ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

For

PALMERSTON NORTH CITY COUNCIL AND MERIDIAN ENERGY LIMITED

Prepared by: Steve Woods and Tara Gannon

Date audit commenced: 22 April 2022

Date audit report completed: 30 May 2022

Audit report due date: 26 May 2021

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EXECUTIVE SUMMARY

This audit of the **Palmerston North City Council (PNCC)** DUML database and processes was conducted at the request of **Meridian Energy Limited (Meridian)** 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 was managed by **Alf Downs Streetlighting Limited (Alf Downs)** on behalf of PNCC up to 30 June 2021, and from 1 July 2021 has been managed by **Fulton Hogan**. Field work, asset data capture and database population is conducted by Fulton Hogan, Alf Downs and **Max Tarr Electrical Limited (Max Tarr)**. In all cases field staff update the database from the field using Pocket RAMM, and database information is validated by Fulton Hogan.

3,932 of the 9,714 lights recorded against the DUML ICPs in the database have reduced wattages recorded to account for dimming. Each affected luminaire has the same five stage dimming profile programmed into its driver by the supplier. The average wattage is calculated and recorded as the lamp wattage in the database.

PNCC and Meridian are working together to arrange approval to use the LGS (Local Government NZ profile) profile for submission of volumes for dimmed lights. First, PNCC will identify a suitable streetlight circuit of at least 100W which can be metered to determine the correct profile shape. Then Meridian will arrange approval to use the LGS profile, create new ICPs for the dimmed lights, and update their submission processes, and PNCC will update the database to the full wattages and move the dimmed lights to the new ICPs.

Meridian reconciles this DUML load using the DST profile. Wattages are derived from a RAMM extract provided by Fulton Hogan each month. On and off times are derived from a data logger read by EMS and are used to create a shape file. Meridian supplies EMS with the capacity information, and EMS calculates the kWh figures for the ICPs and includes them in the relevant AV080 file. This process was audited during Meridian's reconciliation participant audit and EMS' agent audit.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	105.7	Wattage from survey is higher than the database wattage by 5.7%.
R_L	97.4	With a 95% level of confidence it can be concluded that the error could be between -2.6% and +11.7%.
R_H	111.7	

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 2.6% lower and 11.7% higher than the wattage recorded in the DUML database.

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 1 February 2019. The best available estimate concludes with statistical significance that the database is not accurate within ±5.0%, and the difference is largely caused by reduced wattages for dimmed lights. The method used to calculate the dimmed wattages provides a reasonable estimate of the true wattage. Until a dimming profile is applied, use of the full wattage would result in over submission.

- In absolute terms the installed capacity is estimated to be 37 kW higher than the database indicates.

- There is a 95% level of confidence that the installed capacity is between 17 kW lower and 75 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 156,300 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 72,700 kWh p.a. lower and 321,100 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. Meridian completes revision submissions where corrections are required. Meridian has not updated their processes to be consistent with the Authority's memo.

The future risk rating of 25 indicates that the next audit be completed in three months. This may not be sufficient time to resolve the matters raised and move dimmed lights to new profiles. I recommend the Authority considers an audit period of at least nine months from now.

The matters raised are detailed below:

AUDIT SUMMARY

NON-COMPLIANCES

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
Distributed unmetered load audits	1.10	16A.26 and 17.295F	The audit was not completed by the due date.	Weak	Low	3	Identified
Deriving submission information	2.1	11(1) of Schedule 15.3	The database information used to calculate submissions is not accurate within ±5%. Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022. Lamp wattages have been adjusted down to account for dimming for 3,932 lights, which could result in under submission of 22,244W or 95,004 kWh per annum. Lamp wattages differed from expected values for a further 883 lights, which could result in over submission of 5,135W or 21,934 kWh per annum. 17 lights have incorrect gear wattages, which PNCC intends to correct. The impact of the incorrect gear wattages is 18.8W, which could lead to over submission of 80 kWh per annum. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.	Weak	Medium	6	Identified
ICP identifier and items of load	2.2	11(2)(a) and (aa) of Schedule 15.3	Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022.	Moderate	Low	2	Identified
All load recorded in database	2.5	11(2A) of Schedule 15.3	Two lights on Ruamahanga Crescent which were not recorded in the database: L46 lights outside street numbers 17 (pole L13490) and 111 (pole L13493). Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W.	Moderate	Low	2	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
			The lights have been connected since May 2022.				
Database accuracy	3.1	15.2 and 15.37B(b)	The database information used to calculate submissions is not accurate within ±5%. Lamp wattages have been adjusted down to account for dimming for 3,932 lights, which could result in under submission of 22,244W or 95,004 kWh per annum. Lamp wattages differed from expected values for a further 883 lights, which could result in over submission of 5,135W or 21,934 kWh per annum. 17 lights have incorrect gear wattages, which PNCC intends to correct. The impact of the incorrect gear wattages is 18.8W, which could lead to over submission of 80 kWh per annum. The road name recorded for Slim Pole IDs 9284 and 9285 is COLYTON RD_A but is expected to be Oxford Street. Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022.	Weak	Medium	6	Identified
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database information used to calculate submissions is not accurate within ±5%. Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022. Lamp wattages have been adjusted down to account for dimming for 3,932 lights, which could result in under submission of 22,244W or 95,004 kWh per annum. Lamp wattages differed from expected values for a further 883 lights, which could result in over submission of 5,135W or 21,934 kWh per annum. 17 lights have incorrect gear wattages, which PNCC intends to correct. The impact of the	Weak	Medium	6	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
			incorrect gear wattages is 18.8W, which could lead to over submission of 80 kWh per annum. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.				
Future Risk Rating						25	

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
Update ICP for airport owned ICP	2.1	The light connected to slim Pole ID 12347 is the responsibility of Palmerston North Airport, but it is recorded under PNCC ICP 1000581347PCFF5. I recommend liaising with Palmerston North Airport to ensure that they have the correct ICP recorded for this load.
ICP group for privately owned lights listed against DUML ICPs	2.1	Consider changing the ICP group to private for clarity, until the correct ICP is confirmed.
Transit NZ lights recorded against DUML ICPs	2.1	Liaise with NZTA to ensure that the 17 lights not currently included in the NZTA lower north island database are added. The affected pole IDs are: 1132, 1134, 1135, 1139, 1252, 1352, 1779, 1782, 1907, 4098, 4101, 4119, 4611, 4628, 9637, 10280 and 12628. Update the ICP numbers for the other lights with owner = Transit NZ which are currently recorded against PNCC DUML ICPs when they are in the NZTA lower north island database.
Confirm light wattages	3.1	Confirm the correct wattages and update the wattages in 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

