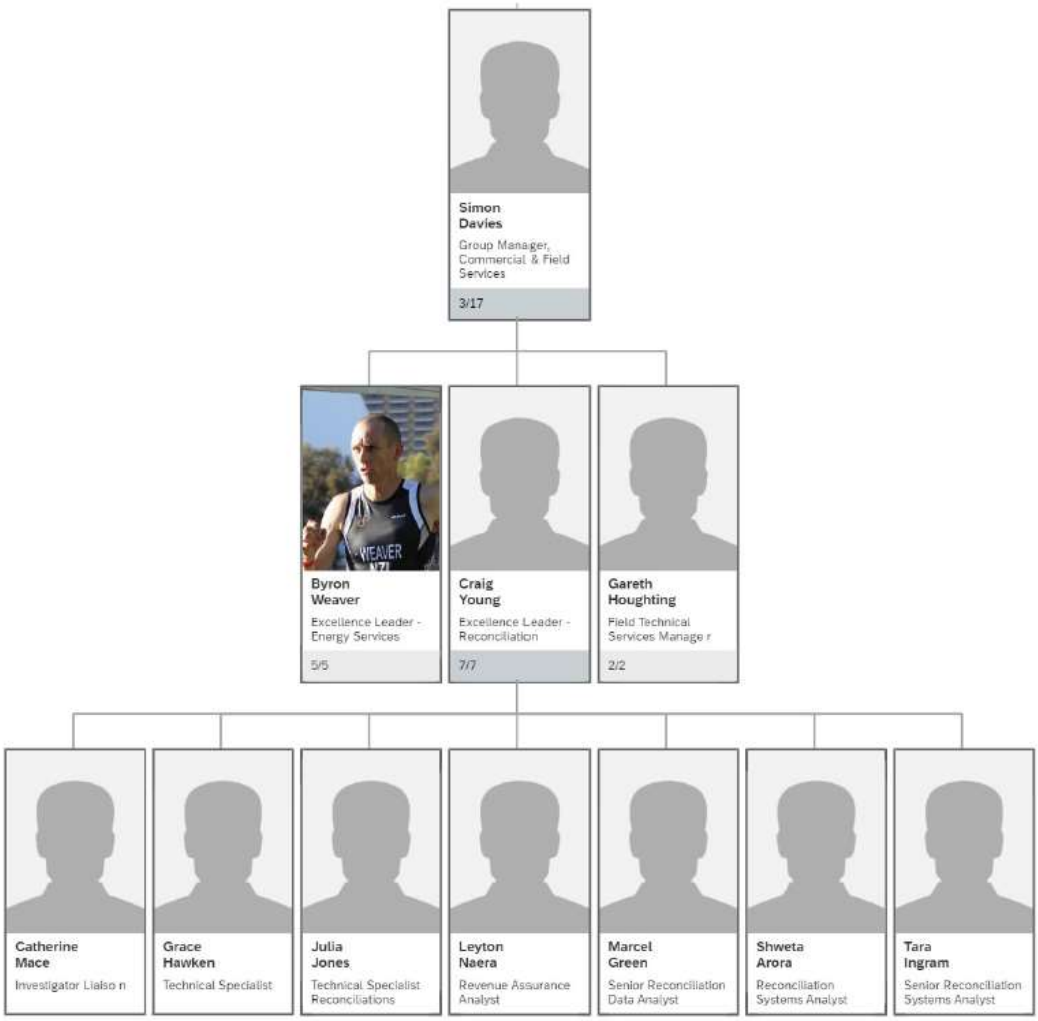
The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

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:

Tara Gannon

Veritek Limited

Electricity Authority Approved Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Steve Bowden	Roading Asset Manager	Stratford District Council
Vivek Regmi	G. Roading Engineer	Stratford District Council
Grace Hawken	Technical Specialist - Reconciliation Team	Genesis Energy

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". The specific module used for DUML is called RAMM Contractor.

RAMM Software Limited backs up the database and assists with disaster recovery as part of their hosting service. Nightly backups are performed. As a minimum, daily backups are retained for the previous five working days, weekly backups are retained for the previous four weeks, and monthly backups are retained for the previous six months.

