ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

SELWYN DISTRICT COUNCIL AND MERCURY NZ LIMITED

Prepared by: Tara Gannon

Date audit commenced: 2 February 2020

Date audit report completed: 26 February 2020

Audit report due date: 31 March 2020

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This audit of the **Selwyn District Council (SDC)** DUML database and processes was conducted at the request of **Mercury NZ Limited (Mercury)** 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 Streetlighting/DUML database is managed by Orion on behalf of SDC, who is Mercury's customer. Fault, maintenance, new connection and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the database.

A monthly report from the database is provided to Mercury, and used to calculate submissions. Mercury submits the DUML load as HHR using the HHR profile in accordance with exemption 233. On hours are derived using data logger information.

A field audit was conducted of a statistical sample of 308 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	91.5	Wattage from the survey is lower than the database wattage by 8.5%
R_L	81.3	With a 95% level of confidence it can be concluded that the error could be between -2.0% and -18.7%
R_H	98.0	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. There is evidence that the database is not accurate within ±5%.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 2.0% and 18.7% lower than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 47 kW lower than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 11 kW and 104 kW lower than the database.
- In absolute terms, total annual consumption is estimated to be 202,000 kWh lower than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 47,600 and 443,700 kWh lower 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 with supporting information which includes the daily unmetered kW and number of connections for each ICP. Mercury applies the kW value for the last day of the month when calculating submission volumes. Mercury completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo. No corrections have occurred in the last 12 months.

Four non-compliances were identified, and no recommendations were raised. The future risk rating of 20 indicates that the next audit be completed in three months. Orion was provided a list of all discrepancies identified during the audit. Almost all the field audit differences relate to LED upgrades, where there is sometimes a delay between the light being installed and paperwork being received to update the database. Three months may not be sufficient time to resolve the matters raised and I recommend the Authority considers an audit period of at least nine months.

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	The database contains some inaccurate data. The database accuracy is assessed to be 91.5% indicating an estimated over submission of 202,000 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool). 69 lamps have incorrect total wattages, resulting in estimated over submission of 110W or 470 kWh p.a. based on 4,271 burn hours. Submissions are calculated based on a snapshot at the end of the month.	Moderate	High	6	Identified
All load recorded in database	2.5	11(2A) of Schedule 15.3	One item of load was missing from the database.	Moderate	Low	2	Identified
Database accuracy	3.1	15.2 and 15.37B(b)	The database contains some inaccurate data. The database accuracy is assessed to be 91.5% indicating an estimated over submission of 202,000 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool). 69 lamps have incorrect total wattages, resulting in estimated over submission of 110W or 470 kWh p.a. based on 4,271 burn hours. Some addresses and GPS coordinates do not reflect the physical location of the item of load, particularly where the light is installed beyond the customer's boundary.	Moderate	High	6	Identified
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database contains some inaccurate data. The database accuracy is assessed to be 91.5% indicating an estimated over submission of 202,000 kWh per annum (based	Moderate	High	6	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
			on annual burn hours of 4,271 as detailed in the DUML database auditing tool). 69 lamps have incorrect total wattages, resulting in estimated over submission of 110W or 470 kWh p.a. based on 4,271 burn hours. Submissions are calculated based on a snapshot at the end of the month.				
Future Risk Rating						20	