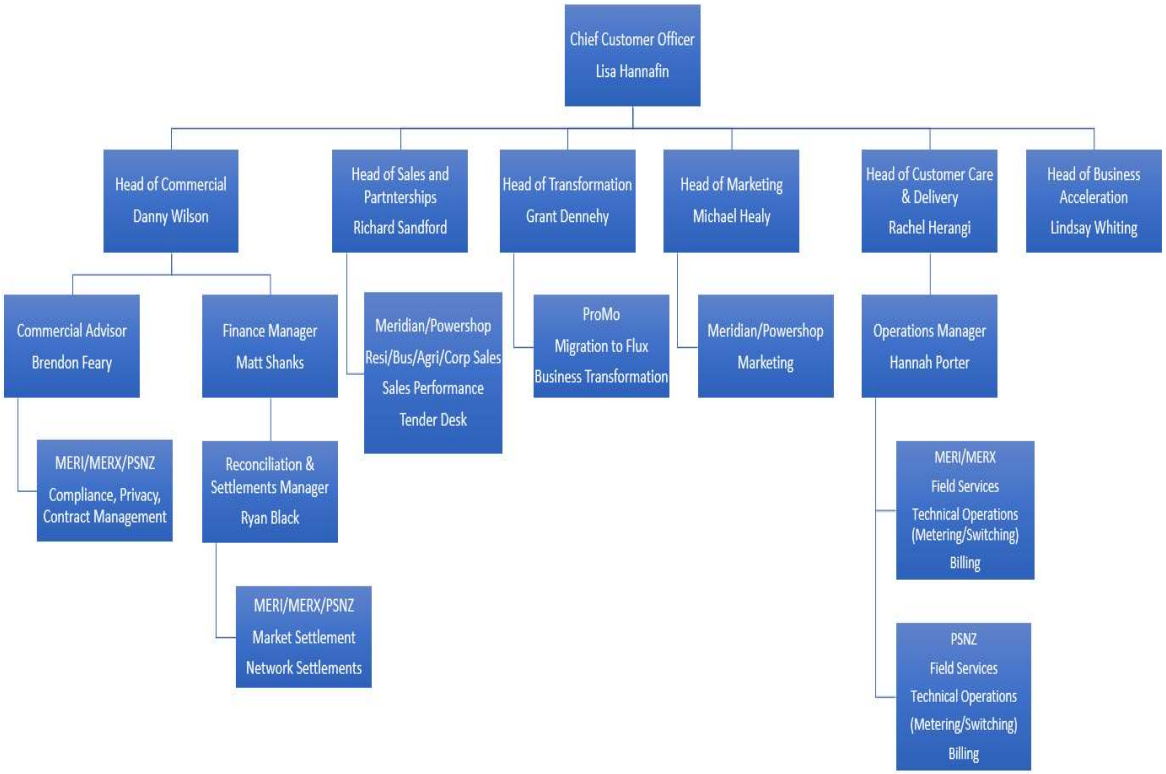
The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

Audit commentary

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

1.2. Structure of Organisation

Meridian provided a copy of their organisational structure.



1.3. Persons involved in this audit

Auditors:

Name	Title	Company
Steve Woods	Lead Auditor	Veritek
Tara Gannon	Supporting Auditor	Veritek

Other personnel assisting in this audit were:

Name	Title	Company
Samantha Lyall	Contract Administrator and RAMM Super User	Fulton Hogan
Amy Cooper	Compliance Manager (NZ Retail)	Meridian Energy
Daniel Lau	Energy Data Analyst	Meridian Energy
Melanie Matthews	Quality and Compliance Advisor	Meridian Energy
Mike Janus	Corporate Sales Manager	Meridian Energy
Margot Mortland	Contract Management Manager	Palmerston North City Council
Richard Ropiha	Asset Information Team Leader	Palmerston North City Council
Rob Cuff	Senior Contract Manager	Palmerston North City Council

1.4. Hardware and Software

The SQL database used for the management of DUML is remotely hosted by Thinkproject New Zealand 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.

Thinkproject New Zealand Ltd 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.

Meridian and EMS' systems used in the process are discussed in their reconciliation participant and agent audit reports respectively.

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)
0000031152CPB70	Streetlights, 32 The Square, Palmerston North	LTN0331	DST	4,081	255,654
1000581347PCFF5	PNCC Streetlights, 28A Redmayne St, Bunnythorpe	BPE0331	DST	5,633	387,152
Total				**9,714**	**642,806**

There are four other ICP groups recorded in the database:

ICP group	Comment
State Highway	NZTA lights are recorded in the database. There are 88 NZTA rural lights with the ICP group recorded as "state highway" totalling 16,368 W. These lights are not PNCC's responsibility and are included in the lower North Island NZTA database, which was audited in 2021.
Horizons	Four lights in a bus shelter on Main East, Hokowhitu are recorded in the database against ICP group "Horizon" totalling 1,112 W. These metered lights are the responsibility of Horizons.
Private	There are 93 lights with the ICP group recorded as "private" totalling 7,483 W. I checked the addresses of all 93 lights on the registry to determine whether standard or shared unmetered load was recorded: • 76 lights had shared unmetered load recorded at the associated address, • one light had standard unmetered load recorded at the associated address, • three lights on Stonehaven Crescent were confirmed to be the responsibility of Kainga Ora and are correctly excluded, and • 13 lights (760 W) did not have shared or standard unmetered load recorded at the associated address on the registry and have been followed up with Powerco in May 2022 to confirm where the load should be reconciled.
Blank	There are six new lights on North Street, Ashhurst (Slim pole IDs 12657-12662) with the ICP group blank totalling 600W. The lights were not connected at the time the original database extract was provided in March 2022, and PNCC's policy is to update the ICP number once the lights are connected. PNCC advised that the lights were connected in May 2022, but they still did not have an ICP number allocated in the database extract received on 25 May 2022. This is recorded as non-compliance in section 2.2.

Ten lights totalling 826W have pole control listed as "metered supply" and ICP group 0000031152CPB70. These lights are excluded from the monthly database extracts and excluded from submission.

1.7. Authorisation Received

All information was provided directly by Meridian, PNCC, or Fulton Hogan.

