

ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT



For

AUCKLAND TRANSPORT AND
MERIDIAN ENERGY
NZBN: 9429037696863

Supervising Auditor: Tara Gannon

Supporting Auditor: Brett Piskulic

Date audit commenced: 17 July 2023

Date audit report completed: 13 October 2023

Audit report due date: 15 October 2023

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EXECUTIVE SUMMARY

This audit of the **Auckland Transport Unmetered Streetlights (Auckland Transport)** 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 streetlight data is held in a RAMM database, and this is managed by Asset Data Solutions Ltd on behalf of Auckland Transport. This audit has assessed the accuracy of the RAMM database. In addition to the RAMM database Auckland Transport are recording all the LED lights in the SLV tele-management system. From 1st September 2023 Auckland Transport and Meridian are using the output of the SLV system for the reconciliation of the LED lighting load under the HHS profile. The non-LED lighting load will continue to be reconciled under the DST profile. This audit was completed using a RAMM database extract obtained on 1st August 2023 and the submission information from July 2023 which was reconciled under the DST profile.

In future audits the SLV tele-management system will be audited for the LED load.

This audit found improvements in the accuracy of the database as a result of continued data cleansing conducted by Auckland Transport, and it is expected that this will continue to improve with the use of the SLV system in future.

A field audit was conducted of a statistical sample of 1,401 items of load. Discrepancies were identified in 19 of the 215 sub-units (roads) included in the field audit. The “database auditing tool” was used to analyse the results. The analysis confirmed that the database error is within the allowable +/-5% variance threshold and compliance is confirmed.

This audit found six non-compliances and one recommendation was made. The future risk rating of 24 indicates that the next audit be completed in three months, but I recommend that the next audit be in a minimum of six months as Auckland Transport and Meridian have now implemented the HHS profile which will result in a significant improvement in the accuracy of submission information.

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	<p>The variance of wattage values between the SLV system and RAMM is calculated to be 1,243,880 kWh per annum. I have not considered this in the audit risk rating as RAMM is less accurate, but the more accurate SLV is being used for submission.</p> <p>Over submission because of dimming being used. The impact on submission is unknown.</p> <p>One item of load with no ICP recorded in the database.</p> <p>18 items of load with zero or blank wattage recorded indicating a potential under submission of 3,844 kWh per annum.</p> <p>Incorrect wattages recorded in the database for a significant number of LED lights.</p> <p>Incorrect ballasts applied to 130 items of load recorded resulting in an estimated over submission of 6,030 kWh per annum.</p> <p>Any changes that are made during any given month take effect from the beginning of that month. This process does not account for historic changes or changes within a month.</p>	Moderate	High	6	Identified
ICP identifier and items of load	2.2	11(2)(a) of Schedule 15.3	<p>One item of load with no ICP recorded in the database.</p> <p>Seven items of load with the incorrect ICP recorded.</p>	Moderate	Low	2	Identified
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	<p>18 items of load with zero or blank wattage recorded indicating a potential under submission of 3,844 kWh per annum.</p>	Moderate	Low	2	Identified
All load recorded in database	2.5	11(2A) and (d) of Schedule 15.3	<p>Four additional lights found in the field of 1,401 sampled.</p>	Moderate	Low	2	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
Database accuracy	3.1	15.2 and 15.37B(b)	<p>Incorrect wattages recorded in the database for a significant number of LED lights.</p> <p>Incorrect ballasts applied to 130 items of load recorded resulting in an estimated over submission of 6,030 kWh per annum.</p>	Moderate	High	6	Identified
Volume information accuracy	3.2	15.2 and 15.37B(c)	<p>The variance of wattage values between the SLV system and RAMM is calculated to be 1,243,880 kWh per annum. I have not considered this in the audit risk rating as RAMM is less accurate, but the more accurate SLV is being used for submission.</p> <p>Over submission because of dimming being used. The impact on submission is unknown.</p> <p>One item of load with no ICP recorded in the database.</p> <p>18 items of load with zero or blank wattage recorded indicating a potential under submission of 3,844 kWh per annum.</p> <p>Incorrect wattages recorded in the database for a significant number of LED lights.</p> <p>Incorrect ballasts applied to 130 items of load recorded resulting in an estimated over submission of 6,030 kWh per annum.</p> <p>Any changes that are made during any given month take effect from the beginning of that month. This process does not account for historic changes or changes within a month.</p>	Moderate	High	6	Identified
Future Risk Rating						24	

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
Database accuracy	3.1	Auckland Transport investigate and identify all festive lights and ensure they are correctly recorded in the database.

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

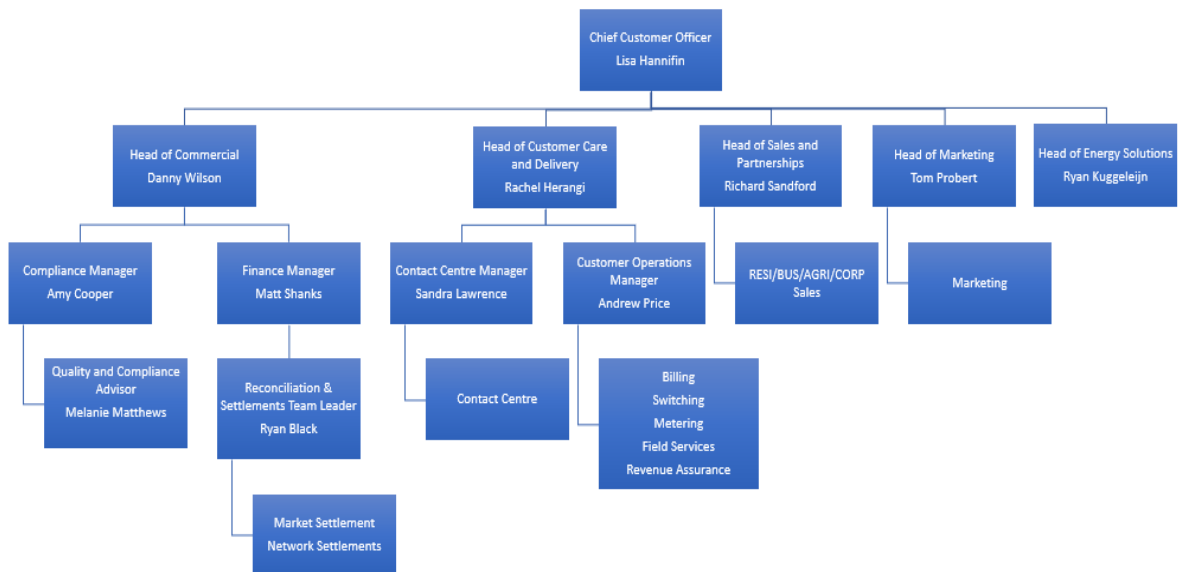
The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

Audit commentary

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

1.2. Structure of Organisation

Meridian Energy provided a copy of their organisational structure.