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	NSP	Profile	Number of items of load	Database wattage (watts)
0080012045PC49C	CARRIAGEWAY LIGHTING	SFD0331	NST	179	23863
0089352001PC37D	UNDER VERANDA LIGHTS - ROMEO STREET	SFD0331	NST	193	8537
0089352004PCE32	DRAWING 9807	SFD0331	NST	761	21763
			Total	**1,133**	**54,163**

1.7. Authorisation Received

All information was provided directly by Genesis or SDC.

1.8. Scope of Audit

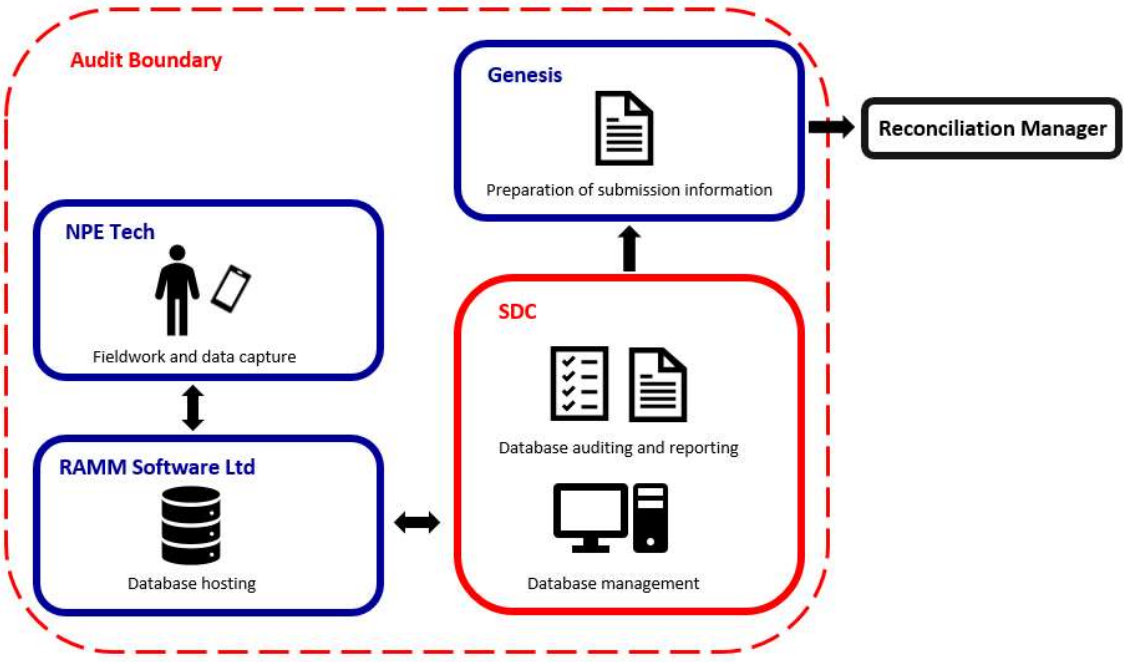
This audit of the SDC DUML database and processes was conducted at the request of Genesis in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied.

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

A RAMM database is held by SDC, who is Genesis' customer. NPE Tech are responsible for fault, maintenance, and upgrade work for streetlights, and maintain the database.

A monthly report from the database is provided to Genesis by SDC, which is used to calculate submissions. Genesis reconciles the DUML load as NHH using the NST profile. Since the February 2020 submission on and off times have been derived from data logger information. Prior to February 2020, Astronomical Society data was used to determine on and off times. Genesis intends to submit revised submission information using data logger hours for prior periods.

The scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information based on the database reporting. The diagram below shows the audit boundary for clarity.



The field audit was undertaken of a statistical sample of 157 items of load on 12 March 2020.

1.9. Summary of previous audit

The previous audit of this database was undertaken by Tara Gannon of Veritek Limited in May 2019. The summary table below shows the statuses of the non-compliances raised in the previous audit. Further comment is made in the relevant sections of this report.