1.8. Scope of Audit

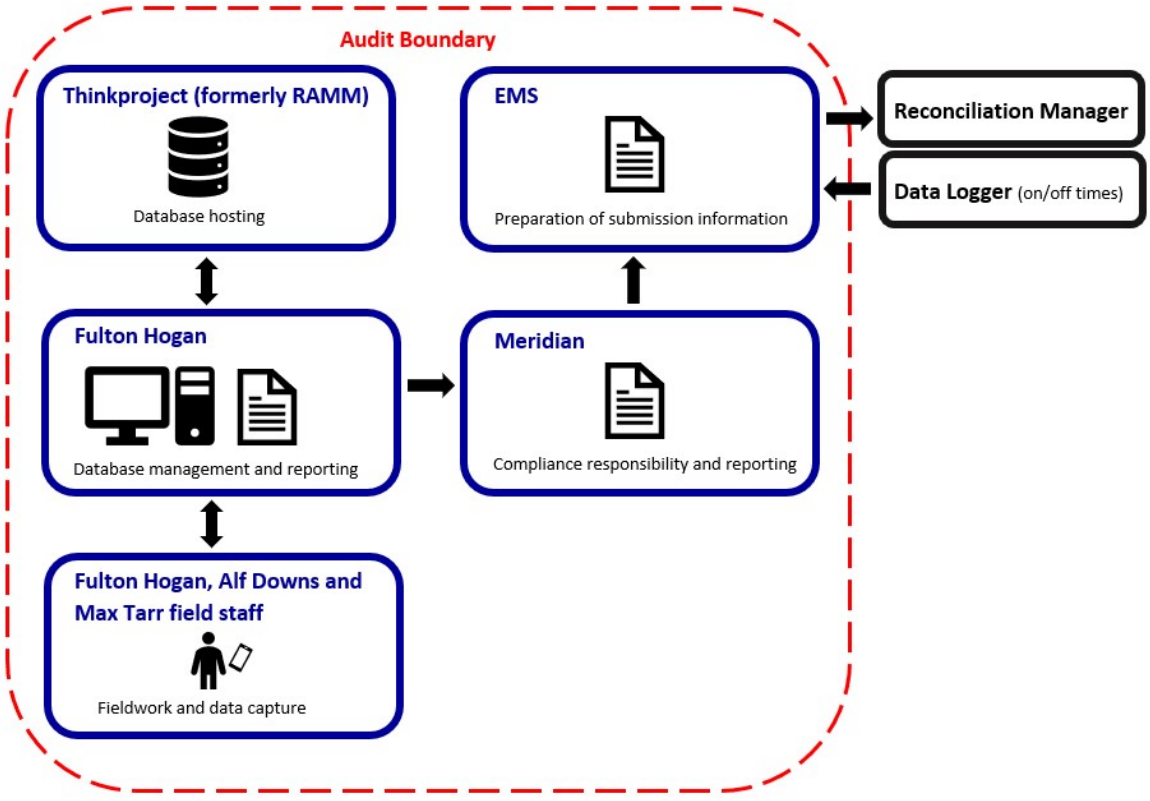
This audit of the PNCC DUML database and processes was conducted at the request of Meridian in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied.

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

A RAMM database was managed by Alf Downs on behalf of PNCC up to 30 June 2021, and from 1 July 2021 has been managed by Fulton Hogan. Field work, asset data capture and database population is conducted by Fulton Hogan, Alf Downs and Max Tarr. In all cases field staff update the database from the field using Pocket RAMM, and database information is validated by Fulton Hogan.

Meridian reconciles this DUML load using the DST profile. Wattages are derived from a RAMM extract provided by Fulton Hogan each month. On and off times are derived from a data logger read by EMS and are used to create a shape file. Meridian supplies EMS with the capacity information, and EMS calculates the kWh figures for the ICPs and includes them in the relevant AV080 file. This process was audited during Meridian's reconciliation participant audit and EMS' agent audit.

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.



A field audit was undertaken of a statistical sample of 408 items of load on 22 and 23 April 2022.

1.9. Summary of previous audit

The previous audit of this database was undertaken by Tara Gannon of Veritek Limited in May 2020. 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 is not confirmed as accurate with a 95% level of confidence. Two lights had missing gear wattages, which were expected to be recorded as zero. Some LED light wattages have been adjusted down to account for dimming. Meridian reports the load for ICP 0000031152CPB70 against profile DST, and the profiles used by PNCC to adjust wattages have not been approved by the Electricity Authority. Meridian processes some wattage corrections prior to submission, which reduces the impact of the non-compliance. Four lights have incorrect gear wattages, which Alf Downs intends to correct. The impact of the incorrect gear wattages is 28W, which could lead to under submission of 120 kWh per annum. There is potential over submission of 4,382 kWh p.a. for metered load. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. The installation and change dates recorded in the database reflect the data collection date, which is not always consistent with the date that the change occurred.	Still existing
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	Pole IDs 96 and 1697 had missing gear wattages, when zero was expected.	Cleared

Subject	Section	Clause	Non-compliance	Status
Database accuracy	3.1	15.2 and 15.37B(b)	The database is not confirmed as accurate with a 95% level of confidence. Two lights had missing gear wattages, which were expected to be recorded as zero. Some LED light wattages have been adjusted down to account for dimming. Meridian reports the load for ICP 0000031152CPB70 against profile DST, and the profiles used by PNCC to adjust wattages have not been approved by the Electricity Authority. Meridian processes some wattage corrections prior to submission, which reduces the impact of the non-compliance. Four lights have incorrect gear wattages, which Alf Downs intends to correct. The impact of the incorrect gear wattages is 28W, which could lead to under submission of 120 kWh per annum. There is potential over submission of 4,382 kWh p.a. for metered load. The road name recorded for Slim Pole IDs 9284 and 9285 is COLYTON RD_A, but is expected to be Oxford Street. The installation and change dates recorded in the database reflect the data collection date, which is not always consistent with the date that the change occurred.	Still existing
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database is not confirmed as accurate with a 95% level of confidence. Two lights had missing gear wattages, which were expected to be recorded as zero. Some LED light wattages have been adjusted down to account for dimming. Meridian reports	Still existing

Subject	Section	Clause	Non-compliance	Status
			the load for ICP 0000031152CPB70 against profile DST, and the profiles used by PNCC to adjust wattages have not been approved by the Electricity Authority. Meridian processes some wattage corrections prior to submission, which reduces the impact of the non-compliance. Four lights have incorrect gear wattages, which Alf Downs intends to correct. The impact of the incorrect gear wattages is 28W, which could lead to under submission of 120 kWh per annum. There is potential over submission of 4,382 kWh p.a. for metered load. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. The installation and change dates recorded in the database reflect the data collection date, which is not always consistent with the date that the change occurred.	

Subject	Section	Clause	Recommendation	Status
Metered lights recorded against DUML ICPs	2.1	11(1) of Schedule 15.3	Check the lights which are recorded against DUML ICPs and indicated to be metered, then update the database to indicate the correct metering status and ICP number.	Adopted
Confirm light wattages	3.1	15.2 and 15.37B(b)	Confirm the correct wattages for the five lamp models which did not match the specifications I located, and 31 models which I could not locate specifications for. Update the wattages in RAMM as necessary.	Not adopted

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

Meridian have requested Veritek to undertake this streetlight audit.

Audit commentary

The audit was due to be completed by 26/05/21 but was not completed until 30/05/22.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 1.10 With: Clause 16A.26 and 17.295F From: 26-May-21 To: 30-May-22	The audit was not completed by the due date. Potential impact: High Actual impact: Unknown Audit history: None Controls: Weak Breach risk rating: 3
Audit risk rating	**Rationale for audit risk rating**
Low	Controls are assessed to be weak as the audit was one year overdue. Meridian delayed the audit in an effort to resolve the known non-compliances before the next audit was completed. The impact is assessed to be low, because completing the audit earlier was unlikely to impact on compliance.

Actions taken to resolve the issue	Completion date	Remedial action status
Meridian delayed the audit of this database while attempting to resolve the substantive issue regarding dimmable lights. Following consultation with the Authority the audit was undertaken to resolve non-compliance with 16A.26 and 17.295F.	30/05/2022	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	

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

Submission

Meridian reconciles this DUML load using the DST profile.

- Wattages are derived from a RAMM extract provided by Fulton Hogan each month. The field survey found that the database is not accurate within ±5.0%, with statistical significance as recorded in **section 3.1**.
- On and off times are derived from a data logger read by EMS and are used to create a shape file.