1.3. Persons involved in this audit

Auditor:

Name	Company	Title
Tara Gannon	Provera	Supervising Auditor
Brett Piskulic	Provera	Supporting Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Amy Cooper	Compliance Officer	Meridian Energy
David Dick	Team Leader Street Lights	Auckland Transport
Nick Kershaw	Director	Asset Data Solutions Ltd

1.4. Hardware and Software

The streetlight data is held in a RAMM database, and this audit has assessed the accuracy of RAMM. From 1st September 2023 Auckland Transport are using the output of the SLV system for the reconciliation of the LED lighting load under the HHS profile. This accounts for 93% or 117,649 items of load of the total lighting load.

Both systems are backed up in accordance with standard industry procedures. Access to RAMM and the SLV tele-management is secure by way of password protection.

Systems used by the trader and their agent to calculate submissions are assessed as part of their reconciliation participant audits.

1.5. Breaches or Breach Allegations

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

1.6. ICP Data

There are 49 ICPs associated with the Auckland Transport DUML load:

ICP Number	Network	Profile Aug 2023	Profile Sep 2023	NSP	Number of items of load	Database wattage (watts)
0000018370WE118	WAIK	DST	HHS	HMB0111	23	2,748.0
0000019359WE3BC	WAIK	DST	HHS	KIR0111	69	2,092.2
0000019934WE91D	WAIK	DST	HHS	FLG0111	4	122.0
0000041244WE13A	WAIK	DST	HHS	STG0111	35	3,311.5
0000041245WED7F	WAIK	DST	HHS	BRI0111	5	190.0
0000041246WE1BF	WAIK	DST	HHS	POR0111	79	3,250.1
0000041247WEDFA	WAIK	DST	HHS	JEF0111	209	5,023.1
0003281740CNA88	COUP	DST	DST	BOB1101	584	54,477.0
0900343060LC471	VECT	DST	DST	TAK0331	752	92,231.9
0905321057LCB09	VECT	DST	DST	HEP0331	4	478.0
0914050273LCECE	VECT	DST	DST	ROS0221	300	25,556.8
0915197278LC21F	VECT	DST	DST	PEN0221	82	7,309.1
0918033403LCA10	VECT	DST	DST	PEN0331	462	40,051.9
0929040953LCE6D	VECT	DST	DST	PEN1101	621	56,227.7
0954776933LCC4F	VECT	DST	DST	PAK0331	490	63,999.1
0977883655LCF24	VECT	DST	DST	MNG0331	648	74,978.0
0984112723LC1A6	VECT	DST	DST	WIR0331	411	61,081.0
0987075446LC985	VECT	DST	DST	OTA0221	663	88,969.5
1001138654LC940	VECT	DST	DST	ROS1101	423	54,821.8
1001282117UNECE	UNET	DST	DST	ALB1101	890	91,459.1
1001282119UND55	UNET	DST	DST	ALB0331	522	70,905.1
1001282121UN8B9	UNET	DST	DST	HEN0331	416	45,498.5
1001282123UN83C	UNET	DST	DST	HEP0331(N)	315	37,584.4
1001282124UN5F6	UNET	DST	DST	SVL0331	832	96,694.8

ICP Number	Network	Profile Aug 2023	Profile Sep 2023	NSP	Number of items of load	Database wattage (watts)
1001282125UN9B3	UNET	DST	DST	WRD0331	7	585.0
1001282126UN573	UNET	DST	DST	WEL0331	70	8,072.5
1001282153UND61	UNET	DST	HHS	ALB1101	6,554	319,807.2
1001282154UN0AB	UNET	DST	HHS	ALB0331	8,733	457,861.0
1001282155UNCCE	UNET	DST	HHS	HEN0331	11,018	467,221.3
1001282156UN02E	UNET	DST	HHS	HEP0331(N)	8,121	377,936.1
1001282163UNA99	UNET	DST	HHS	WRD0331	535	30,671.5
1001282164UN753	UNET	DST	HHS	WEL0331	1,775	71,450.3
1001282166LCDC2	VECT	DST	HHS	HEP0331	876	36,364.6
1001282171LCAA5	VECT	DST	HHS	MNG0331	5,099	229,202.4
1001282172LC665	VECT	DST	HHS	OTA0221	6,269	298,573.8
1001282174LC7EA	VECT	DST	HHS	PEN0221	2,249	128,294.2
1001282175LCBAF	VECT	DST	HHS	PEN0331	13,214	660,750.1
1001282176LC76F	VECT	DST	HHS	PEN1101	3,236	238,470.4
1001282177LCB2A	VECT	DST	HHS	ROS0221	8,789	411,102.3
1001282178LC4F4	VECT	DST	HHS	ROS1101	6,506	330,424.4
1001282179LC8B1	VECT	DST	HHS	TAK0331	9,162	404,393.4
1001282180LC6F7	VECT	DST	HHS	WIR0331	4,093	211,264.3
1001287978LC3D9	VECT	DST	HHS	PAK0331	7,491	323,491.2
1001287979UN588	UNET	DST	HHS	SVL0331	6,726	313,650.3
1099572697CNB44	COUP	DST	DST	BOB0331	19	1,598.0
1099572698CN49A	COUP	DST	DST	GLN0332	228	18,690.6
1099583146CN17D	COUP	DST	HHS	BOB0331	242	19,327.6
1099583147CND38	COUP	DST	HHS	BOB1101	4,950	195,591.2
1099583148CN2E6	COUP	DST	HHS	GLN0332	1,587	61,224.2
TOTAL					126,388	6,595,078.5

In the last audit it was recorded that the unmetered streetlights connected to seven embedded networks were incorrectly recorded against LE ICPs in the database, with a further four also being potentially incorrect which required further investigation. I confirmed that these have been corrected with all embedded network unmetered streetlights now recorded against the correct ICPs, with the exception of one light which is recorded against the LE ICP 1001134799UN964 associated with the Hulme Place embedded network, NSP HUL0111. Non-compliance is recorded in **section 2.2** for this instance.