Subject	Section	Clause	Non-compliance	Status
Deriving submission information	2.1	11(1) of Schedule 15.3	The database contains some inaccurate data.	Still existing
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	One light has a missing lamp model, lamp wattage and gear wattage. 21 lights have invalid blank or zero total wattages recorded.	Still existing
All load recorded in database	2.5	11(2A) of Schedule 15.3	One 24W LED was missing from the database. Festive and decorative lights are not recorded in the database.	Still existing
Database accuracy	3.1	15.2 and 15.37B(b)	The database contains some inaccurate data.	Still existing
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database contains some inaccurate data.	Still existing

Subject	Section	Description	Recommendation	Status
All load recorded in database	2.5	Festive lights	Confirm the wattages for festive and decorative lights, and update RAMM. Communicate on and off dates for festive and decorative lights to Genesis.	Underway, to be implemented

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:

- *by 1 June 2018 (for DUML that existed prior to 1 June 2017)*
- *within three months of submission to the reconciliation manager (for new DUML)*
- *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 the DUML load as NHH using the NST profile.

- Wattages are derived from an extract provided by SDC each month. The best available estimate indicates that the database is accurate within ± 5 % as discussed in **section 3.1**.
- Since the February 2020 submission on and off times have been derived from data logger information. Prior to February 2020, Astronomical Society data was used to determine on and off times. Genesis intends to submit revised submission information using data logger hours for prior periods.

I checked the February 2020 submission data for ICP 0080012045PC49C, 0089352001PC37D and 0089352004PCE32, and compliance is confirmed.

Sources of inaccuracy are as follows:

Issue	Estimated volume information impact (annual kWh)
Eight unmetered Christmas lights are not recorded in RAMM.	Potential under submission of 50.4 kWh p.a.[1]
Ten unmetered decorative lights are not recorded in RAMM.	Potential under submission of 726 kWh p.a.
Some errors in the gear wattage field have resulted in incorrect total wattages being reported for the 200 lights (excluding the lights with missing and invalid zero gear wattages separately listed below).	Potential under submission of 9,857 kWh p.a.
One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage.	Unknown, SDC is to investigate to confirm the correct wattages
One light (light ID 118) has a missing gear (total) wattage.	Potential under submission of 354.5 kWh p.a.

[1] Based on total festive light wattage of 120 W connected for six summer weeks per annum (approximately 420 burn hours), omission of the lights from the database may lead to potential under submission of 50.4 kWh p.a.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed 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. 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. Genesis is working to develop event-based calculations, which will enable accurate volume calculations where lamps change part way through a month.

There have been no new connections during the audit period. The RAMM database records an installation date, and there is no separate livening date. It is expected that NPE Tech will enter the connection date as the livening date if a new connection occurs.

NPE Tech updates the database from the field using PDAs, or from the office based on paper field records. Where the changes are entered from the field using PDAs, the change date will reflect the date that the change occurred. When changes are entered in the office the user enters an asset change date which reflects the date that the work was carried out.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 12-Mar-20 To: 12-Mar-20	One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage, which could result in potential under submission of 354.5 kWh per annum. One light (light ID 118) has a missing gear wattage, which could result in an unknown amount of under submission. A further 200 lights have incorrect gear (total) wattages recorded, including the lamps with missing and invalid zero gear wattages. This may result in under reporting of 2,308 W or 9,857 kWh p.a. based on 4,271 annual burn hours. Ten unmetered decorative lights are not recorded in RAMM. This may result in estimated under submission of 1,700W or 726 kWh p.a. Eight unmetered Christmas lights are not recorded in RAMM. This may result in estimated under submission of 120 W or 50.4 kWh p.a. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Potential impact: Medium Actual impact: Unknown Audit history: Twice Controls: Strong Breach risk rating: 2

Audit risk rating	Rationale for audit risk rating
Medium	The controls over the database are rated as strong, because accuracy falls within the ±5% accuracy threshold. The impact is assessed to be medium based on the kWh differences described above. SDC intends to investigate and resolve the issues identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis has highlighted to the council the field audit exceptions for correction. Genesis has provided the asset information to the council where erroneous gear wattages have been found for correction. Genesis has also discussed the tracking of changes and requested this to be reviewed.	01/05/2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis has spoken with the council and have requested that they revise their reporting to Genesis and look at database accuracy. Until the correction has been made Genesis will **continue** to calculate using the correct wattages.	01/05/2020	

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 have an ICP number recorded. The accuracy of ICP numbers is assessed in **section 3.1**.

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 database was checked to confirm the location is recorded for all items of load.

