Horizon Networks Rhizome GridADAPT Climate Resilience Planning Trial

EEA Winter Webinar – August 2026

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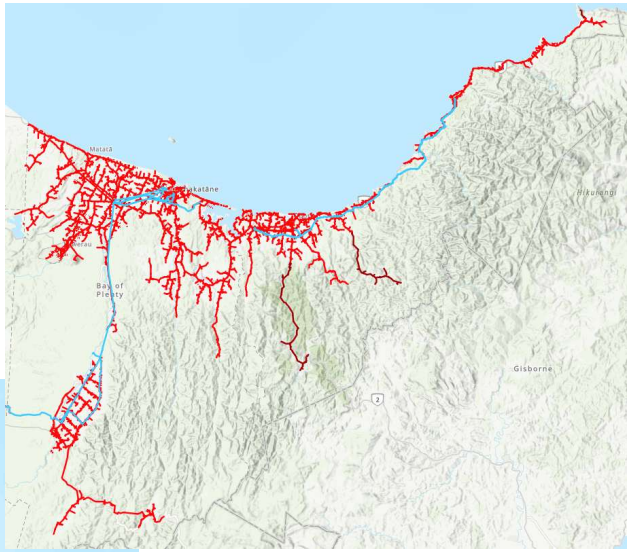
Horizon Networks

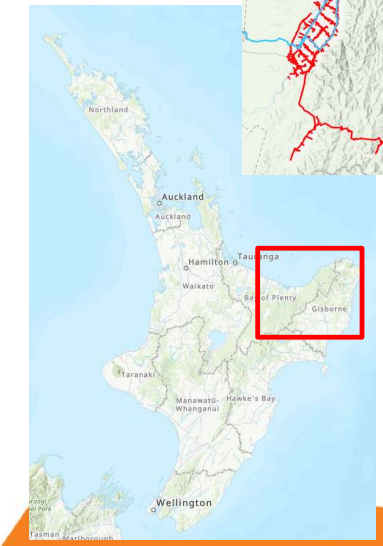
Overview

- Background, current capability and limitations
- Rhizome GridADAPT trial project overview
- Data preparation and processing
- Modelling considerations
- Preliminary deliverables
- Next steps