1.7. Authorisation Received

All information was provided directly by Meridian, Auckland Transport and Asset Data Solutions Ltd.

1.8. Scope of Audit

This audit of the Auckland Transport Unmetered Streetlights (AT) DUMML 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.

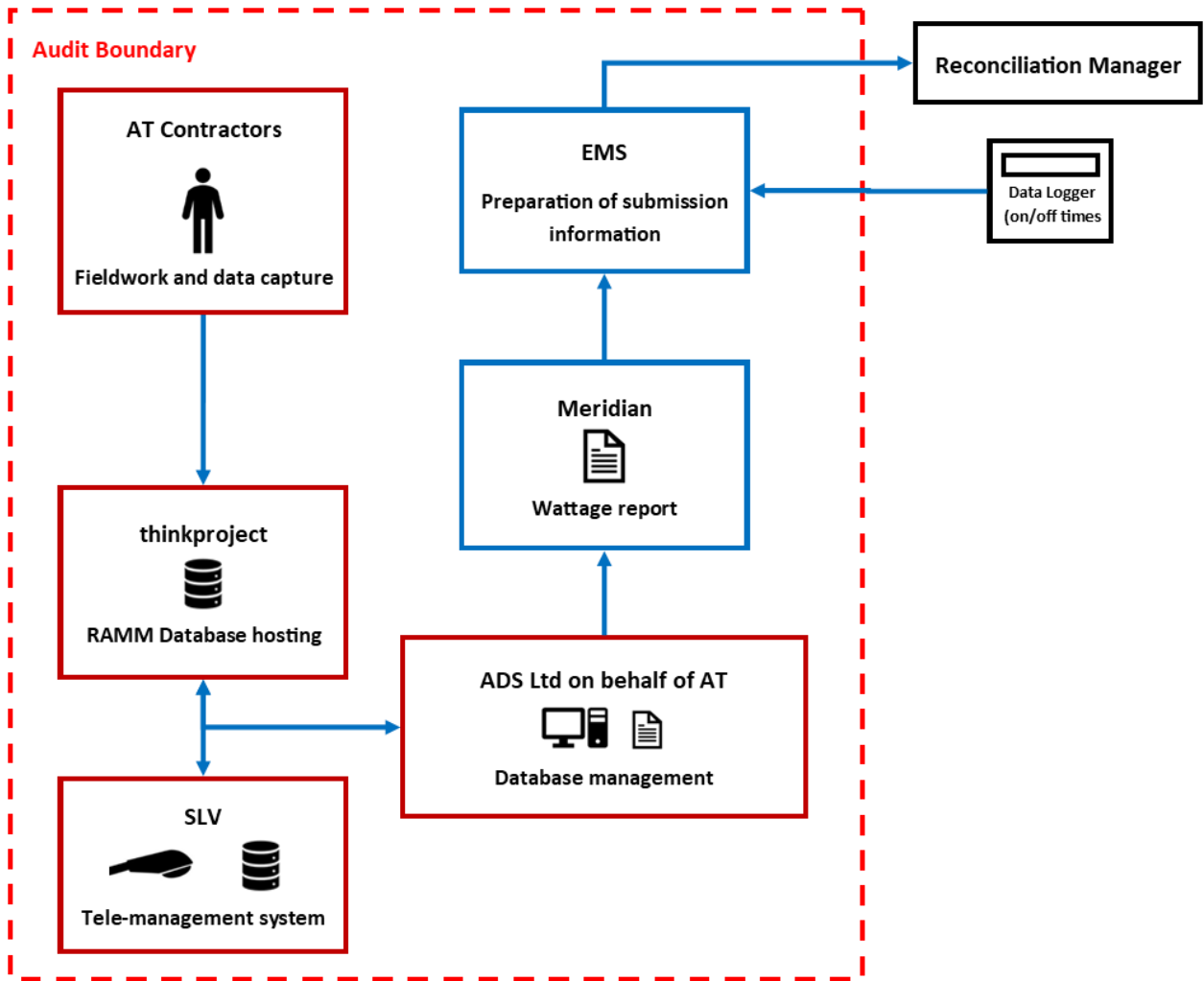
The audit was conducted in accordance with the audit guidelines for DUMML audits version 1.1.

There are 49 ICPs associated with Auckland Transport.

The streetlight data is held in a RAMM database, and this is managed by Asset Data Solutions Ltd on behalf of Auckland Transport. This audit has assessed the accuracy of RAMM. In addition to the RAMM database Auckland Transport are recording all the LED lights in the SLV tele-management system. From 1st September 2023 Auckland Transport are using the output of the SLV system for the reconciliation of the LED lighting load under the HHS profile. The non-LED lighting load will continue to be reconciled under the DST profile. There are separate ICPs for SLV and non-SLV lights under each NSP. This audit was completed using a RAMM database extract obtained on 1st August 2023 and the submission information from July 2023 which was reconciled under the DST profile.

In future audits the SLV tele-management system will be audited for the LED load.

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



The field audit was undertaken of a statistical sample of 1,401 items of load in September 2023.