Audit commentary

The database contains fields for the road name, location number, and GPS coordinates. All items of load have GPS coordinates populated and are locatable.

Audit outcome

Compliant

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 that:

- it contained a field for light type and wattage capacity,
- wattage capacities include any ballast or gear wattage, and
- each item of load has a light type, light wattage, and gear wattage recorded.

Audit commentary

The database contains a lamp make model description, lamp wattage and gear wattage (which reflects the total wattage including the lamp and gear wattage).

The 2019 audit recorded that some items of load were missing lamp make and model, lamp and/or gear wattage information. No new discrepancies were identified, and all previous missing or invalid zero data had been updated except:

Road Name	Light ID	Lamp Make Model	Database Gear (Total) Wattage	Comment
SH 43 (1 REGAN STREET EAST)	118	PH (70SI, 70 watts)	0	Light ID 118 is located on Regan St near the corner of Esk Road and appears to be a 70W sodium light. The total wattage should be 83W.
SH 3 (2 BROADWAY)	1786	UNK	-	Light ID 1786 is connected to pole ID 724. The database records two lights against this pole; light ID 729 (Philips 40W fluorescent light) and light ID 1786 (unknown). There are many lights around this location (Broadway near the Propsero Place walkway), and it appears likely that pole ID 724 relates to a pedestrian crossing light and associated Belisha Beacon.

SDC will arrange for NPE Tech to complete site visits to confirm the correct lamp types and wattages and update RAMM. I also recommend that the other side of the pedestrian crossing on Broadway is checked at the same time.

The confirmed discrepancy for light ID 118 could lead to potential under submission of 83 W or 354.5 kWh p.a. based on 4,271 annual burn hours. The difference for light ID 1786 is unknown.

The accuracy of the non-zero recorded wattages is discussed in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.4 With: Clause 11(2)(c) and (d) of Schedule 15.3 From: 25-Feb-19 To: 25-Feb-19	One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage. One light (light ID 118) has a missing gear wattage. Potential impact: Low Actual impact: Low Audit history: Once Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	Controls are rated as moderate because most items of load have model, lamp wattage and gear wattages recorded. The impact is assessed to be low. The confirmed discrepancy for light ID 118 could lead to potential under submission of 83 W or 354.5 kWh p.a. based on 4,271 annual burn hours. The difference for light ID 1786 is unknown.

Actions taken to resolve the issue	Completion date	Remedial action status
Lamps to be investigated when able.	01/07/2020	Investigating
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Lamps will be recorded when they are located. After the LED up grade, it was the councils impression that all lamps were accounted for. The database manager will investigate the two lamps and update as required.	01/07/2020	

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 157 items of load on 12 March 2020. The sample was selected from three strata as follows:

1. 0080012045PC49C
2. 0089352001PC37D, and
3. 0089352004PCE32.

Audit commentary

The field audit discrepancies are detailed in the table below:

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
0080012045PC49C					
SH 3 (2 BROADWAY) location 10741-11274	20	20	-	-	Three Phillips 40W fluorescent lights were recorded in the railway subway on SH2 Broadway (location 11274), and three unknown lights were present. It was not possible to determine the bulb types through the opaque covers, but I was able to confirm that they were definitely not 40W under verandah fluorescent lights.
SH 43 (1 REGAN STREET EAST)	26	26	-	1	The database recorded 0 gear (total) wattage for one 70W sodium light (light ID 118).
0080012045PC49C					
SH 3 (2 BROADWAY) location 10741-11274	41	41	-	1	One 70W sodium light was recorded in the railway subway on SH2 Broadway (location 11274), and one unknown light was present. It was not possible to determine the bulb type through the opaque cover.
Grand Total	**157**	**157**	**-**	**5**	

All lights checked during the field survey were present in the database. Wattage differences are recorded as non-compliance in **section 3.1**.

Christmas and decorative lights are connected to the streetlight circuits when operating but are not recorded in RAMM. This is recorded as non-compliance in **sections 2.1**, **3.1** and **3.2**, and I repeat the last audit recommendation to maintain visibility.