Background

Horizon Networks Overview





Owned by Trust Horizon

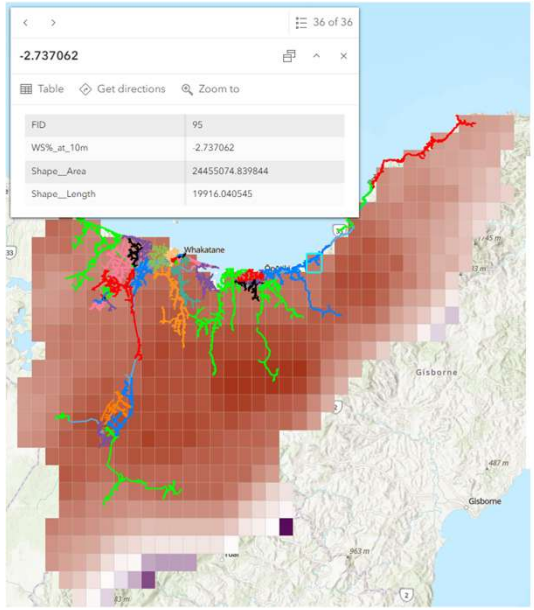
Part of Horizon Energy Group

Serve 25,000 customers

3 GXP and 10 zone substations

93MW System Demand

2,000 km OH
600 km UG


36 of 36
-2.737062
Table
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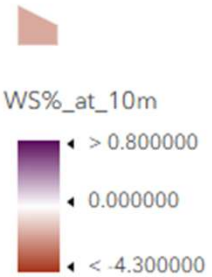
19916.040545
Whakatane
Gisborne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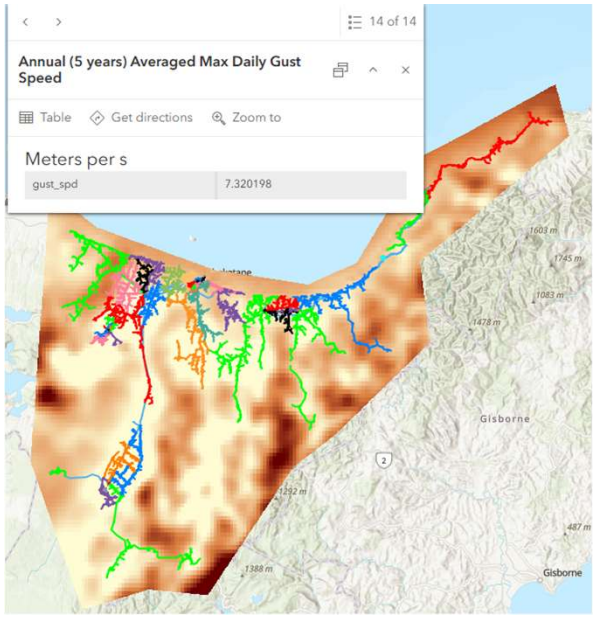