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
		Nil

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

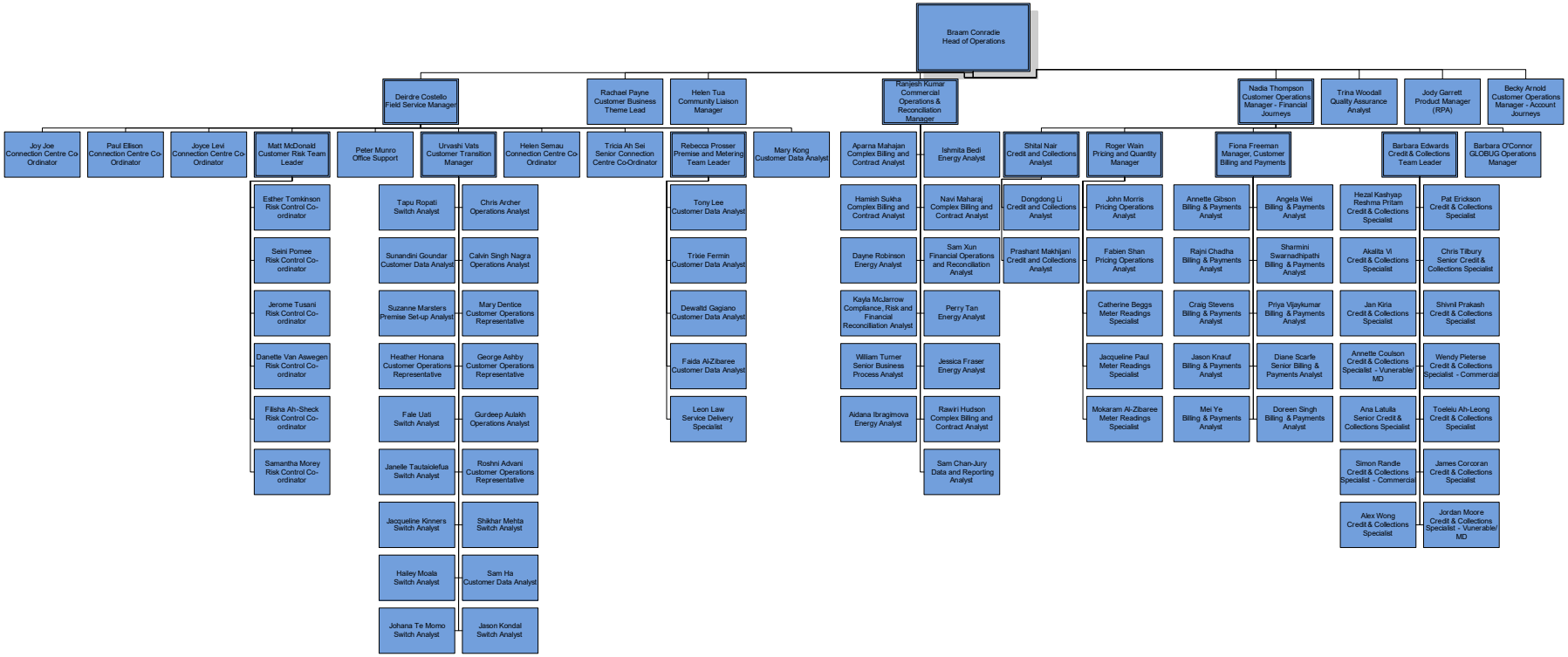
Current code exemptions were reviewed on the Electricity Authority website.

Audit commentary

Mercury has been granted exemption No. 233. This allows them to provide half-hour ("HHR") submission information instead of non half-hour ("NHH") submission information for distributed unmetered load ("DUML"). This exemption expires on 31 October 2023.

1.2. Structure of Organisation

Mercury provided their current 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
Penny Lawrence	Operations Services	Orion
Kayla McJarrow	Compliance, Risk & Financial Reconciliation Analyst	Mercury Energy

1.4. Hardware and Software

Orion use a purpose built Oracle Streetlighting/DUML database for the management of the DUML information. Backup and restoration procedures are in place, and access to the Orion network (including the database) is restricted using logins and passwords.

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)
0007131640RN99E	Ref Orion_SDC GXP street light ICP - ISL0661 GXP SDC Street Lights	ISL0661	HHR	5,652	411,865.1
0007111135RN743	Ref Orion_SDC GXP street light ICP - Isl0331 Gxp Sdc Street Lights	ISL0331	HHR	726	60,064
0007111134RNB06	Ref Orion_SDC GXP street light ICP - Hor0331 Gxp Sdc Street Lights	HOR0331	HHR	542	53,596
0007152475RN996	Ref Orion_SDC GXP street light ICP Kimberley - West Coast Road	KBY0661	HHR	141	14,851
0007111132RNA89	Ref Orion_SDC GXP street light ICP - Gxpclh 0111 Sdc Street Lights	CLH0111	HHR	59	5,929
0007111131RN649	Ref Orion_SDC GXP street light ICP - Aps0111 Gxp Sdc Street Lights	APS0111	HHR	36	5,158

ICP Number	Description	NSP	Profile	Number of items of load	Database wattage (watts)
0007111133RN6CC	Ref Orion_SDC GXP street light ICP - Col0111 Cxp Sdc Street Lights	COL0111	HHR	45	3,208
0007131637RN109	Ref Orion_SDC GXP street light ICP - HOR0661 GXP SDC Street Lights	HOR0661	HHR	7	563
Total				7,208	555,234.1

1.7. Authorisation Received

All information was provided directly by Mercury or Orion.