1.9. Summary of previous audit

The last audit report undertaken by Rebecca Elliot of Veritek Limited in December 2022. The current status of the non-compliances is recorded below:

Table of Non-compliances

Subject	Section	Clause	Non-Compliance	Status
Deriving submission information	2.1	11(1) of Schedule 15.3	The variance of wattage values between the SLV system and RAMM is calculated to be 237,955 kWh per annum. I have not considered this in the audit risk rating as RAMM is less accurate, but the more accurate SLV is being used for submission.	Still existing
			Over submission because of dimming being used. The impact on submission is unknown.	Still existing
			850 items of load with no ICP recorded indicating a potential under submission of 174,631 kWh per annum.	Still existing for one ICP
			Incorrect wattages applied based on lamp description for 60 lamp types recorded resulting in an estimated over submission of 379,238 kWh per annum.	Still existing
			Incorrect ballasts applied to some items of load recorded resulting in an estimated over submission of 5,166 kWh per annum.	Still existing
			Seven LE ICPs with unmetered load allocated resulting in an estimated under submission of 13,594 kWh per annum.	Cleared
			Four LE ICPs with load allocated are still to be investigated to determine if these are Auckland Transport items of load and are metered or unmetered potentially resulting in an estimated under submission of 6,753 kWh per annum.	Cleared
			156 metered or solar items of load recorded against unmetered ICPs resulting in an estimated over submission of 54,245 kWh per annum.	Cleared
			Any changes that are made during any given month take effect from the beginning of that month. This process does not account for historic changes or changes within a month.	Still existing
ICP identifier and items of load	2.2	11(2)(a) of Schedule 15.3	850 items of load with no ICP recorded indicating a potential under submission of 174,631 kWh per annum.	Still existing for one ICP
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	591 items of load with zero or blank wattage recorded indicating a potential under submission of 126,208 kWh per annum.	Still existing for 18 lights
All load recorded in database	2.5	11(2A) and (d) of Schedule 15.3	22 additional lights found in the field or 2% of the load sampled.	Still existing
Database accuracy	3.1	15.2 and 15.37B(b)	Incorrect wattages applied based on lamp description for 60 lamp types recorded resulting in an estimated over submission of 379,238 kWh per annum.	Still existing

Subject	Section	Clause	Non-Compliance	Status
			<p>Incorrect ballasts applied to some items of load recorded resulting in an estimated over submission of 5,166 kWh per annum.</p> <p>850 items of load with no ICP recorded indicating a potential under submission of 174,631 kWh per annum.</p> <p>Seven embedded networks with unmetered streetlights incorrectly allocated to an LE ICP resulting in an estimated under submission of 13,594 kWh for since October 2022.</p> <p>Four LE ICPs with load allocated are still to be investigated to determine if these are Auckland Transport items of load and are metered or unmetered potentially resulting in an estimated under submission of 6,753 kWh per annum.</p> <p>156 metered or solar items of load recorded against unmetered ICPs resulting in an estimated over submission of 54,245 kWh per annum.</p>	<p>Still existing</p> <p>Still existing for one ICP</p> <p>Cleared</p> <p>Cleared</p> <p>Cleared</p>
Volume information accuracy	3.2	15.2 and 15.37B(c)	<p>The variance of wattage values between the SLV system and RAMM is calculated to be 237,955 kWh per annum. I have not considered this in the audit risk rating as RAMM is less accurate, but the more accurate SLV is being used for submission.</p> <p>Over submission because of dimming being used. The impact on submission is unknown.</p> <p>850 items of load with no ICP recorded indicating a potential under submission of 174,631 kWh per annum.</p> <p>Incorrect wattages applied based on lamp description for 60 lamp types recorded resulting in an estimated over submission of 379,238 kWh per annum.</p> <p>Incorrect ballasts applied to some items of load recorded resulting in an estimated over submission of 5,166 kWh per annum.</p> <p>Seven embedded networks with unmetered streetlights incorrectly allocated to an LE ICP resulting in an estimated under submission of 13,594 kWh for since October 2022.</p> <p>Four LE ICPs with load allocated are still to be investigated to determine if these are Auckland Transport items of load and are metered or unmetered potentially resulting in an estimated under submission of 6,753 kWh per annum.</p> <p>156 metered or solar items of load recorded against unmetered ICPs resulting in an estimated over submission of 54,245 kWh per annum.</p> <p>Any changes that are made during any given month take effect from the beginning of that month. This process does not account for historic changes or changes within a month.</p>	<p>Still existing</p> <p>Still existing</p> <p>Still existing for one ICP</p> <p>Still existing</p> <p>Still existing</p> <p>Cleared</p> <p>Cleared</p> <p>Cleared</p> <p>Still existing</p>

Table of Recommendations

Subject	Section	Description	Status
		Nil	

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 Provera to undertake this streetlight audit.

Audit commentary

This audit report confirms compliance with the requirement to have the database audited.

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

Prior to 1 September 2023, Meridian has reconciled this DUML load using the DST profile. From 1st September 2023 Auckland Transport are using the output of the SLV system for the reconciliation of the LED lighting load under the HHS profile. The non-LED lighting load will continue to be reconciled under the DST profile. This audit was completed using a RAMM database extract obtained on 1st August 2023 and the submission information from July 2023 which was reconciled under the DST profile.

The total volume submitted to the Reconciliation Manager was based on a monthly database report derived from RAMM and the “burn time” which is sourced from a data logger. Meridian supplies EMS with the capacity information and EMS calculates the kWh figure for each ICP and includes this in the relevant AV080 file. This process was audited during Meridian’s reconciliation participant audit and the EMS agent audit and compliance was confirmed.

As reported in previous audits, the monthly report is adjusted by Auckland Transport by using the average LED wattages from the SLV system (central management system) which can detect the wattage of each light as many of the LED lights were set to a lower wattage than their rated wattage when they were installed. The RAMM database contains the rated wattage not the adjusted wattage, therefore the SLV wattage is likely to be more accurate than the wattage contained in the RAMM database. Meridian uses the adjusted wattage from SLV not the rated wattage from RAMM for submission of the LED lights. The RAMM wattage is used for submission of the non-LED lights. Therefore, when I checked the RAMM database output with the kW values being submitted by Meridian it appears there is an under submission of an estimated 1,243,880 kWh per annum assuming burn hours of 4,271.

Dimming is applied to some lights, but the output of the central management system was not being used at the time of this audit and was not considered when deriving submission. Over submission has been occurring for the dimmed lights but the extent is not yet known.

From 1 September 2023 the SLV system output is being used for the reconciliation of the LED lighting load. This accounts for 93% or 117,649 items of load of the total lighting load. The SLV system is able to record the light wattage on each pole and identify any items of load with a wattage different to that recorded in RAMM. These will be flagged as exceptions and investigated. SLV is able to measure the energy usage of each light, so can account for dimming. It is expected that the accuracy of submission will improve with the use of the SLV reported wattage including dimming.

Analysis of the database contents found the issues shown in the table below.