Description	Recommendation	Audited party comment	Remedial action
Christmas and decorative lights	Add the Christmas and decorative lights to RAMM. Communicate on and off dates for Christmas lights to Genesis.	Genesis discussed this with the council Thursday 26/03/2020 details are to be provided once the council have details for the festive lighting.	Identified
Railway subway lights	Confirm the correct wattages for the railway subway lights on SH2 Broadway (location 11274) and update the database as necessary.	Genesis will request the council to confirm the wattages for these lamps, Genesis will also confirm the hours they burn.	Identified

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.5 With: Clause 11(2A) of Schedule 15.3 From: 12-Mar-20 To: 12-Mar-20	Ten unmetered decorative lights are not recorded in RAMM. This may result in estimated under submission of 1,700W or 726 kWh p.a. Eight unmetered Christmas lights are not recorded in RAMM. This may result in estimated under submission of 120 W or 50.4 kWh p.a. Potential impact: Medium Actual impact: Unknown Audit history: Once Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	A control rating of moderate was selected, because: • the controls over the database are rated as strong, because accuracy falls within the ±5% accuracy threshold, and • the controls over the inclusion of Christmas and decorative lights are weak but will improve to strong once the lights have been added to the database. The impact is assessed to be low based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis has spoken with the council and have requested that they revise their reporting to Genesis and look at database accuracy. All Gear wattage errors have been provided to the council and requested they be corrected. Until the correction has been made Genesis will **continue** to calculate using the correct wattages.	01/05/2020	Identified

Preventative actions taken to ensure no further issues will occur	Completion date	
Genesis revises the information provide and due to the reporting Genesis allocates the correct gear wattage based off the lamp information provided in the Database extract. I do question the validity of 3 inaccurate lamp wattages recorded based on the auditor not being able to verify due to opaque covers. This does not mean they are incorrect.	01/05/2020	

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

Genesis' submissions are based on a monthly extract from the RAMM database. A RAMM database extract was provided in March 2020 and I assessed the accuracy of this by using the DUML Statistical Sampling Guideline. The table below shows the survey plan.

Plan Item	Comments
Area of interest	Stratford District Council streetlights
Strata	The database contains the SDC items of load DUML in the Stratford region. The processes for the management of all SDC items of load are the same, but I decided to place the items of load into three strata: 1. 0080012045PC49C 2. 0089352001PC37D, and 3. 0089352004PCE32.
Area units	I created a pivot table of the roads and I used a random number generator in a spreadsheet to select a total of 11 sub-units.
Total items of load	157 items of load were checked, making up 18% of the database load.

Wattages were checked for alignment with the published standardised wattage table produced by the Electricity Authority against the database or in the case of LED lights against the LED light specification.

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

Audit commentary

Field audit findings

A field audit was conducted of a statistical sample of 157 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	100.3	Wattage from survey is higher than the database wattage by 0.3%
R_L	99.4	With a 95% level of confidence it can be concluded that the error could be between -0.6% and 2.2%
R_H	102.2	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. The table below shows that Scenario A (detailed below) applies, and the best available estimate indicates that the database is accurate within ± 5.0%.

- In absolute terms the installed capacity is estimated to be 0 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 and 1 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 600 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 1,000 kWh p.a. lower to 3,600 kWh p.a. higher than the database indicates.

Scenario	Description
A - **Good accuracy, good precision**	This scenario applies if: (a) R_H is less than 1.05; and (b) R_L is greater than 0.95 The conclusion from this scenario is that: (a) the best available estimate indicates that the database is accurate within +/- 5 %; and (b) this is the best outcome.
B - **Poor accuracy, demonstrated with statistical significance**	This scenario applies if: (a) the point estimate of R is less than 0.95 or greater than 1.05 (b) as a result, either R_L is less than 0.95 or R_H is greater than 1.05. 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: (a) the point estimate of R is between 0.95 and 1.05 (b) R_L is less than 0.95 and/or R_H is greater than 1.05 The conclusion from this scenario is that the best available estimate is not precise enough to conclude that the database is accurate within +/- 5 %

Light description and capacity accuracy

As discussed in **section 2.4**, two items have missing or unknown model, gear wattage and/or lamp wattage information. The confirmed discrepancy for light ID 118 could lead to potential under submission of 83 W or 354.5 kWh p.a. based on 4,271 annual burn hours. The wattage discrepancy for light ID 1786 is unknown. SDC will arrange for NPE Tech to complete site visits to confirm the correct lamp types and wattages, and then update RAMM.