Meridian supplies EMS with the capacity information from Fulton Hogan. EMS calculates the kWh figures for ICP 0000031152CPB70 and 1000581347PCFF5 and includes them in the relevant AV080 file. This process was audited during Meridian's reconciliation participant audit and EMS' agent audit.

I checked the data provided to EMS for December 2021, January 2022, and February 2022 I found that the capacity information provided to EMS matched raw database extracts provided by Fulton Hogan for each month within ± 0.002 kW.

Festive lights are provided in the database extract when they are connected, and I confirmed that connected festive lights were included in the wattages provided to EMS. Festive light processes are discussed further in **section 3.1**.

The previous two audits found that the RAMM extract included load which appeared to be metered and were expected to be excluded from submissions. Ten lights in the current extract have the pole control listed as "metered supply". These lights are excluded from the extracts that Fulton Hogan provides to Meridian.

Some items of load are recorded against a DUML ICP but excluded from the database extracts because the light owner is not PNCC:

Recorded owner	Findings
Airport	One 103W light is owned by Palmerston North Airport and is correctly excluded from the database extracts and submission. Responsibility for the light will eventually be transferred to PNCC, and the ICP number should be updated until responsibility is transferred.
Not connected to the network	One 83W light is confirmed to be disconnected, and is correctly excluded from database extracts and submission.

Recorded owner	Findings
Private	33 lights recorded against DUML ICPs with a private owner (2,659W) are excluded from the database extracts and submission. The lights have been followed up with Powerco in May 2022 to confirm where the load should be reconciled.
Transit NZ urban lights	275 lights (44,255W) are excluded from the database extracts and submission. 258 of the lights are included in the NZTA lower north island database, but 17 are not. PNCC confirmed that the excluded lights are NZTA lights and should be included in the NZTA lower north island database.

Recommendation	Description	Audited party comment	Remedial action
Update ICP for airport owned ICP	The light connected to slim Pole ID 12347 is the responsibility of Palmerston North Airport, but it is recorded under PNCC ICP 1000581347PCFF5. I recommend liaising with Palmerston North Airport to ensure that they have the correct ICP recorded for this load.	Meridian will liaise with Palmerston North Airport to confirm that the correct ICP is recorded against this load.	Identified
ICP group for privately owned lights listed against DUML ICPs	Consider changing the ICP group to private for clarity, until the correct ICP is confirmed.	Meridian has advised Palmerston North City Council of the recommendation and they have advised that they will look at updating the RAMM Database.	Identified
Transit NZ lights recorded against DUML ICPs	Liaise with NZTA to ensure that the 17 lights not currently included in the NZTA lower north island database are added. The affected pole IDs are: 1132, 1134, 1135, 1139, 1252, 1352, 1779, 1782, 1907, 4098, 4101, 4119, 4611, 4628, 9637, 10280 and 12628. Update the ICP numbers for the other lights with owner = Transit NZ which are recorded against PNCC DUML ICPs when they are in the NZTA lower north island database.	Meridian will liaise with the Trader for NZTA lower north island to verify the pole ID's of the 17 lights and ensure they are included in the Lower North Island Database. Once all NZTA lights are confirmed as being included in the NZTA database we will liaise with PNCC to determine whether these lights are to remain in the database or be removed. If they are to stay in the database they will be updated with the relevant ICP numbers.	Identified

Sources of database inaccuracy are as follows:

Issue	Estimated volume information impact (annual kWh)
The database information used to calculate submissions is not accurate within ±5%.	There is a 95% level of confidence that the annual consumption is between 72,700 kWh p.a. lower and 321,100 kWh p.a. higher than the database indicates.
Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022.	2,563 kWh of under submission per annum.
17 lamps connected to DUML ICPs had incorrect gear wattages recorded.	80 kWh of over submission per annum.
Lamp wattages have been adjusted down to account for dimming for 3,932 lights.	95,004 kWh of under submission per annum based on the full expected wattage. The method used to calculate the dimmed wattages provides a reasonable estimate of the true wattage. Until a dimming profile is applied, use of the full wattage would result in over submission.
Lamp wattages differed from expected values for a further 883 lights which PNCC confirmed were not dimmed.	21,934 kWh of over submission per annum.

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

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

The current monthly report is provided as a snapshot and this practice is non-compliant. 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. Meridian has not yet updated their processes to be consistent with the Authority's memo.

The RAMM database records light installation and replacement dates, which default to the date which the data is collected. Field work, asset data capture and database population is conducted by Fulton Hogan, Alf Downs and Max Tarr. In all cases field staff update the database from the field using Pocket RAMM when work is completed.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3	The database information used to calculate submissions is not accurate within ±5%. Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022. Lamp wattages have been adjusted down to account for dimming for 3,932 lights, which could result in under submission of 22,244W or 95,004 kWh per annum.

From: 01-Mar-22 To: 23-Apr-22	Lamp wattages differed from expected values for a further 883 lights, which could result in over submission of 5,135W or 21,934 kWh per annum. 17 lights have incorrect gear wattages, which PNCC intends to correct. The impact of the incorrect gear wattages is 18.8W, which could lead to over submission of 80 kWh per annum. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Potential impact: High Actual impact: Unknown Audit history: Multiple times Controls: Weak Breach risk rating: 6
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls over the database are rated as weak, due to the large number of discrepancies identified during the field count and analysis of the RAMM database extract. The audit risk rating is medium. The majority of the database inaccuracies relate to dimmed lights, and the method used to calculate the dimmed wattages provides a reasonable estimate of the true wattage. Until a dimming profile is applied, use of the full wattage would result in over submission.

Actions taken to resolve the issue	Completion date	Remedial action status
Palmerston North City Council advises the 6 lights in North Street, Ashhurst are now connected to the Powerco network and are recorded in our RAMM Database.	15/6/2022	Identified
Meridian is working with Palmerston North City Council to meet the requirement of the LGS profile so this can be used for the dimming lights. Palmerston North City Council advises they are in the process of meter installations.	1/12/2022	
Meridian advised Palmerston North City Council regarding the 883 lights. Palmerston North City Council advise the 2 x LED CRI 80 3000K 14W have been corrected in the database. The 75 x Road Grace BRP711 30LED26W are covered in the dimming profile. The remaining 806 lights are confirmed as correct.	15/6/2022	
Palmerston North City Council confirm that the 17 lights with incorrect gear wattages have been corrected in the RAMM Database.	15/6/2022	
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Meridian will continue to work with and follow up with Palmerston North City Council in setting up the dimming lights profile.	1/12/2022	

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 an ICP was recorded against each item of load.

Audit commentary

All items of load that PNCC is responsible for have a valid ICP number recorded except:

Recorded ICP	Findings
Blank ICP group	There are six new lights on North Street, Ashhurst (Slim pole IDs 12657-12662) with the ICP group blank totalling 600W. The lights were not connected at the time the original database extract was provided in March 2022, and PNCC's policy is to update the ICP number once the lights are connected. PNCC advised that the lights were connected in May 2022, but they still did not have an ICP number allocated in the database extract received on 25 May 2022. This is recorded as non-compliance below.