14 of 14
Annual (5 years) Averaged Max Daily Gust Speed
Table
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7.320198
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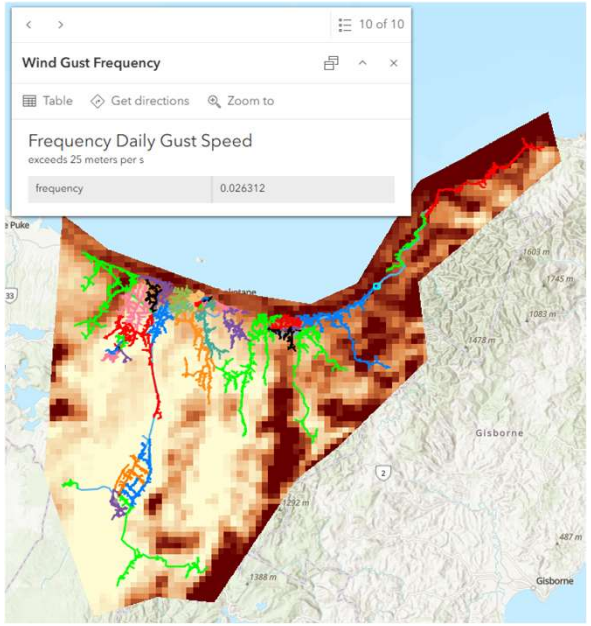
10 of 10
Wind Gust Frequency
Table
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Frequency Daily Gust Speed
exceeds 25 meters per s