Issue	Volume information impact (annual kWh)
-------	--

18 items of load with zero or blank wattage recorded	3,844 kWh under submission
Incorrect wattages recorded in the database for a significant number of LED lights.	Unknown but up to 1,243,880 kWh over submission
Incorrect ballasts applied to 130 items of load.	6,030 kWh over submission
One item of load with no ICP recorded in the database.	150 kWh under submission

The field audit confirmed that the database accuracy fell within the +/-5% allowable threshold which could still result with an annual consumption difference of between 116,400 kWh p.a. and 820,300 kWh p.a. lower than the database indicates (with a 95% level of confidence). The data inaccuracies found have been passed to Auckland Transport to investigate and correct.

Any changes that are made during any given month take effect from the beginning of that month. This process does not account for historic changes or changes within a month. The SLV system tracks change at a daily level so this issue will be resolved after 1st September 2023.

Audit outcome

Non-compliant

Non-compliance	Description
<p>Audit Ref: 2.1 With: 11(1) of Schedule 15.3</p> <p>From: 01-Jan-23 To: 02-Aug-23</p>	<p>The variance of wattage values between the SLV system and RAMM is calculated to be 1,243,880 kWh per annum. I have not considered this in the audit risk rating as RAMM is less accurate, but the more accurate SLV is being used for submission.</p> <p>Over submission because of dimming being used. The impact on submission is unknown.</p> <p>One item of load with no ICP recorded in the database.</p> <p>18 items of load with zero or blank wattage recorded indicating a potential under submission of 3,844 kWh per annum.</p> <p>Incorrect wattages recorded in the database for a significant number of LED lights.</p> <p>Incorrect ballasts applied to 130 items of load recorded resulting in an estimated over submission of 6,030 kWh per annum.</p> <p>Any changes that are made during any given month take effect from the beginning of that month. This process does not account for historic changes or changes within a month.</p> <p>Potential impact: High Actual impact: High Audit history: Multiple times Controls: Moderate Breach risk rating: 6</p>

Audit risk rating	Rationale for audit risk rating		
High	<p>The controls are rated as moderate. The accuracy of the database has improved and will improve further with the SLV system being used to determine actual load for each light.</p> <p>The audit risk rating is high due to the indicative kWh variances found for those that can be quantified.</p>		
Actions taken to resolve the issue		Completion date	Remedial action status
<p>Data for submission is now being calculated from the SLV system under the HHS profile for all LED lights (approx. 93% of lights) which resolves the vast majority of issues that have been identified in relation to database and submission accuracy.</p> <p>Other wattage/ballast and ICP discrepancies are in the process of being reviewed and corrected by Auckland Transport.</p>		<p>01 Sept 2023</p> <p>28/02/2024</p>	Identified
Preventative actions taken to ensure no further issues will occur		Completion date	
<p>Auckland Transport has robust controls in place to monitor and manage their streetlight network. There are daily comparisons between RAMM and SLV to ensure changes to the network are identified and any discrepancies are followed up.</p>		Ongoing	

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 DUMML database must contain:

- *each ICP identifier for which the retailer is responsible for the DUMML,*
- *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

The RAMM database extract was analysed.

All items of load had an unmetered load ICP recorded in the database with the exception of one light which is recorded against the LE ICP 1001134799UN964 associated with the Hulme Place embedded network, NSP HUL0111. LE ICPs are a distributor only ICP and cannot be used for reconciliation so the consumption of this light is not accounted for. This is estimated to be resulting in a minor under submission of 150 kWh p.a.

There were seven items of load identified as having an incorrect ICP recorded. These were outliers identified as having a physical location outside the area supplied by the NSP associated with the ICP recorded.

Details of the discrepancies found were supplied to Auckland Transport during the audit.

Auckland Transport has conducted data cleansing over the audit period which has corrected the 850 items of load identified in the last audit with no ICP recorded.

Audit outcome

Non-compliant

Non-compliance	Description		
Audit Ref: 2.2 With: 11(2)(a) of Schedule 15.3 From: 01-Jan-23 To: 02-Aug-23	One item of load with no ICP recorded in the database. Seven items of load with the incorrect ICP recorded. Potential impact: Low Actual impact: Low Audit history: Twice Controls: Moderate Breach risk rating: 2		
Audit risk rating	Rationale for audit risk rating		
Low	The controls are rated as moderate. ICP allocation of new load has robust controls but there is still some data cleansing to be done of historical data. The impact on settlement and participants is minor; therefore, the audit risk rating is low.		
Actions taken to resolve the issue		Completion date	Remedial action status
Wattage/ballast and ICP discrepancies are in the process of being reviewed and corrected by Auckland Transport.		28/02/2024	Identified
Preventative actions taken to ensure no further issues will occur		Completion date	
Meridian will continue to follow up to ensure corrections are made to the database.		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 DUMML database must contain the location of each DUMML item.

Audit observation

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

Audit commentary

The database contains house numbers, road names, offset, side (of road), location (in metres), and GPS coordinates.

Pocket RAMM is used by all contractors to capture the GPS co-ordinates of each item of load in the RAMM database.

Analysis of the RAMM database extract confirmed all items of load have GPS coordinates.

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 DUMML 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 lamp type and wattage capacity and included any ballast or gear wattage and that each item of load had a value recorded in these fields.

Audit commentary

The RAMM database contains fields for the lamp make, lamp model, lamp wattage and the gear wattage.

Analysis of the database found 18 items of load with no wattage recorded resulting in a potential 3,844 kWh p.a. under submission (assuming 50 watts per light). This has improved significantly from the 591 recorded in the last audit.

The overall accuracy of the wattages is discussed in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.4 With: 11(2)(c) and (d) of Schedule 15.3 From: 01-Jan-23 To: 02-Aug-23	18 items of load with zero or blank wattage recorded indicating a potential under submission of 3,844 kWh per annum. Potential impact: Low Actual impact: Low Audit history: Multiple times Controls: Moderate Breach risk rating: 2
Audit risk rating	Rationale for audit risk rating

Low	The controls are rated as moderate. The accuracy of the database has improved, and processes continue to be strengthened to ensure accuracy. The audit risk rating is low due to potential impact on reconciliation.		
Actions taken to resolve the issue		Completion date	Remedial action status
Wattage/ballast and ICP discrepancies are in the process of being reviewed and corrected by Auckland Transport.		28/02/2024	Identified
Preventative actions taken to ensure no further issues will occur		Completion date	
Meridian will continue to follow up to ensure corrections are made to the database.		Ongoing	

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 1,401 lights using the statistical sampling methodology.