I checked all items of load which did not have a valid DUML ICP number and confirmed that PNCC was not responsible for them:

Recorded ICP	Findings
Private lights	There are 93 lights with the ICP group recorded as "private" totalling 7,483W. I checked the addresses of all 93 lights on the registry to determine whether standard or shared unmetered load was recorded: • 76 lights had shared unmetered load recorded at the associated address, • one light had standard unmetered load recorded at the associated address, • three lights on Stonehaven Crescent were confirmed to be the responsibility of Kainga Ora and are correctly excluded, and • 13 lights (760W) did not have shared or standard unmetered load recorded at the associated address on the registry and have been followed up with Powerco in May 2022 to confirm where the load should be reconciled.
NZTA lights	There are 88 NZTA rural lights with the ICP group recorded as "state highway" totalling 16,368 W. These lights are not PNCC's responsibility and are included in the lower North Island NZTA database, which was audited in 2021.
Horizons lights	Four lights in a bus shelter on Main East, Hokowhitu are recorded in the database against ICP group "Horizon" totalling 1,112W. These metered lights are the responsibility of Horizons.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.2 With: Clause 11(2)(a) and (aa) of Schedule 15.3 From: 01-May-22 To: 25-May-22	Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022. Potential impact: Low Actual impact: Low Audit history: None Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are moderate, as almost all ICPs which should be recorded against DUML ICPs had the correct ICP recorded. The exceptions appear to be caused by a delay in updating the database for these newly connected lights. The audit risk rating is low because 1) the lights were connected within the last month and 2) the unmetered volume is small.

Actions taken to resolve the issue	Completion date	Remedial action status
Palmerston North City Council advises the 6 lights in North Street, Ashhurst are now connected to the Powerco network and are recorded in our RAMM Database.	15/6/2022	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
The Council and contractor processes to keep the database up to date with changes are generally robust	Ongoing	

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 carriageway area, road name, displacement, GPS coordinates, and pole numbers.

All items of load are locatable. 11,277 items of load (99.73%) have GPS coordinates, and the other 30 items have road name, displacement and council pole number information which allows to be readily located.

The accuracy of locations is discussed 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

A description of each light is recorded in the lamp model field, and wattages are recorded in the lamp wattage and gear wattage fields.

All items of load which PNCC is responsible for had valid lamp models, lamp wattages and gear wattages recorded.

Two lights with ICP group = private had unknown lamp models and zero lamp and gear wattages recorded. PNCC confirmed that they are twin globe lights on the same pole and have been referred to Powerco for investigation and confirmation of where the load should be reconciled.

ICP Group	Road Name	Slim Pole ID	Council Pole No.	Lamp Model	Gear Wattage	Lamp Wattage
Private	CHURCH ST EAST	11762	L12884	Unknown	0	0
Private	CHURCH ST EAST	11762	L12884	Unknown	0	0

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 408 items of load on 22 and 23 April 2022. The sample was selected from five strata, as follows:

1. 0000031152CPB70 street names A to Main West,
2. 0000031152CPB70 street names Main West North to Z,
3. 1000581347PCFF5 road names A to Fitzherbert,
4. 1000581347PCFF5 road names Fitzroy to Parnell Heights, and
5. 1000581347PCFF5 road names Pastoral to Z.

Audit commentary

The field audit discrepancies are detailed in the table below. Most of the differences relate to lamps which had a correct lamp description recorded in the database, but a lower profiled wattage had been applied.

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
0000031152CPB70 street names A to Main West					
AINTREE CRES	11	11	-	11	One L23 light was recorded in the database as Road Grace BRP711 23LED20W – 14W. Nine L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W. One L18 light was recorded in the database as Tera LED Mini 18W – 15W.
BALRICKARD WAY WEST	3	3	-	3	Four Vizuolo AR|B|C 21|022 were recorded in the database as Vizulo Mini Stork LED 28.4W – 20W.
GILLESPIES LINE	21	21	-	1	One L20 was recorded in the database as Road Grace BRP711 23LED20W – 14W.
HENARE ST	8	8	-	8	Eight L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
LYNDHURST ST	20	20	-	20	20 L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
0000031152CPB70 street names Main West North to Z					
MONTROSE PL	4	4	-	4	Four L18 lights were recorded in the database as Tera LED Mini 18W – 15W.

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
NIKAU ST	4	4	-	4	Four L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
PENCARROW ST	13	12	-1	11	One Road Grace BRP711 23LED20W recorded in the database was not located outside 2 Pencarrow St. PNCC intends to update the database to remove this light. 11 L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
PIRANI PL	4	4	-	4	Four L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
SEFTON AVE	4	4	-	4	Four L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
SHAMROCK ST	21	21	-	21	21 L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
SILKWOOD PL	4	4	-	4	Four L18 lights were recorded in the database as Tera LED Mini 18W – 15W.
SUTHERLAND CRES	13	13	-	13	One L26 light outside 83 Sutherland Cres was recorded in the database as Road Grace BRP711 23LED20W – 14W. 12 L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
WILLIS ST	5	5	-	5	Five L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
1000581347PCFF5 road names A to Fitzherbert					
ACACIA ST	8	8	-	8	Eight L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
ALFRED ST	8	8	-	7	Five L18 lights were recorded in the database as Tera LED Mini 18W – 15W.

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
					Two L18 lights were recorded in the database as Tera LED Mini 12W – 9W.
ASHFORD AVE	7	7	-	7	One L18 light was recorded in the database as a 70watt SON-T (HPS) – 83W. Six L18 lights were recorded in the database as Tera LED Mini 18W – 15W.
BRIGHTWATER TCE	15	15	-	13	13 L24 lights were recorded in the database as Tera LED Mini 24W – 22W.
CROXLEY PL	2	2	-	2	Two L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
DELTA PL	4	4	-	4	Four L18 lights were recorded in the database as Tera LED Mini 18W – 15W.
1000581347PCFF5 road names Fitzroy to Parnell Heights					
GLENMARY CL	12	8	-4	1	Four sodium, mercury and LED lights recorded in the database were not present on the street. One 13W PL was recorded with an incorrect light type. PNCC visited Glenmarry Cl following the field audit and believes that 11 13W PL lights are present and intends to update the database.
GRANGE PL	4	4	-	4	Four L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
KARAMEA CRES	8	8	-	8	Eight L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
MARGARET ST	13	13	-	13	13 L18 lights were recorded in the database as Tera LED Mini 18W – 15W.
MARNE ST	20	20	-	20	20 L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
1000581347PCFF5 road names Pastoral to Z					
PEMBROKE ST_A	5	5	-	3	Two L26 lights were recorded in the database as Teceo 16 LED (27) - 19W. One L122 light was recorded in the database as Teceo 80 LED (122) - 88W.
RAINFORTH ST	7	7	-	6	Six L18 lights were recorded in the database as Tera LED Mini 18W – 15W.
REDMAYNE STREET_B	6	6	-	3	Three L25 lights were recorded in the database as two 'TLD' 30w/33 x 2 tubes and one 70W sodium.
RUAMAHANGA CRES	20	22	+2	20	20 L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W. Two L46 lights outside street numbers 17 (pole L13490) and 111 (pole L13493) were missing from the database. PNCC intends to update the database to include these.
TENNYSON AVE	10	10	-	10	Ten L33 lights were recorded in the database as Winsor Ely C 33W LED – 24W.
TYNE ST	11	11	-	11	11 L20 lights were recorded in the database as Road Grace BRP711 23LED20W – 14W.
Total	**408**	**405**	**7(-5+2)**	**253**	**5 missing from street** **2 missing from database**

The audit found two lights on Ruamahanga Crescent which were not recorded in the database; L46 lights outside street numbers 17 (pole L13490) and 111 (pole L13493).