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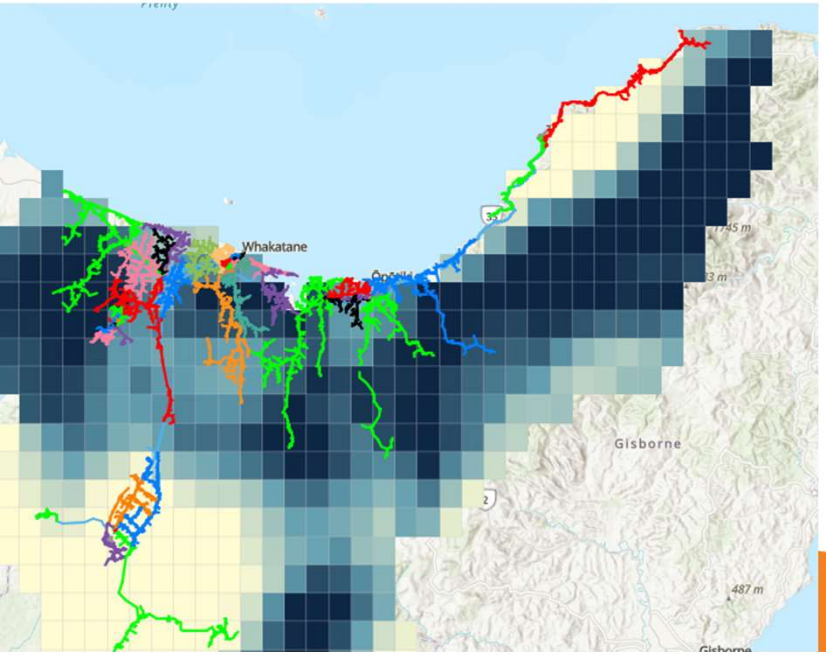
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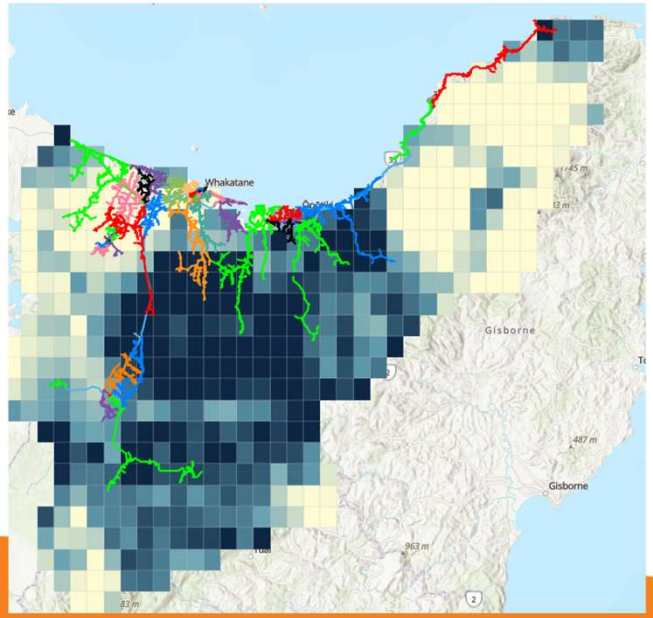
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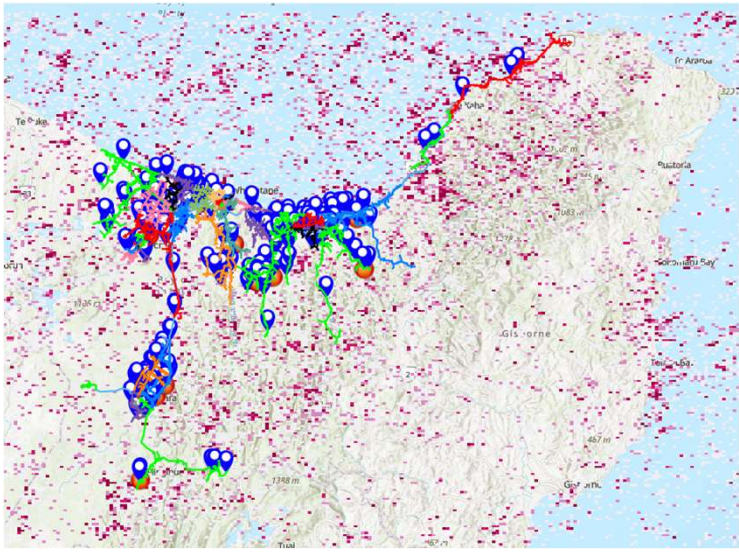
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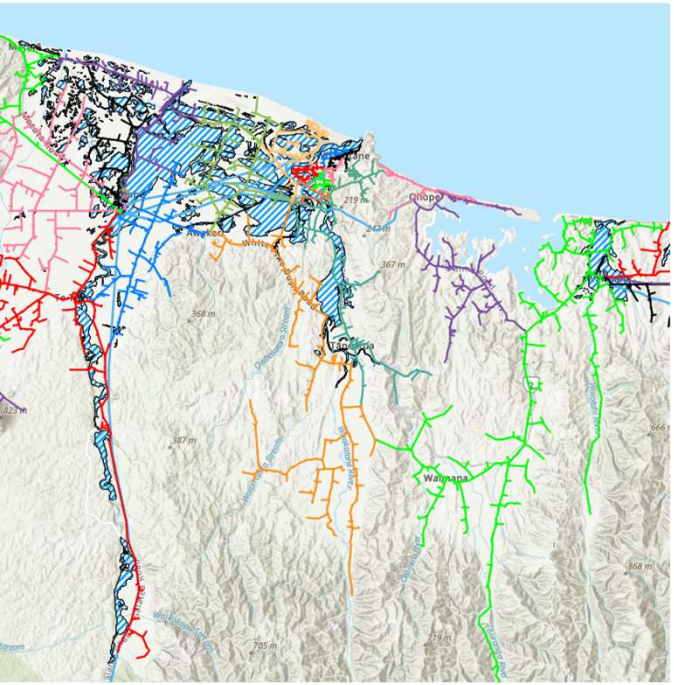
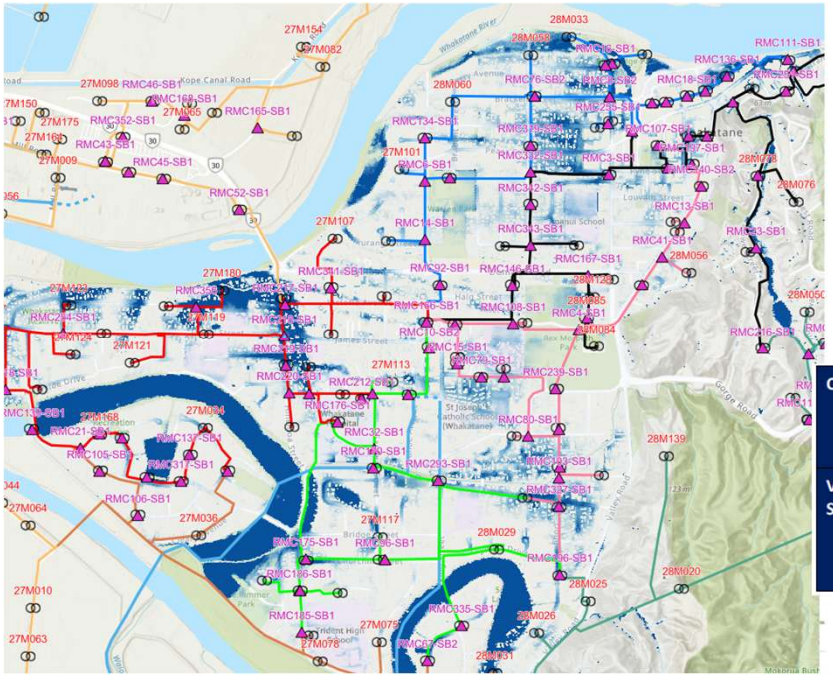
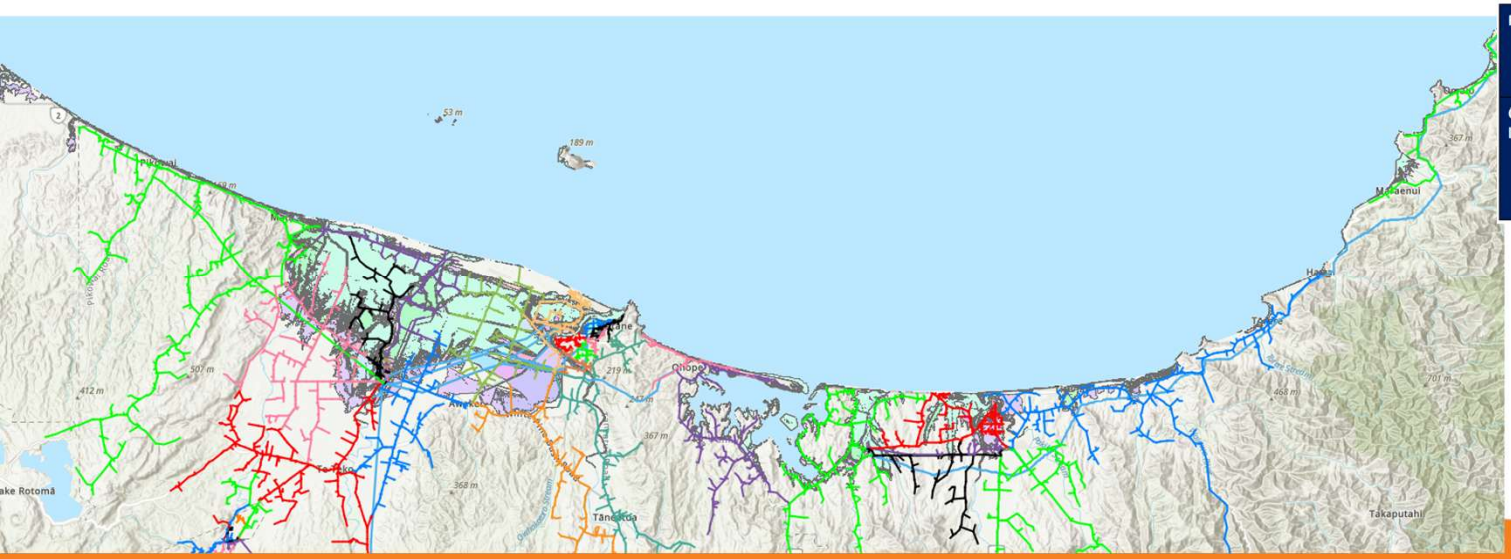