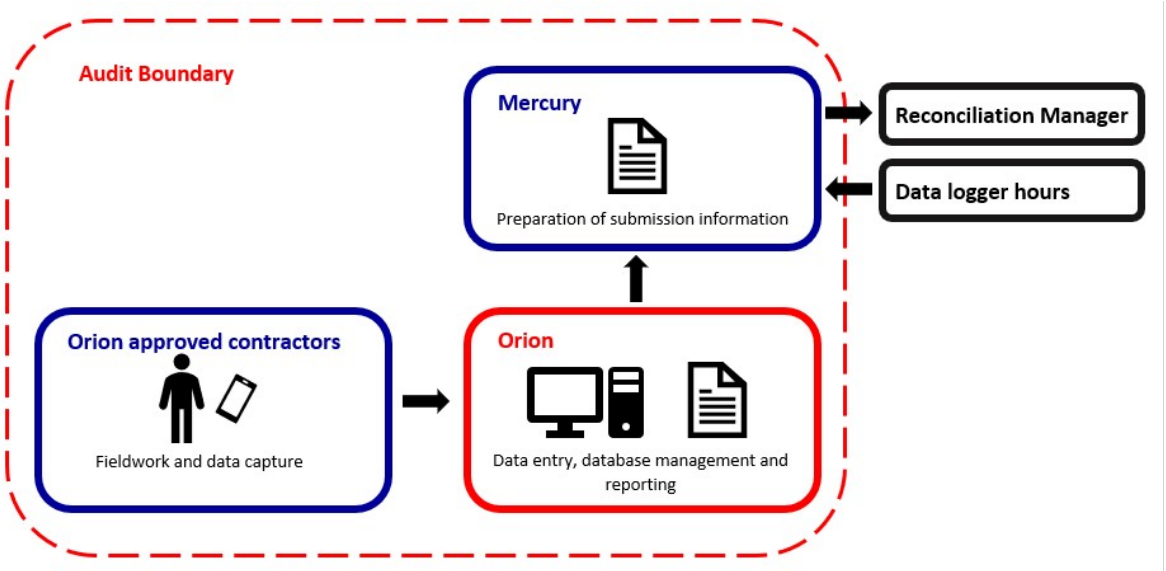
1.8. Scope of Audit

This audit of the SDC DUML database and processes was conducted at the request of Mercury 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 Streetlighting/DUML database is managed by Orion on behalf of SDC, who is Mercury's customer.

Orion's fault, maintenance, new connection and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the database. A monthly report from the database is provided to Mercury, and used to calculate submissions. Mercury submits the DUML load as HHR using the HHR profile. On hours are derived using data logger information.

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 boundaries for clarity.



The field audit was undertaken of a statistical sample of 308 items of load on 2 February 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
All load recorded in database	2.5	11(2A) of Schedule 15.3	14 items of load were missing from 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

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

Mercury 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

Mercury reconciles this DUML load using the HHR profile in accordance with exemption 233.

- Wattages are derived from an extract provided by Orion each month. The database is not confirmed to be accurate within ±5% as recorded in **section 3.1**.
- On and off times are derived from a data logger.

I reviewed the submission information for November 2019 and confirmed that the calculation methodology was correct, and that wattages were based on the extract and on hours were based on data logger information.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
69 lamps have incorrect total wattages.	Over submission of 470 kWh.

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 with supporting information which includes the daily unmetered kW and number of connections for each ICP. Mercury applies the kW value for the last day of the month when calculating submission volumes. Mercury completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Orion's database records a "start date" and "created date". The "start date" is entered by the user and reflects the date that the light was installed or changed, and system controls prevent future "start dates" from being entered. The "created date" reflects when the database record was created. Full history of the records that applied from each start date can be viewed in the database.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: unknown To: 05-Feb-20	The database contains some inaccurate data. The database accuracy is assessed to be 91.5% indicating an estimated over submission of 202,000 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool). 69 lamps have incorrect total wattages, resulting in estimated over submission of 110W or 470 kWh p.a. based on 4,271 burn hours. Submissions are calculated based on a snapshot at the end of the month. Potential impact: High Actual impact: Unknown Audit history: Three times Controls: Moderate Breach risk rating: 6
Audit risk rating	**Rationale for audit risk rating**
High	Controls are rated as moderate. Almost all the field audit differences relate to LED upgrades, where there is sometimes a delay between the light being installed and paperwork being received to update the database. A relatively small number of lights are affected by the wattage differences. A small number of incorrect lamp wattages were identified. The impact is assessed to be high, based on the kWh differences described above. Orion intends to investigate and correct the differences identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Mercury will liaise with the customer to update the database to ensure accurate submission. We will review our internal processes to comply with the EA memo.	July 20	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Mercury will liaise with the customer to ensure timely and accurate database updates to allow for correct submission. We will review our internal processes to comply with the EA memo.	July 20	