As recorded in **section 2.2**, six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022.

Wattage differences are discussed in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description

Audit Ref: 2.5 With: Clause 11(2A) of Schedule 15.3 From: 22-Apr-22 To: 25-May-22	Two lights on Ruamahanga Crescent which were not recorded in the database: L46 lights outside street numbers 17 (pole L13490) and 111 (pole L13493). Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022. Potential impact: Medium Actual impact: Low Audit history: None Controls: Moderate Breach risk rating: 2

Audit risk rating	Rationale for audit risk rating
Low	The controls over the completeness of database information are assessed to be moderate because the differences are recent changes and are expected to be timing differences. The impact is low, based on the wattages.

Actions taken to resolve the issue	Completion date	Remedial action status
Palmerston North City Council confirm that the 2 lights on Ruamahanga Crescent have now been added to the RAMM Database. Palmerston North City Council advises the 6 lights in North Street, Ashhurst are now connected to the Powerco network and are recorded in our RAMM Database.	15/6/2022 15/6/2022	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
The Council and contractor processes to keep the database up to date with changes are generally robust	Ongoing	

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 Meridian 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

Meridian's submissions are based on a monthly extract from the RAMM database.

A RAMM database extract was provided in March 2022 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	Palmerston North City Council streetlights
Strata	The database contains the PNCC items of load for the DUML ICPs in the Palmerston North region. The processes for the management of all PNCC items of load are the same, but I decided to place the items of load into five strata: 1. 0000031152CPB70 street names A to Main West, 2. 0000031152CPB70 street names Main West North to Z, 3. 1000581347PCFF5 road names A to Fitzherbert, 4. 1000581347PCFF5 road names Fitzroy to Parnell Heights, and 5. 1000581347PCFF5 road names Pastoral to Z.
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 50 sub-units.
Total items of load	408 items of load making up 2.5% of the total load were checked.

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 408 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	105.7	Wattage from survey is higher than the database wattage by 5.7%
R_L	97.4	With a 95% level of confidence it can be concluded that the error could be between -2.6% and +11.7%
R_H	111.7	

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 2.6% lower and 11.7% higher than the wattage recorded in the DUML database.

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 1 February 2019. The best available estimate concludes with statistical significance that the database is not accurate within ±5.0%.

- In absolute terms the installed capacity is estimated to be 37 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 17 kW lower and 75 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 156,300 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 72,700 kWh p.a. lower and 321,100 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

Missing and invalid zero wattages

As discussed in **section 2.4**, all items of load which PNCC is responsible for had valid lamp models, lamp wattages and gear wattages recorded.

Two lights with ICP group = private had unknown lamp models and zero lamp and gear wattages recorded. PNCC confirmed that they are twin globe lights on the same pole and have been referred to Powerco for investigation.

ICP Group	Road Name	Slim Pole ID	Council Pole No.	Lamp Model	Gear Wattage	Lamp Wattage
Private	CHURCH ST EAST	11762	L12884	Unknown	0	0
Private	CHURCH ST EAST	11762	L12884	Unknown	0	0

Lamp wattages

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

3,932 of the 9,714 lights recorded against the DUML ICPs in the database have reduced wattages recorded to account for dimming. Each affected luminaire has the same five stage dimming profile programmed into its driver by the supplier. The average wattage is calculated and recorded as the lamp wattage in the database. This could result in under submission of 22,244W or 95,004 kWh per annum. The affected lamp models are:

Lamp Model	Count of lamps	Recorded lamp wattage	Expected lamp wattage
Tera LED Mini 12W	90	9	12
Tera LED Mini 18W	968	15	18
Road Grace BRP711 23LED20W	2396	14	20
Tera LED Mini 24W	52	22	24
Windsor Ely C 27W LED	82	19	27
Teceo 1 24 LED (27)	19	19	27
Teceo 16 LED (27)	9	19	27
T3ME IPD H 29W	30	21	29
Winsor Ely C 33W LED	49	24	33
Tera LED Mini 36W	18	29	36
Vizulo Mini Stork LED 28.4W	38	20	28.4
Teceo 80 LED (122)	15	88	122
20 LED AT 525mA	7	27	35-39
30 LED AT 525mA	30	37/39	53-55
T3ME 22W	1	16	22
XSP (29W)	8	21	29
T210 IPD H 29W	4	21	29
Windsor Trafalgar 33W LED	11	24	33

Lamp Model	Count of lamps	Recorded lamp wattage	Expected lamp wattage
T3 IPD E 34W	5	24	34
Teceo 32 LED (38)	26	27	36
T3ME IPD H 45W	1	32	45
XSP2 T210 IPD 1 (SW 74W)	18	53	74
Vizulo Mini Stork 16.6W	3	12	16.6
LED 4000k 20W	8	14	20
Cree XSP1T3ME 37W DIM	2	27	37
Valentino 24 LED 39W	10	28	39
Piano 1 32 Leds	3	41	52
Cree XSP1 T3ME 22W DIM	10	16	22
20 LED AT 700mA	3	37	47-51
30 LED AT 700mA	7	53	70-73
XSP2 T2 IPD A (SW 101)	6	72	101
XSP2 T2 IPD E (SW 65)	3	47	65

PNCC and Meridian are working together to arrange approval to use the LGS (Local Government NZ profile) profile for submission of volumes for dimmed lights. First, PNCC will identify a suitable streetlight circuit of at least 100W which can be metered to determine the correct profile shape. Then Meridian will arrange approval to use the LGS profile, create new ICPs for the dimmed lights, and update their submission processes, and PNCC will update the database to the full wattages and move the dimmed lights to the new ICPs.

For a further 883 lights which PNCC confirmed were not dimmed, the wattage differed from the expected lamp wattages and could result in over submission of 5,135W or 21,934 kWh per annum. The affected lamp models are:

Lamp Model	Count of lamps	Recorded lamp wattage	Expected lamp wattage
Gewiss Smart 4 LED 4000K	778	31	25
Road Grace BRP711 30LED26W	75	18	26
4000K CoB LED 6W/220÷240V	7	8	6
LED CRI 80, 3000K 14W	2	15.8	14
Teceo 90 LED	21	146	96

I was unable to confirm the correct wattages for the lamps listed below, and recommend these are checked:

Lamp Model	Count of lamps	Recorded lamp wattage	Comment
LED 4000k, 1600lm 25000hrs	4	20	
Scala Midi 32LED	6	51	
Tryka GrazeLine 30 42 X 1m	2	193.2	
Apollo RL2P 056	6	120	
GE_LED	4	165	
Cree LED 3000K CRI ≥83 120lm	16	2	
Festive Shapes	11	150	
Prolicht 750	1	27.6	PNCC advised disconnected but still recorded in the database in May 2022.
RGB Sign	2	100	
Festive String 20 LED	1	47	
Festive String 60 LED	3	142	

I have not attempted to calculate the exact impact of these discrepancies, due to difficulty in confirming the correct values where I could not find matching lamp specifications.