Horizon Networks

Combined likelihood			Hazard likelihood			
			Very Unlikely	Unlikely	Likely	Very Likely
			VU	U	L	VL
Vulnerability Score	Very low	1	1VU	1U	1L	1VL
	Low	2	2VU	2U	2L	2VL
	Moderate	3	3VU	3U	3L	3VL
	High	4	4VU	4U	4L	4VL



Risk			Criticality				
			Very low	Low	Moderate	High	Very high
			1	2	3	4	5
Combined likelihood	Very unlikely	VL	1VU	2VU	3VU	4VU	5VU
	Unlikely	UL	1UL	2UL	3UL	4UL	5UL
	Likely	L	1L	2L	3L	4L	5L
	Very likely	VL	1VL	2VL	3VL	4VL	5VL

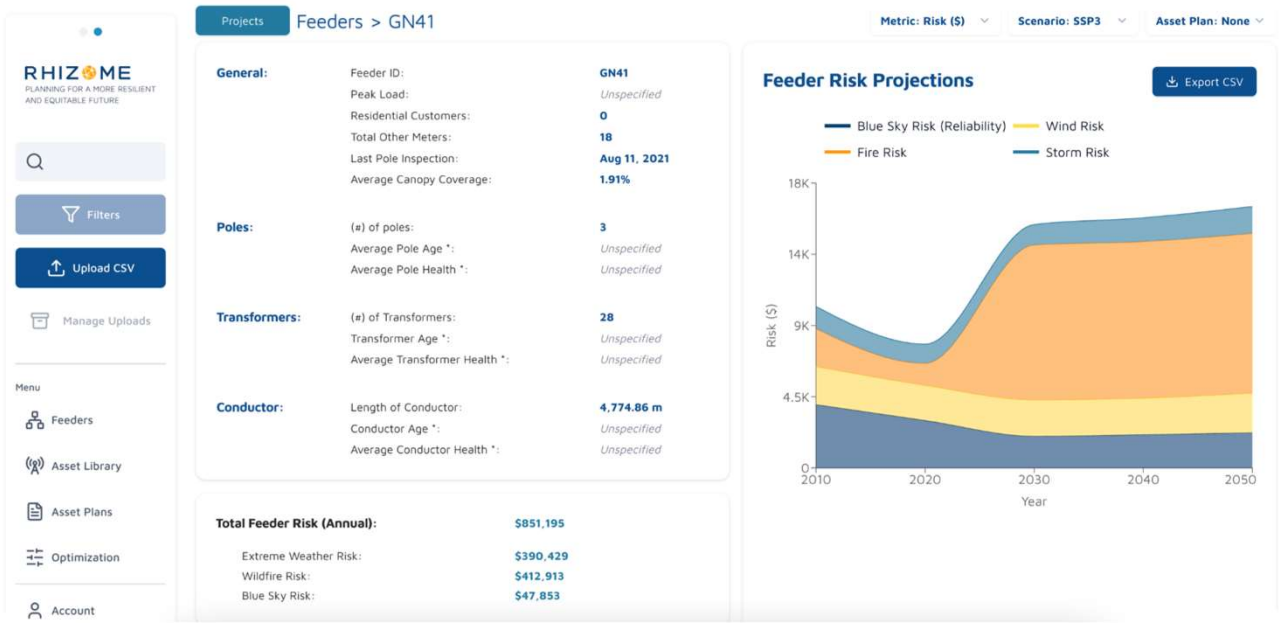
Limitations of existing toolset

- Rich hazard visibility, not risk visibility
- Manual risk assessment using a simple framework