Audit commentary

The field audit discrepancies found are detailed in the table below.

Street	Database Count	Field Count	Count differences	Wattage differences	Comments
SACKVILLE ST, Grey Lynn	18	17	-1	-	1 x 26.7W LED not found in the field.
OWAIRAKA AVE, Mt Albert	35	34	-1	-	1 x 114W Beacon not found.
CLAYTON ST, Newmarket	3	4	+1	-	1 x additional 30.5W LED found in the field.
DEVORE ST, St Heliers	17	16	-1	-	1 x 30.5W LED not found in the field.
SHIPWRIGHT PL, Warkworth	3	3	-	1	1 x 100W MH recorded in the database found to be 1x 22W LED in the field.
FLAVELL DR - Orewa	10	9	-1	-	1 x 150W HPS not found in the field.
KOTANUI AVE - Army Bay	9	9	-	1	1 x 71.5W LED recorded in the database found to be 1 x 20W LED in the field.
RUXTON RD - Wainui	25	17	-8	1	8 x 28W LEDs not found in the field.
SYLVAN PARK AVE - Milford	7	7	-	1	1 x 22W LED recorded in the database found to be 1 x 24W LED in the field.

Street	Database Count	Field Count	Count differences	Wattage differences	Comments
HUKA RD - Birkenhead	7	7	-	1	1 x 29W LED recorded in the database found to be 1 x 22W LED in the field.
JOHN BRACKEN WAY (WEST)/SHEPHERDS PARK WAY	1	1	-	1	1 x 150W HPS recorded in the database found to be 1 x 30W(est.) LED in the field.
MANGERE TOWN CENTRE SERVICE LANE (#19-26) (RP17 RHS)	2	4	+2	-	2 x 50W(est.) additional LED floodlights found in field.
TUI ST (OTAHUHU)	7	6	-1	-	1 x 91.6W LED not found in the field.
ROYAL ARCH PL, Rosehill	12	9	-3	-	3 x 26.7W LEDs not found in the field.
JOSHUA CARDER DR (NTH), Hobsonville	14	13	-1	-	1 x 44W LED not found in the field.
FRENZ DR, Titirangi	4	5	+1	-	1 x additional 20W LED found in the field.
Total	1,401	1,388	21(+4, -17)	6	

The field audit found four additional lamps that were not recorded in the database, and this is recorded as non-compliance below. The database accuracy is discussed in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description		
Audit Ref: 2.5 With: 11(2A) of Schedule 15.3 From: 01-Jan-23 To: 02-Aug-23	Four additional lights found in the field of 1,401 sampled. Potential impact: Low Actual impact: Low Audit history: Multiple times Controls: Moderate Breach risk rating: 2		
Audit risk rating	Rationale for audit risk rating		
Low	The controls are recorded as moderate as they will mitigate risk most of the time but there is room for improvement. The impact is assessed to be low due to the small number of additional lights found in the field in relation to the overall count of the items of load.		
Actions taken to resolve the issue		Completion date	Remedial action status

Field audit discrepancies are in the process of being reviewed and corrected by Auckland Transport.	28/02/2024	Identified
Preventative actions taken to ensure no further issues will occur	Completion date	
Meridian will continue to follow up to ensure corrections are made to the database.	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 ability of the database to track changes was assessed and the process for tracking of changes in the database was examined.

Audit commentary

The RAMM database functionality achieves compliance with the code.

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 RAMM database has a complete audit trail of all additions and changes to the database information.

Audit outcome

Compliant

3. ACCURACY OF DUML DATABASE

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

Code reference

Clause 15.2 and 15.37B(b)

Code related audit information

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

Audit observation

The DUML Statistical Sampling Guideline was used to determine the database accuracy of the Auckland Transport DUML load for the 49 ICPs supplied in the database extract. The table below shows the survey plan.

Plan Item	Comments
Area of interest	Auckland Council region
Strata	The database contains items of load in Auckland area. The area has four sub geographical regions of Central, North, South and West. The processes for the management of Auckland Transport items of load are the same, but I decided to place the items of load into four strata, as follows: <ol style="list-style-type: none"> 1. Central, 2. North, 3. South, and 4. West.
Area units	I created a pivot table of the roads in each area, and I used a random number generator in a spreadsheet to select a total of 215 sub-units.
Total items of load	1,401 items of load were checked.

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

Audit commentary

Database accuracy based on the field audit

A field audit was conducted of a statistical sample of 1,401 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	98.6	Wattage from survey is lower than the database wattage by 1.4%
R _L	97.1	With a 95% level of confidence, it can be concluded that the error could be between -2.9% and -0.4%
R _H	99.6	

These results were categorised in accordance with the “Distributed Unmetered Load Statistical Sampling Audit Guideline”, effective from 1 February 2019 and the table below shows that Scenario A (detailed

below) applies. The conclusion from Scenario A is that the database is within the allowable +/-5% variance threshold and compliance is confirmed.

In absolute terms the installed capacity is estimated to be 92 kW lower than the database indicates.

There is a 95% level of confidence that the installed capacity is between 27 kW to 192 kW lower than the database.

In absolute terms, total annual consumption is estimated to be 393,500 kWh lower than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 116,400 kWh p.a. and 820,300 kWh p.a. lower than the database indicates.