I recommend that the lamp wattages which could not be confirmed are checked, and updated if necessary.

Description	Recommendation	Audited party comment	Remedial action
Confirm light wattages	Confirm the correct wattages, and update the wattages in RAMM as necessary.	Palmerston North City Council advise that all wattages are verified and corrected in the RAMM Database where necessary.	Identified

Gear wattages

Gear wattages were checked for alignment with the published standardised wattage table produced by the Electricity Authority, and expected values for LED lights. 17 discrepancies for lamps connected to DUML ICPs were identified which could result in over submission of 18.8W or 80 kWh per annum.

Lamp Model	Gear wattage exceptions	Wattage difference
100watt Metal Hallide	Two lights have 18W instead of 14W	-8W
100watt SON-I (HPS)	One light has 11W instead of 14W	+3W
100watt SON-T (HPS)	Six lights have 11W instead of 14W One light has 13W instead of 14W	+19W
15000lm/150w/100LlmW/4000K	One light has 0.8W instead of 0W	-0.8W
2 x 18w PL Lamp	Four lights have 10W instead of 0W	-40W

Lamp Model	Gear wattage exceptions	Wattage difference
TLD 40Watt Tube x 1	Two lights have 6W instead of 10W	+8W

Address accuracy

All address discrepancies identified during previous audits were cleared except Slim Pole IDs 9284 and 9285 which were located at the upper end of Oxford Street before the road name changes to Colyton Rd, but are still recorded with a road name of COLYTON RD_A.

ICP number and owner accuracy

There are six new lights on North Street, Ashhurst (Slim pole IDs 12657-12662) with the ICP group blank totalling 600W. The lights were not connected at the time the original database extract was provided in March 2022. PNCC's policy is to update the ICP number once the lights are connected. PNCC advised that the lights were connected in May 2022, but they still did not have an ICP number allocated in the database extract received on 25 May 2022.

Change management process findings

A RAMM database was managed by Alf Downs on behalf of PNCC up to 30 June 2021, and from 1 July 2021 has been managed by Fulton Hogan. Field work, asset data capture and database population is conducted by Fulton Hogan, Alf Downs and Max Tarr. In all cases field staff update the database from the field using Pocket RAMM, and database information is validated by Fulton Hogan.

I walked through the new connections process:

- for subdivisions the developer is responsible for arranging for an approved contractor (Fulton Hogan, Alf Downs or Max Tarr) to update RAMM when the lights are connected; PNCC checks that lights have been added to RAMM as part of the subdivision approval process, and
- other new connections are completed by approved contractors and RAMM is updated at the time work is completed; lights will be added to the database with a blank ICP before connection, and the ICP is updated once they are connected.

The RAMM database records light installation and replacement dates, which default to the date which the data is collected. In all cases field staff update the database from the field using Pocket RAMM when work is completed. Data is verified when claims are generated by matching requested and completed work, and as part of the claims approval process which includes site visits for 10% of work.

Night patrols for outages are completed for parts of the network approximately monthly, and daytime patrols are completed in response to complaints.

Festive lights

There are two sets of festive lights recorded in the database:

1. Festoon strings located on Regent Arcade (ICP 1000581347PCFF5), which are decorative lights which are connected year round and included in all database extracts and reconciliation submissions.
2. Festive shapes located in Ashhurst (ICP 1000581347PCFF5) are connected during December and January. These lights are only included in the RAMM database extracts when they are connected, and are appropriately included in submission information when they are provided. I reviewed the extracts for December 2021 and January 2022 and confirmed that these lights were included because they were connected, and February 2022 and confirmed that these lights were excluded because they were not connected.

Private lights

There are 93 lights with the ICP group recorded as "private" totalling 7,483W. I checked the addresses of all 93 lights on the registry to determine whether standard or shared unmetered load was recorded:

- 76 lights had shared unmetered load recorded at the associated address,
- one light had standard unmetered load recorded at the associated address,
- three lights on Stonehaven Crescent were confirmed to be the responsibility of Kainga Ora and are correctly excluded, and
- 13 lights (760W) did not have shared or standard unmetered load recorded at the associated address on the registry and have been followed up with Powerco in May 2022 to confirm where the load should be reconciled.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 01-Mar-22 To: 25-May-22	The database information used to calculate submissions is not accurate within ±5%. Lamp wattages have been adjusted down to account for dimming for 3,932 lights, which could result in under submission of 22,244W or 95,004 kWh per annum. Lamp wattages differed from expected values for a further 883 lights, which could result in over submission of 5,135W or 21,934 kWh per annum. 17 lights have incorrect gear wattages, which PNCC intends to correct. The impact of the incorrect gear wattages is 18.8W, which could lead to over submission of 80 kWh per annum. The road name recorded for Slim Pole IDs 9284 and 9285 is COLYTON RD_A but is expected to be Oxford Street. Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022. Potential impact: High Actual impact: High Audit history: Three times Controls: Weak Breach risk rating: 6
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls over the database are rated as weak, due to the large number of discrepancies identified during the field count and analysis of the RAMM database extract. The audit risk rating is medium. The majority of the database inaccuracies relate to dimmed lights, and the method used to calculate the dimmed wattages provides a reasonable estimate of the true wattage. Until a dimming profile is applied, use of the full wattage would result in over submission.

Actions taken to resolve the issue	Completion date	Remedial action status

Meridian is working with Palmerston North City Council to meet the requirement of the LGS profile so this can be used for the dimming lights. Palmerston North City Council advises they are in the process of meter installations.	1/12/2022	Identified
Meridian advised Palmerston North City Council regarding the 883 lights. Palmerston North City Council advise the 2 x LED CRI 80 3000K 14W have been corrected in the database. The 75 x Road Grace BRP711 30LED26W are covered in the dimming profile. The remaining 806 lights are confirmed as correct.	15/6/2022	
Palmerston North City Council confirm that the 17 lights with incorrect gear wattages have been corrected in the RAMM Database.	15/6/2022	
Palmerston North City Council advise the name has been corrected from Colyton Road to Oxford Street in the RAMM Database.	15/6/2022	
Palmerston North City Council advises the 6 lights in North Street, Ashhurst are now connected to the Powerco network and are recorded in our RAMM Database.	15/6/2022	
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Meridian will continue to work and follow up with Palmerston North City Council in setting up the dimming lights profile.	1/12/2022	

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

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

- Wattages are derived from a RAMM extract provided by Fulton Hogan each month. The field survey found that the database is not accurate within ±5.0%, with statistical significance as recorded in **section 3.1**.
- On and off times are derived from a data logger read by EMS and are used to create a shape file.