- No consistent integration of current and forecast asset condition
- No consistent consideration on historical outages and asset failures
- Unable to conduct multi-scenario analysis easily
- Manual and labour-intensive

Rhizome GridADAPT Overview

Rhizome gridADAPT

Reliability & Resilience planning product



Assess 01

What's driving **outages** and **asset failures**?

How is our **hazard exposure** evolving?

Prioritize 02

Where are **failure rates** concentrated?

How does each dollar improve the most **reliability?**

Evaluate 03

What does this **resilience plan** buy us?

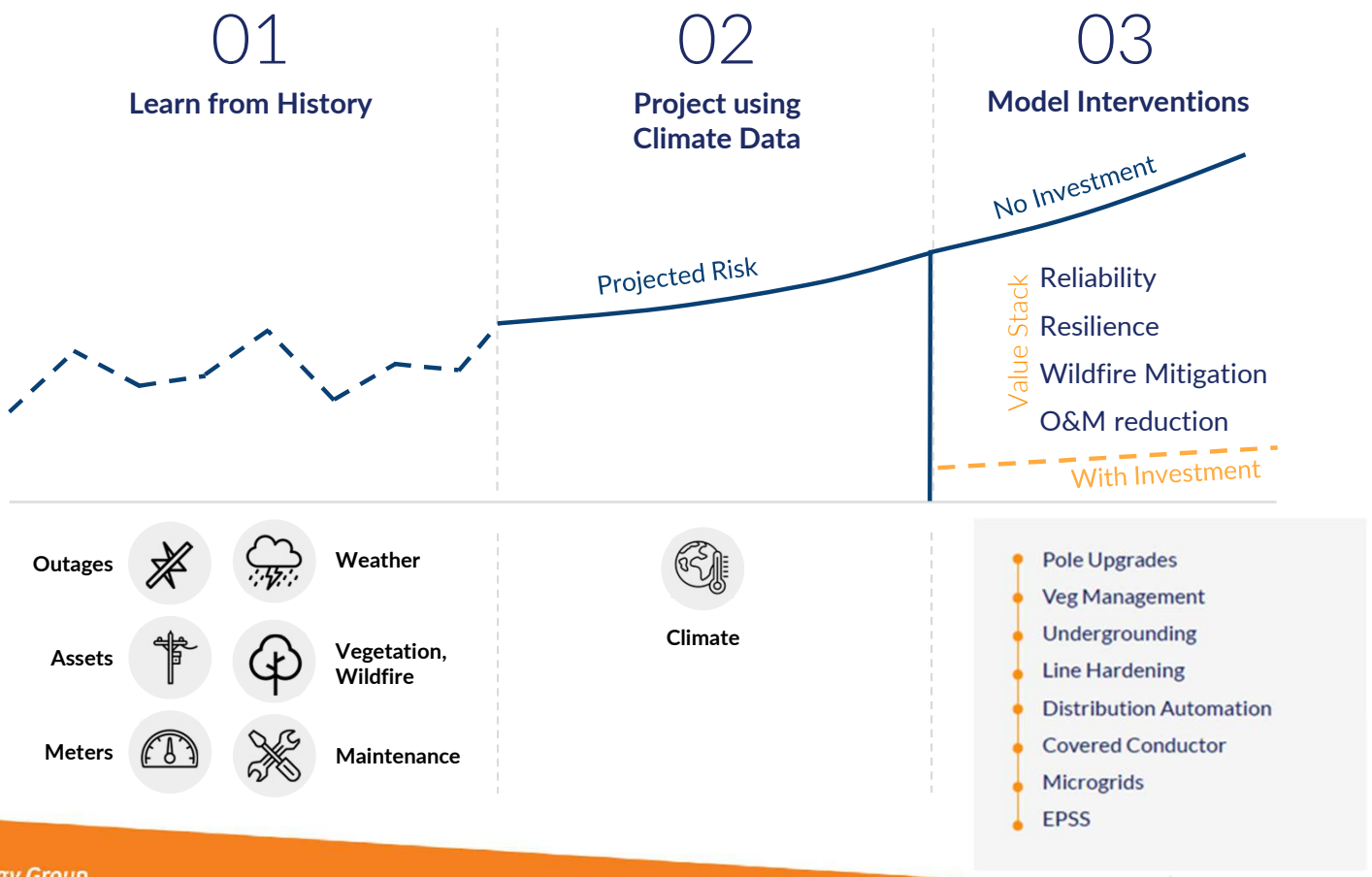
Which investments serve **more than one objective**?