Lamp and gear wattages were compared to the expected values. The gear wattage field records the total wattage for each item of load, including lamp and gear wattage. Some errors in the gear wattage field have resulted in incorrect total wattages being reported for the 202 lights shown in red below, including

the lamps with missing and invalid zero gear wattages described above, which are also recorded as non-compliance in **section 2.4**.

A list of discrepancies was provided to SDC, who intend to update RAMM to reflect the correct wattages.

	Gear (total) wattage										
Lamp make model	0	24	44	50	81	83	110	168	278	Blank	Expected
GO (500, 70 watts)			1								83
PH (100S, 100 watts)							2				111
PH (150I, 150 watts)							2	60			168
PH (250H, 250 watts)			2					4	18		278
PH (40, 40 watts)			180	1							50
PH (70SI, 70 watts)	1	1			8	74					83
TERR (T24, 24 watts)		328									24
UNK										1	Unknown
Grand Total	**1**	**329**	**183**	**1**	**8**	**74**	**4**	**64**	**18**	**1**	
Total Exceptions	**1**	**1**	**183**	**-**	**8**	**-**	**4**	**4**	**-**	**1**	

This may result in under reporting of 2,308 W or 9,857 kWh p.a. based on 4,271 annual burn hours, excluding the two lights with missing or invalid zero gear wattages.

Address accuracy

As discussed in **section 2.3**, all items of load have address information recorded. No inaccurate addresses were identified during the field audit.

ICP number accuracy

As discussed in **section 2.2**, all items of load have an ICP number recorded. The accuracy of ICP numbers was checked by comparing the ICP description, location and light type for each item of load for consistency.

I identified seven items of load connected to 0089352001PC37D (Under Veranda Lights - Romeo Street) which do not appear to be under verandah lights.

Road Name	Light ID	Lamp Make Model	Total Wattage
SH 3 (2 BROADWAY)	683	PH (100S, 100 watts)	110
SH 3 (2 BROADWAY)	814	GO (500, 70 watts)	44
SH 3 (2 BROADWAY)	894	PH (250H, 250 watts)	44
SH 3 (2 BROADWAY)	970	PH (250H, 250 watts)	44
SH 3 (2 BROADWAY)	988	PH (70SI, 70 watts)	83
REGAN STREET (1 WEST)	971	TERR (T24, 24 watts)	24
REGAN STREET (1 WEST)	972	TERR (T24, 24 watts)	24

I identified four items of load connected to 0080012045PC49C (Carriageway Lighting) which do not appear to be carriageway lights.

Road Name	Light ID	Lamp Make Model	Total Wattage
SH 3 (2 BROADWAY)	729	PH (40, 40 watts)	44
SH 3 (2 BROADWAY)	731	PH (40, 40 watts)	44
SH 3 (2 BROADWAY)	757	PH (40, 40 watts)	44
SH 3 (2 BROADWAY)	935	PH (40, 40 watts)	44

All three Stratford DC DUML ICPs have the same NSP, submission type and profile recorded, so there is no impact on submission. A list of discrepancies was provided to SDC, assuming that the lamp types recorded are correct, they believe that the ICP numbers may be incorrectly assigned for these lights. I recommend that these lights are investigated to confirm the correct ICP and RAMM is updated as necessary.

Recommendation	Description	Audited party comment	Remedial action
ICP number accuracy	Check the ICP numbers for the seven items of load connected to 0089352001PC37D (Under Veranda Lights - Romeo Street) which do not appear to be under verandah lights, and four items of load connected to 0080012045PC49C (Carriageway Lighting) which do not appear to be carriageway lights. Update RAMM as necessary.	Genesis will request that the lamps be investigated and update the description or lamps details as required.	Investigating

Change management process findings

Fault, maintenance and upgrade work is completed by NPE Tech.

NPE Tech updates the database from the field using PDAs, or from the office based on paper field records. Where the changes are entered from the field using PDAs, the change date will reflect the date that the change occurred. When changes are entered in the office the user enters an asset change date which reflects the date that the work was carried out. NPE Tech are responsible for validating any work completed in RAMM.