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 recorded against them. The accuracy of ICP identifiers is discussed 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 street name, number, and GPS coordinates. All items of load have GPS coordinates and are locatable.

Where lighting is installed beyond the customer's property boundary, such as in parks, reserves, and community housing properties, a single GPS and address location which reflects the point of connection to the streetlight circuit is recorded for all lights at that address.

Address accuracy is discussed further in **section 3.1**.

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 type, which corresponds to a lamp total wattage including ballast wattage. All items of load have a lamp type and total wattage recorded. The accuracy of the recorded wattages is discussed in **section 3.1**.

Audit outcome

Compliant

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 308 items of load on 2 February 2020. The sample was selected from four strata, as follows:

1. 0007131640RN99E street names A-G
2. 0007131640RN99E street names H to O
3. 0007131640RN99E street names P to Z; and
4. Other ICPs.

Audit commentary

The field audit discrepancies are detailed in the table below:

Light model	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
0007131640RN99E street names A-G					
Carnaveron Dr	19	19	-	1	One 92W LED (SL053970) was recorded in the database as a 94W LED.
Castleton Dr	13	13	-	13	13 x L20 were recorded in the database as 70W HPS (SL048341, SL048342, SL048343, SL048362 x2, SL048364, SL048366, SL048367 x2, SL048370, SL048372, SL048373 x2).
0007131640RN99E street names P to Z					

Light model	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
Rosamond Way	6	6	-	6	6 x L20 were recorded in the database as 70W HPS.
Siltstone St	3	3	-	1	1 x L40 at the beginning of Siltstone St (SL048963) was recorded in the database as 47W LED.
Siltstone St opp	1	1	-	1	1 x L40 at the beginning of Siltstone St (SL048958) was recorded in the database as 47W LED.
St John St	3	4	1	1	1 x 18W LED near 18 St John St was missing from the database. 1 x L29 (SL021978) was recorded as 30W LED in the database.
Wilfield Dr	9	9	-	9	9 x L18 were recorded in the database as 70W HPS.
Other ICPs					
Broadmeadows Dr	2	2	-	2	2 x L18 (SL007264 and SL038571) were recorded in the database as 70W HPS.
Mathias St	27	27	-	9	1 x 150W HPS + 4 x L29 + 4 x L18 were recorded in the database as 7 x 70W HPS + 2 x 2*30W FF.
Grand Total	**308**	**309**	**1**	**43**	

The field audit found one item of load was missing from the database, which is recorded as non-compliance below. Other light count and wattage differences identified during the field audit are recorded as non-compliance in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.5 With: Clause 11(2A) of Schedule 15.3 From: unknown To: 02-Feb-20	One item of load was missing from the database. 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. Almost all the differences relate to LED upgrades, where there is sometimes a delay between the light being installed and paperwork being received to update the database. The impact is assessed to be low. One 20W light was missing from the database, and estimated under submission is 85.4 kWh p.a. based on 4,271 annual burn hours.

Actions taken to resolve the issue	Completion date	Remedial action status
Mercury will liaise with the customer to have the database updated accordingly.	July 20	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Mercury will liaise with the customer to ensure timely and accurate database updates to allow for correct submission.	July 20	

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 database functionality achieves compliance with the code.

The change management process and the compliance of the database reporting provided to Mercury 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

Orion demonstrated a complete audit trail of all additions and changes to the database information. The user who processed the change is stored in the back end of the database.

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

Mercury's submissions are based on a monthly extract from the Orion database. A database extract was provided in December 2019 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	Selwyn DC streetlights
Strata	The database contains 7,208 items of load in the Selwyn DC region. The management process is the same for all lights. I created four strata: 1. 0007131640RN99E street names A-G 2. 0007131640RN99E street names H to O 3. 0007131640RN99E street names P to Z; and 4. Other ICPs.
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 56 sub-units.
Total items of load	308 items of load were checked, making up 5.3% of the database.