Meridian supplies EMS with the capacity information from Fulton Hogan. EMS calculates the kWh figures for ICP 0000031152CPB70 and 1000581347PCFF5 and includes them in the relevant AV080 file. This process was audited during Meridian's reconciliation participant audit and EMS' agent audit.

I checked the data provided to EMS for December 2021, January 2022, and February 2022 I found that the capacity information provided to EMS matched raw database extracts provided by Fulton Hogan for each month within ± 0.002 kW.

Festive lights are provided in the database extract when they are connected, and I confirmed that connected festive lights were included in the wattages provided to EMS. Festive light processes are discussed further in **section 3.1**.

The previous two audits found that the RAMM extract included load which appeared to be metered and were expected to be excluded from submissions. Ten lights in the current extract have the pole control listed as "metered supply". These lights are excluded from the extracts that Fulton Hogan provides to Meridian.

Some items of load are recorded against a DUML ICP but excluded from the database extracts because the light owner is not PNCC:

Recorded owner	Findings
Airport	One 103W light is owned by Palmerston North Airport and is correctly excluded from the database extracts and submission. Responsibility for the light will eventually be transferred to PNCC, and the ICP number should be updated until responsibility is transferred.
Not connected to the network	One 83W light is confirmed to be disconnected, and is correctly excluded from database extracts and submission.
Private	33 lights recorded against DUML ICPs with a private owner (2,659W) are excluded from the database extracts and submission. The lights have been followed up with Powerco in May 2022 to confirm where the load should be reconciled.
Transit NZ urban lights	275 lights (44,255W) are excluded from the database extracts and submission. 258 of the lights are included in the NZTA lower north island database, but 17 are not. PNCC confirmed that the excluded lights are NZTA lights and should be included in the NZTA lower north island database.

Recommendations to update ICP information are recorded in **section 2.1**.

Sources of database inaccuracy are as follows:

Issue	Estimated volume information impact (annual kWh)
The database information used to calculate submissions is not accurate within ±5%.	There is a 95% level of confidence that the annual consumption is between 72,700 kWh p.a. lower and 321,100 kWh p.a. higher than the database indicates.

Issue	Estimated volume information impact (annual kWh)
Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022.	2,563 kWh of under submission per annum.
17 lamps connected to DUML ICPs had incorrect gear wattages recorded	80 kWh of over submission per annum.
Lamp wattages have been adjusted down to account for dimming for 3,932 lights.	95,004 kWh of under submission per annum based on the full expected wattage. The method used to calculate the dimmed wattages provides a reasonable estimate of the true wattage. Until a dimming profile is applied, use of the full wattage would result in over submission.
Lamp wattages differed from expected values for a further 883 lights which PNCC confirmed were not dimmed.	21,934 kWh of over submission per annum.

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

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

The current monthly report is provided as a snapshot and this practice is non-compliant. 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. Meridian has not yet updated their processes to be consistent with the Authority's memo.

The RAMM database records light installation and replacement dates, which default to the date which the data is collected. Field work, asset data capture and database population is conducted by Fulton Hogan, Alf Downs and Max Tarr. In all cases field staff update the database from the field using Pocket RAMM when work is completed.

Audit outcome

Non-compliant

Non-compliance	Description

Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 01-Mar-22 To: 23-Apr-22	The database information used to calculate submissions is not accurate within ±5%. Six lights in North St, Ashhurst (Slim pole IDs 12657-12662) have a blank ICP group and total 600W. The lights have been connected since May 2022. Lamp wattages have been adjusted down to account for dimming for 3,932 lights, which could result in under submission of 22,244W or 95,004 kWh per annum. Lamp wattages differed from expected values for a further 883 lights, which could result in over submission of 5,135W or 21,934 kWh per annum. 17 lights have incorrect gear wattages, which PNCC intends to correct. The impact of the incorrect gear wattages is 18.8W, which could lead to over submission of 80 kWh per annum. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Potential impact: High Actual impact: Unknown Audit history: Multiple times Controls: Weak Breach risk rating: 6

Audit risk rating	Rationale for audit risk rating
Medium	The controls over the database are rated as weak, due to the large number of discrepancies identified during the field count and analysis of the RAMM database extract. The audit risk rating is medium. The majority of the database inaccuracies relate to dimmed lights, and the method used to calculate the dimmed wattages provides a reasonable estimate of the true wattage. Until a dimming profile is applied, use of the full wattage would result in over submission.

Actions taken to resolve the issue	Completion date	Remedial action status
Palmerston North City Council advises the 6 lights in North Street, Ashhurst are now connected to the Powerco network and are recorded in our RAMM Database.	15/6/2022	Identified
Meridian is working with Palmerston North City Council to meet the requirement of the LGS profile so this can be used for the dimming lights. Palmerston North City Council advises they are in the process of meter installations.	1/12/2022	
Meridian advised Palmerston North City Council regarding the 883 lights. Palmerston North City Council advise the 2 x LED CRI 80 3000K 14W have been corrected in the database. The 75 x Road Grace BRP711 30LED26W are covered in the dimming profile. The remaining 806 lights are confirmed as correct.	15/6/2022	
Palmerston North City Council confirm that the 17 lights with incorrect gear wattages have been corrected in the RAMM Database.	15/6/2022	

Preventative actions taken to ensure no further issues will occur	Completion date	
Meridian will continue to work and follow up with Palmerston North City Council in setting up the dimming lights profile.	1/12/2022	

CONCLUSION

A small number of data completeness issues were identified but the majority of database accuracy issues are caused by reduced wattages being applied for dimmed lights. Each affected luminaire has the same five stage dimming profile programmed into its driver by the supplier. The average wattage is calculated and recorded as the lamp wattage in the database.

PNCC and Meridian are working together to arrange approval to use the LGS (Local Government NZ profile) profile for submission of volumes for dimmed lights. First, PNCC will identify a suitable streetlight circuit of at least 100W which can be metered to determine the correct profile shape. Then Meridian will arrange approval to use the LGS profile, create new ICPs for the dimmed lights, and update their submission processes, and PNCC will update the database to the full wattages and move the dimmed lights to the new ICPs.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	105.7	Wattage from survey is higher than the database wattage by 5.7%.
R_L	97.4	With a 95% level of confidence it can be concluded that the error could be between -2.6% and +11.7%.
R_H	111.7	

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 2.6% lower and 11.7% higher than the wattage recorded in the DUML database.

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 1 February 2019. The best available estimate concludes with statistical significance that the database is not accurate within ±5.0%, and the difference is largely caused by reduced wattages for dimmed lights. The method used to calculate the dimmed wattages provides a reasonable estimate of the true wattage. Until a dimming profile is applied, use of the full wattage would result in over submission.

- In absolute terms the installed capacity is estimated to be 37 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 17 kW lower and 75 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 156,300 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 72,700 kWh p.a. lower and 321,100 kWh p.a. higher than the database indicates.

The future risk rating of 25 indicates that the next audit be completed in three months. This may not be sufficient time to resolve the matters raised and move dimmed lights to new profiles. I recommend the Authority considers an audit period of at least nine months from now.

PARTICIPANT RESPONSE

Meridian have reviewed this report and their comments are contained within its body.