New connections are infrequent, and none have occurred during the audit period. In the event of a new connection, the SDC roading team works closely with the planning team to identify new subdivisions that will have streetlighting. The roading team approves any proposed streetlights, and the developer is responsible for installation and advising SDC once the work is complete. NPE Tech updates RAMM once the lights have been installed. The RAMM database records an installation date, and there is no separate livening date. It is expected that NPE Tech will enter the connection date as the livening date if a new connection occurs.

SDC's LED road lighting upgrade project is complete apart from Mercade Close where LEDs are still to be retrofitted. NZTA lights have not been upgraded.

Outage patrols are completed by NPE Tech every three months. Outages are also reported by residents within the SDC region and work orders are raised with NPE Tech as required.

Christmas lights

Christmas lights are connected to the streetlight circuits when operating but are not recorded in RAMM. SDC confirmed that there are four 15 W Christmas tree lights and four 15 W Christmas bell lights, which are typically connected for six weeks from the first of December until the second week of January. SDC confirmed the correct wattages with the supplier during the audit.

SDC will add the lights to the database against the associated poles and communicate on and off dates to Genesis.

Based on total Christmas light wattage of 120 W connected for six summer weeks per annum (approximately 420 burn hours), omission of the lights from the database may lead to potential under submission of 50.4 kWh p.a.

Decorative lights

Ten poles in the town centre have Inari 200 17 W decorative lights installed. These lights operate year-round and are connected to the streetlight circuits but are not recorded in RAMM. SDC confirmed the correct wattages with the supplier during the audit.

SDC will add the lights to the database against the associated poles.

Exclusion of the decorative lights from RAMM may result in under reporting of 1,700 W or 726 kWh p.a. based on 4,271 annual burn hours.

Private lights

There are no private lights recorded in the database, and SDC confirmed that they are not aware of any private streetlights in the SDC region.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 12-Mar-20 To: 12-Mar-20	One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage, which could result in potential under submission of 354.5 kWh per annum. One light (light ID 118) has a missing gear wattage, which could result in an unknown amount of under submission. A further 200 lights have incorrect gear (total) wattages recorded, including the lamps with missing and invalid zero gear wattages. This may result in under reporting of 2,308 W or 9,857 kWh p.a. based on 4,271 annual burn hours. Ten unmetered decorative lights are not recorded in RAMM. This may result in estimated under submission of 1,700W or 726 kWh p.a. Eight unmetered Christmas lights are not recorded in RAMM. This may result in estimated under submission of 120 W or 50.4 kWh p.a. Potential impact: Medium Actual impact: Unknown Audit history: Twice Controls: Strong Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls over the database are rated as strong, because accuracy falls within the ±5% accuracy threshold. The impact is assessed to be medium based on the kWh differences described above. SDC intends to investigate and resolve the issues identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis has highlighted to the council the field audit exceptions for correction. Genesis has provided the asset information to the council where erroneous gear wattages have been found for correction. Genesis has also discussed the tracking of changes and requested this to be reviewed.	01/05/2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis has spoken with the council and have requested that they revise their reporting to Genesis and look at database accuracy. Until the correction has been made Genesis will **continue** to calculate using the correct wattages.	01/05/2020	

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 the DUML load as NHH using the NST profile. The correct profiles and submission types are recorded on the registry.

Genesis reconciles the DUML load as NHH using the NST profile.

- Wattages are derived from an extract provided by SDC each month. The best available estimate indicates that the database is accurate within ± 5 % as discussed in **section 3.1**.
- Since the February 2020 submission on and off times have been derived from data logger information. Prior to February 2020, Astronomical Society data was used to determine on and off times. Genesis intends to submit revised submission information using data logger hours for prior periods.

I checked the February 2020 submission data for ICP 0080012045PC49C, 0089352001PC37D and 0089352004PCE32, and compliance is confirmed.

Sources of inaccuracy are as follows:

Issue	Estimated volume information impact (annual kWh)
Eight unmetered Christmas lights are not recorded in RAMM.	Potential under submission of 50.4 kWh p.a.[2]
Ten unmetered decorative lights are not recorded in RAMM.	Potential under submission of 726 kWh p.a.
Some errors in the gear wattage field have resulted in incorrect total wattages being reported for the 200 lights (excluding the lights with missing and invalid zero gear wattages separately listed below).	Potential under submission of 9,857 kWh p.a.
One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage.	Unknown, SDC is to investigate to confirm the correct wattages
One light (light ID 118) has a missing gear (total) wattage.	Potential under submission of 354.5 kWh p.a.