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 308 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	91.5	Wattage from the survey is lower than the database wattage by 8.5%
R_L	81.3	With a 95% level of confidence it can be concluded that the error could be between -2.0% and -18.7%
R_H	98.0	

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 B (detailed below) applies, and there is evidence that the database is not accurate within ±5%.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 2.0% and 18.7% lower than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 47 kW lower than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 11 kW and 104 kW lower than the database.
- In absolute terms, total annual consumption is estimated to be 202,000 kWh lower than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 47,600 and 443,700 kWh lower 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**, all lights have a lamp and gear wattage recorded.

Lamp and gear wattages for all other lamps were compared to the expected values, and the following exceptions were identified:

Model	Database wattage	Correct wattage	Quantity	Total difference	Comment
26W LED (Orangetek TERRALED 24 LED)	26W	24W	68	-136W	Cleared, now updated
106W LED (ADLT Cree LEDway 60 LED)	106W	132W	1	+26W	To be updated
		Total	69	-110W	

This could result in an estimated annual over submission of 470 kWh.

ICP number accuracy

As discussed in **section 2.2**, all lights have a GXP and corresponding ICP recorded. I compared the street addresses and GXP recorded for all items of load, and found that 31 streets had items of load connected to more than one NSP. All 31 streets were checked, and I confirmed that the NSP assignment appeared reasonable based on the light locations.

Address location accuracy

As discussed in **section 2.3**, all lights have an address recorded.

Where Orion is aware that lights are installed but CCC has not provided roading information, Orion records the GPS locations of the lights and a placeholder for road name such as "Road 1", "Unknown" or "Unnamed". Once the street details are provided the road names are updated. I confirmed the process by viewing a sample of lights assigned to an unnamed road in the pre-audit database extract and found that the road names had been updated by 5 February 2020.

Where lighting is installed beyond the customer's property boundary, such as in parks, reserves, and community housing properties, a single GPS and address location which reflects the point of connection to the streetlight circuit is recorded for all lights at that address rather than the physical location of each light.

Change management process findings

Fault, maintenance, new connection and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the Streetlighting/DUML database and GIS. For new subdivisions, this paperwork includes "as built" plans.

Upon receipt, paperwork is checked for completeness and accuracy and any issues are followed up with the contractor. The information is sent to the GIS team so that the GIS can be updated, and then returned to the connections team to update the Streetlighting/DUML database from the date the change or new connection was effective. Once data entry is complete, the values loaded are checked against the paperwork provided, and some spot checks in the field are completed. Paperwork is normally promptly provided electronically, and processed within two to three business days of receipt.

All jobs are tracked using job numbers by the connections team as part of the works management process. Late paperwork from contractors, and late updates by the GIS team are followed up. A checklist is followed to ensure that all steps in the process are completed.

Orion's approved contractors have access to a web based version of the Streetlighting/DUML database in the field, and advise Orion's connections team if they notice any discrepancies in the data recorded. Orion's operation team acts on these notifications, and checks and updates the data where necessary.

An LED upgrade project is underway, and at this stage there are no plans to use a centralised management system. Lights are upgraded in batches of 600-1,200 at a time. The upgrade data including pole, light, and installation date information is provided in spreadsheet form and the IT team run scripts to load the information in the database. The IT and connections teams complete testing on the updates to ensure that the records are correct.

Six monthly outage patrols are completed by Orion's contractors as part of the maintenance programme. Outages are also reported by residents within the CCC region and work orders are raised with contractors as required.

Festive lights

No festive lights are used in the Selwyn DC region.