Scenario	Description
<p>A - Good accuracy, good precision</p>	<p>This scenario applies if:</p> <ul style="list-style-type: none"> (a) R_H is less than 1.05; and (b) R_L is greater than 0.95 <p>The conclusion from this scenario is that:</p> <ul style="list-style-type: none"> (a) the best available estimate indicates that the database is accurate within +/- 5 %; and (b) this is the best outcome.
<p>B - Poor accuracy, demonstrated with statistical significance</p>	<p>This scenario applies if:</p> <ul style="list-style-type: none"> (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. <p>There is evidence to support this finding. In statistical terms, the inaccuracy is statistically significant at the 95% level</p>
<p>C - Poor precision</p>	<p>This scenario applies if:</p> <ul style="list-style-type: none"> (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 <p>The conclusion from this scenario is that the best available estimate is not precise enough to conclude that the database is accurate within +/- 5 %</p>

Lamp description and capacity accuracy

As detailed in **sections 2.1** and **3.2**, the wattage recorded in the SLV database was used to calculate the kW value for the LED lights. This accounts for 93% or 117,649 items of load of the total lighting load. The wattages recorded in the RAMM database are the full wattage value. Many of the LED lights were set to a lower wattage than their rated wattage when they were installed. From 1st September 2023 the SLV system output will be used for the reconciliation of the LED lighting load. The SLV system is able to record the light wattage on each pole and identify any items of load with a wattage different to that recorded in RAMM. I have recorded non-compliance in this section as the wattages recorded in a RAMM for a large number of the LED lights is inaccurate. This was identified by the discrepancy between the submission volume and database total in **sections 2.1** and **3.2**. I am unable to quantify the actual number of lights or wattage difference but the information available indicates that this forms a significant portion of the estimated 1,243,880 kWh per annum difference between the database and submission.

The database was checked against the published standardised wattage table, and manufacturer's specifications where available. There were 17 lamp types identified with gear wattage differences as detailed in the table below. This will result in an estimated over submission of 6,031 kWh per annum. This is recorded as non-compliance.

Lamp Type	Database Wattage	Gear	EA Standardised Gear Wattage	Difference	Database Quantity
100W HPS		12	14	-2	1
50W HPS		13	11	2	3
80w HPS		13	17	-4	2
MV125 Watt MVC		12	11	1	1
1000W Metal Halide		100	40	60	1
100W Incandescent		12	0	12	2
100W Incandescent		14	0	14	62
250W HPS		38	28	10	1
250W Mercury Vapour		28	20	8	46
250W Metal Halide		20	28	-8	1
250W Metal Halide		69	28	41	1
45W Cosmo		10	5	5	1
45W Cosmo		13	5	8	3
Ambar-2 HPS 150w		69	18	51	1
Queen St 250W Metal Halide		18	28	-10	1
Sodium Vapour 250w		18	28	-10	2
Sodium Vapour SON 50W		13	11	2	1

Details of the discrepancies found were supplied to Auckland Transport during the audit.

Asset Data Solutions Ltd has continued to work on cleansing the database which has seen further improvement in the accuracy of the database since the last audit.

ICP accuracy

In the last audit it was recorded that the unmetered streetlights connected to seven embedded networks were incorrectly recorded against LE ICPs in the database, with a further four also being potentially incorrect which required further investigation. I confirmed that these have been corrected with all embedded network unmetered streetlights now recorded against the correct ICPs, with the exception of one light which is recorded against the LE ICP 1001134799UN964 associated with the

Hulme Place embedded network, NSP HUL0111. Non-compliance is recorded in **section 2.2** for this instance.

Auckland Transport has conducted data cleansing over the audit period which has corrected the 850 items of load identified in the last audit with no ICP recorded.

I checked the database and confirmed there were no examples of load identified as metered or recorded as solar but assigned to an unmetered ICP. The last audit identified 156 examples which have now been corrected.

Location accuracy

Analysis of the RAMM database extract identified all items of load had GPS details recorded.

Change management process findings

Auckland Transport has three field contractors that cover the North/West, Central and Southern geographical areas. Contractors use pocket RAMM to track changes made in the database. Auckland Transport have identified some of the issues they have with database accuracy is due to unauthorised removal of lights. LED lights that report no consumption or fail to communicate with SLV are investigated and field visits are arranged. Faulty lights are repaired or replaced and RAMM is updated by the contractor on-site. RAMM is updated when a light has been permanently removed.

Outage patrols are carried out by the contractors, but these are planned to be phased out and the SLV information will be used to identify faults.

Developers submit plans for new subdivisions to Auckland Transport which are checked and approved prior to the installation taking place. The new connections process requires that a check is made at the time of livening to ensure the ICP is identified, and the data is in the database. This is often prior to the asset being vested to the council. Vector and Counties Power do not liven streetlights until Auckland Transport has provided approval.

NZTA lighting

NZTA lighting is not included in the database. Any State Highway references relate to former state Highways that have now been vested to Auckland Transport.

Festive lighting

The Auckland Transport process requires that all festive lights are recorded in the database. There is a field in RAMM that records the lights as "Christmas Decorative" when the lights are not in use. The contractor updates the RAMM field to "unmetered" when they are energised and back to "Christmas Decorative" when de-energised. Any lights recorded as "Christmas Decorative" are excluded from the monthly load reports sent to Meridian. When in use and recorded as "unmetered" they are added to the monthly load reports. Examination of the database extract found that there were 96 lights currently recorded as "Christmas Decorative" and I was unable to identify any other festive lights in the database which were currently not active. At the time of the audit Auckland Transport were unable to confirm the total number of festive lights either active or inactive in the database. I recommend that Auckland Transport investigate and identify all festive lights and ensure they are correctly recorded in database.

Details of the 96 "Christmas Decorative" lights found were supplied to Auckland Transport during the audit.

Recommendation	Description	Audited party comment	Remedial action
Festive lights	Auckland Transport investigate and identify all festive lights and ensure they are correctly recorded in the database.	This investigation is in progress.	Investigating

Audit outcome

Non-compliant

Non-compliance	Description		
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 01-Jan-23 To: 02-Aug-23	Incorrect wattages recorded in the database for a significant number of LED lights. Incorrect ballasts applied to 130 items of load recorded resulting in an estimated over submission of 6,030 kWh per annum. Potential impact: High Actual impact: High Audit history: Multiple times Controls: Moderate Breach risk rating: 6		
Audit risk rating	Rationale for audit risk rating		
High	The controls are rated as moderate. The accuracy of the database has improved and will improve further with the SLV system being used to determine actual load for each light. The impact is assessed to be high, based on the kWh differences described above.		
Actions taken to resolve the issue		Completion date	Remedial action status
Data for submission is now being calculated from the SLV system under the HHS profile for all LED lights (approx. 93% of lights).		1 Sept 2023	Identified
Ballast discrepancies are in the process of being reviewed and corrected by Auckland Transport.		28/02/2024	
Preventative actions taken to ensure no further issues will occur		Completion date	

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 burn hours against the submitted figure to confirm accuracy.