[2] Based on total festive light wattage of 120 W connected for six summer weeks per annum (approximately 420 burn hours), omission of the lights from the database may lead to potential under submission of 50.4 kWh p.a.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed 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. 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. Genesis is working to develop event-based calculations, which will enable accurate volume calculations where lamps change part way through a month.

There have been no new connections during the audit period. The RAMM database records an installation date, and there is no separate livening date. It is expected that NPE Tech will enter the connection date as the livening date if a new connection occurs.

NPE Tech updates the database from the field using PDAs, or from the office based on paper field records. Where the changes are entered from the field using PDAs, the change date will reflect the date that the change occurred. When changes are entered in the office the user enters an asset change date which reflects the date that the work was carried out.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 12-Mar-20 To: 12-Mar-20	One light (light ID 1786) has an unknown lamp model, and a missing lamp wattage and gear wattage, which could result in potential under submission of 354.5 kWh per annum. One light (light ID 118) has a missing gear wattage, which could result in an unknown amount of under submission. A further 200 lights have incorrect gear (total) wattages recorded, including the lamps with missing and invalid zero gear wattages. This may result in under reporting of 2,308 W or 9,857 kWh p.a. based on 4,271 annual burn hours. Ten unmetered decorative lights are not recorded in RAMM. This may result in estimated under submission of 1,700W or 726 kWh p.a. Eight unmetered Christmas lights are not recorded in RAMM. This may result in estimated under submission of 120 W or 50.4 kWh p.a. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Potential impact: Medium Actual impact: Unknown Audit history: Twice Controls: Strong Breach risk rating: 2

Audit risk rating	Rationale for audit risk rating
Medium	The controls over the database are rated as strong, because accuracy falls within the ±5% accuracy threshold. The impact is assessed to be medium based on the kWh differences described above. SDC intends to investigate and resolve the issues identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis has highlighted to the council the field audit exceptions for correction. Genesis has provided the asset information to the council where erroneous gear wattages have been found for correction. Genesis has also discussed the tracking of changes and requested this to be reviewed. Tracking of changes has been discussed with the council, further discussions will be required.	01/05/2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis has spoken with the council and have requested that they revise their reporting to Genesis and look at database accuracy. Until the correction has been made Genesis will **continue** to calculate using the correct wattages.	01/05/2020	

CONCLUSION

A RAMM database is held by SDC, who is Genesis' customer. NPE Tech are responsible for fault, maintenance, and upgrade work for streetlights, and maintain the database.

A monthly report from the database is provided to Genesis by SDC, which is used to calculate submissions. Genesis reconciles the DUML load as NHH using the NST profile. Since the February 2020 submission on and off times have been derived from data logger information. Prior to February 2020, Astronomical Society data was used to determine on and off times. Genesis intends to submit revised submission information using data logger hours for prior periods.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	100.3	Wattage from survey is higher than the database wattage by 0.3%
R_L	99.4	With a 95% level of confidence it can be concluded that the error could be between -0.6% and 2.2%
R_H	102.2	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. The best available estimate indicates that the database is accurate within ± 5.0%.

- In absolute terms the installed capacity is estimated to be 0 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 and 1 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 600 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 1,000 kWh p.a. lower to 3,600 kWh p.a. higher than the database indicates.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed 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 is non-compliant, and Genesis completes revision submissions where corrections are required. Genesis is working to develop event-based calculations, which will enable accurate volume calculations where lamps change part way through a month.

The future risk rating of ten indicates that the next audit be completed in 12 months. SDC intends to resolve the issues identified. Given that the database is accurate and a small number of exceptions were found, I recommend the next audit is completed in 18 months on 01/10/21.

PARTICIPANT RESPONSE

Majority of the database exceptions can be fixed in a relative short amount of time. Genesis has contacted the council and provided them the list of exceptions and requested the data to be updated within the database. Genesis calculate the volumes based off the lamp type provided and assign the correct gear wattage value.

Genesis has requested the investigation of the missing field audit items and the updates to be made accordingly.

The festive lighting details will be provided to Genesis along with connection period.