Private lights

New private lights are not accepted, and where private lights are identified Orion arranges for standard or shared unmetered load to be created. In the meantime, private unmetered lights are recorded in the database against the appropriate ICP number and reported to Mercury in the monthly extracts for submission. I viewed an example of a private streetlight in the database to confirm this.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: unknown To: 05-Feb-20	The database contains some inaccurate data. The database accuracy is assessed to be 91.5% indicating an estimated over submission of 202,000 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool). 69 lamps have incorrect total wattages, resulting in estimated over submission of 110W or 470 kWh p.a. based on 4,271 burn hours. Some addresses and GPS coordinates do not reflect the physical location of the item of load, particularly where the light is installed beyond the customer's boundary. Potential impact: High Actual impact: Unknown Audit history: Three times Controls: Moderate Breach risk rating: 6

Audit risk rating	Rationale for audit risk rating
High	Controls are rated as moderate. Almost all the field audit differences relate to LED upgrades, where there is sometimes a delay between the light being installed and paperwork being received to update the database. A relatively small number of lights are affected by the wattage differences. A small number of incorrect lamp wattages were identified. The impact is assessed to be high, based on the kWh differences described above. Orion intends to investigate and correct the differences identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Mercury will liaise with the customer to update the database to ensure accurate submission.	July 20	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Mercury will liaise with the customer to ensure timely and accurate database updates to allow for correct submission.	July 20	

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

Mercury reconciles this DUML load using the HHR profile, and the correct profiles and submission types are recorded on the registry.

I reviewed the submission information for November 2019 and confirmed that it the calculation methodology was correct, and that wattages were based on the extract and on hours were based on data logger information.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
69 lamps have incorrect total wattages.	Over submission of 470 kWh.

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 with supporting information which includes the daily unmetered kW and number of connections for each ICP. Mercury applies the kW value for the last day of the month when calculating submission volumes. Mercury completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Orion's database records a "start date" and "created date". The "start date" is entered by the user and reflects the date that the light was installed or changed, and system controls prevent future "start dates" from being entered. The "created date" reflects when the database record was created. Full history of the records that applied from each start date can be viewed in the database.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: unknown To: 05-Feb-20	The database contains some inaccurate data. The database accuracy is assessed to be 91.5% indicating an estimated over submission of 202,000 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool). 69 lamps have incorrect total wattages, resulting in estimated over submission of 110W or 470 kWh p.a. based on 4,271 burn hours. Submissions are calculated based on a snapshot at the end of the month. Potential impact: High Actual impact: Unknown Audit history: Three times Controls: Moderate Breach risk rating: 6
Audit risk rating	**Rationale for audit risk rating**
High	Controls are rated as moderate. Almost all the field audit differences relate to LED upgrades, where there is sometimes a delay between the light being installed and paperwork being received to update the database. A relatively small number of lights are affected by the wattage differences. A small number of incorrect lamp wattages were identified. The impact is assessed to be high, based on the kWh differences described above. Orion intends to investigate and correct the differences identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Mercury will liaise with the customer to update the database to ensure accurate submission. We will review our internal processes to comply with the EA memo.	July 20	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Mercury will liaise with the customer to ensure timely and accurate database updates to allow for correct submission. We will review our internal processes to comply with the EA memo.	July 20	

CONCLUSION

A Streetlighting/DUML database is managed by Orion on behalf of SDC, who is Mercury's customer. Fault, maintenance, new connection and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the database.

A monthly report from the database is provided to Mercury, and used to calculate submissions. Mercury submits the DUML load as HHR using the HHR profile in accordance with exemption 233. On hours are derived using data logger information.

A field audit was conducted of a statistical sample of 308 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	91.5	Wattage from the survey is lower than the database wattage by 8.5%
R_L	81.3	With a 95% level of confidence it can be concluded that the error could be between -2.0% and -18.7%
R_H	98.0	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. There is evidence that the database is not accurate within ±5%.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 2.0% and 18.7% lower than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 47 kW lower than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 11 kW and 104 kW lower than the database.
- In absolute terms, total annual consumption is estimated to be 202,000 kWh lower than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 47,600 and 443,700 kWh lower 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 with supporting information which includes the daily unmetered kW and number of connections for each ICP. Mercury applies the kW value for the last day of the month when calculating submission volumes. Mercury completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo. No corrections have occurred in the last 12 months.

Four non-compliances were identified, and no recommendations were raised. The future risk rating of 20 indicates that the next audit be completed in three months. Orion was provided a list of all discrepancies identified during the audit. Almost all the field audit differences relate to LED upgrades, where there is

sometimes a delay between the light being installed and paperwork being received to update the database. Three months may not be sufficient time to resolve the matters raised and I recommend the Authority considers an audit period of at least nine months.

PARTICIPANT RESPONSE

Mercury will liaise with the customer to have all discrepancies identified during the audit, corrected and updated in the database. We will request the customer to review the LED upgrade process to ensure database updates are timely and accurate.