Audit commentary

Prior to 1 September 2023, Meridian has reconciled this DUML load using the DST profile. From 1st September 2023 Auckland Transport are using the output of the SLV system for the reconciliation of the LED lighting load under the HHS profile. The non-LED lighting load will continue to be reconciled under the DST profile. This audit was completed using a RAMM database extract obtained on 1st August 2023 and the submission information from July 2023 which was reconciled under the DST profile.

The total volume submitted to the Reconciliation Manager was based on a monthly database report derived from RAMM and the “burn time” which is sourced from a data logger. Meridian supplies EMS with the capacity information and EMS calculates the kWh figure for each ICP and includes this in the relevant AV080 file. This process was audited during Meridian’s reconciliation participant audit and the EMS agent audit and compliance was confirmed.

As reported in previous audits, the monthly report is adjusted by Auckland Transport by using the average LED wattages from the SLV system (central management system) which can detect the wattage of each light as many of the LED lights were set to a lower wattage than their rated wattage when they were installed. The RAMM database contains the rated wattage not the adjusted wattage, therefore the SLV wattage is likely to be more accurate than the wattage contained in the RAMM database. Meridian uses the adjusted wattage from SLV not the rated wattage from RAMM for submission of the LED lights. The RAMM wattage is used for submission of the non-LED lights. Therefore, when I checked the RAMM database output with the kW values being submitted by Meridian it appears there is an under submission of an estimated 1,243,880 kWh per annum assuming burn hours of 4,271.

Dimming is applied to some lights, but the output of the central management system was not being used at the time of this audit and was not considered when deriving submission. Over submission has been occurring for the dimmed lights but the extent is not yet known.

From 1 September 2023 the SLV system output is being used for the reconciliation of the LED lighting load. This accounts for 93% or 117,649 items of load of the total lighting load. The SLV system is able to record the light wattage on each pole and identify any items of load with a wattage different to that recorded in RAMM. These will be flagged as exceptions and investigated. SLV is able to measure the energy usage of each light, so can account for dimming. It is expected that the accuracy of submission will improve with the use of the SLV reported wattage including dimming.

Analysis of the database contents found the issues shown in the table below.

Issue	Volume information impact (annual kWh)
18 items of load with zero or blank wattage recorded	3,844 kWh under submission
Incorrect wattages recorded in the database for a significant number of LED lights.	Unknown but up to 1,243,880 kWh over submission

Incorrect ballasts applied to 130 items of load.	6,030 kWh over submission
One item of load with no ICP recorded in the database.	150 kWh under submission

The field audit confirmed that the database accuracy fell within the +/-5% allowable threshold which could still result with an annual consumption difference of between 116,400 kWh p.a. and 820,300 kWh p.a. lower than the database indicates (with a 95% level of confidence).

The data inaccuracies found have been passed to Auckland Transport to investigate and correct.

Any changes that are made during any given month take effect from the beginning of that month. This process does not account for historic changes or changes within a month. The SLV system tracks change at a daily level so once in use this issue will be resolved.

Audit outcome

Non-compliant

Non-compliance	Description	
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 01-Jan-23 To: 02-Aug-23	The variance of wattage values between the SLV system and RAMM is calculated to be 1,243,880 kWh per annum. I have not considered this in the audit risk rating as RAMM is less accurate, but the more accurate SLV is being used for submission. Over submission because of dimming being used. The impact on submission is unknown. One item of load with no ICP recorded in the database. 18 items of load with zero or blank wattage recorded indicating a potential under submission of 3,844 kWh per annum. Incorrect wattages recorded in the database for a significant number of LED lights. Incorrect ballasts applied to 130 items of load recorded resulting in an estimated over submission of 6,030 kWh per annum. Any changes that are made during any given month take effect from the beginning of that month. This process does not account for historic changes or changes within a month. Potential impact: High Actual impact: High Audit history: Multiple times Controls: Moderate Breach risk rating: 6	
Audit risk rating	Rationale for audit risk rating	
High	The controls are rated as moderate. The accuracy of the database has improved and will improve further with the SLV system being used to determine actual load for each light. The audit risk rating is high due to the indicative kWh variances found for those that can be quantified.	
Actions taken to resolve the issue		Completion date
Remedial action status		

CONCLUSION

The streetlight data is held in a RAMM database, and this is managed by Asset Data Solutions Ltd on behalf of Auckland Transport. This audit has assessed the accuracy of the RAMM database. In addition to the RAMM database Auckland Transport are recording all the LED lights in the SLV tele-management system. From 1st September 2023 Auckland Transport and Meridian are using the output of the SLV system for the reconciliation of the LED lighting load under the HHS profile. The non-LED lighting load will continue to be reconciled under the DST profile. This audit was completed using a RAMM database extract obtained on 1st August 2023 and the submission information from July 2023 which was reconciled under the DST profile.

In future audits the SLV tele-management system will be audited for the LED load.

This audit found improvements in the accuracy of the database as a result of continued data cleansing conducted by Auckland Transport, and it is expected that this will continue to improve with the use of the SLV system in future.

A field audit was conducted of a statistical sample of 1,401 items of load. Discrepancies were identified in 19 of the 215 sub-units (roads) included in the field audit. The “database auditing tool” was used to analyse the results. The analysis confirmed that the database error is within the allowable +/-5% variance threshold and compliance is confirmed.

This audit found six non-compliances and one recommendation was made. The future risk rating of 24 indicates that the next audit be completed in three months, but I recommend that the next audit be in a minimum of six months as Auckland Transport and Meridian have now implemented the HHS profile which will result in a significant improvement in the accuracy of submission information.

PARTICIPANT RESPONSE

Meridian is pleased to be able to report in this audit that an approved profile for Auckland Transport's dimming streetlights has finally been implemented after many years of working towards this result.

This will result in submission information for these lights being significantly more accurate than what was previously being reported.

Implementation of the profile was complex, and we'd like to acknowledge the support of Steve Woods of Veritek during this process who helped to interpret the technical requirements of the profile and application of these into business processes.

We'd also like to note the amount of work that Auckland Transport has put in to cleansing their database, reducing the number of missing ICPs and wattages considerably since the last audit.