Report 04

How do we **communicate the value** of the plan?

How do we show **investment benefits** over time?

Rhizome's weather & climate-aware modelling approach



Trial Project Overview

Trial Project Overview

- **Objective:** Enhance Horizon Networks' toolset for planning and managing climate-related risks to our electricity distribution network.
- **Key outputs**: Assess the suitability of Rhizome's gridADAPT product for long-term resilience planning, focusing on:
  - The applicability of asset fragility modelling in New Zealand's context
  - Data quality requirements and the effect on modelling accuracy
  - Accuracy of identifying network vulnerability and quantifying climate resilience risks
  - The application of the scenario analysis for planning purposes.

Trial Project Overview

Rhizome will leverage gridADAPT, our proprietary AI reliability and resilience platform, to quantify the following on circuit segments:

- A climate hazard and extreme weather analysis at 9km resolution, projected to 2100
- The expected **SAIDI, SAIFI, CMI on each circuit,** incorporating extreme events and broken down by hazard, projected to 2080
- A benefit analysis for mitigations, quantified by **reduction in expected outages** per circuit

Pilot Characteristics

- **Feeders**: System wide
- **Term**: 12 months, with milestones and delivery timelines mutually agreed (*variability mostly stemming from data ingestion*)
- Evaluate benefits of **three mitigation types** (i.e. vegetation management, undergrounding, pole replacement)

Asset/GIS

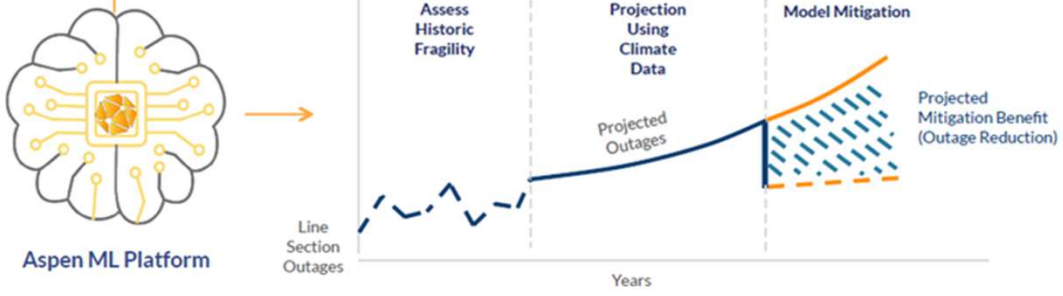
Asset type, location, age, condition; GIS, connectivity, and feeder topology

Outage

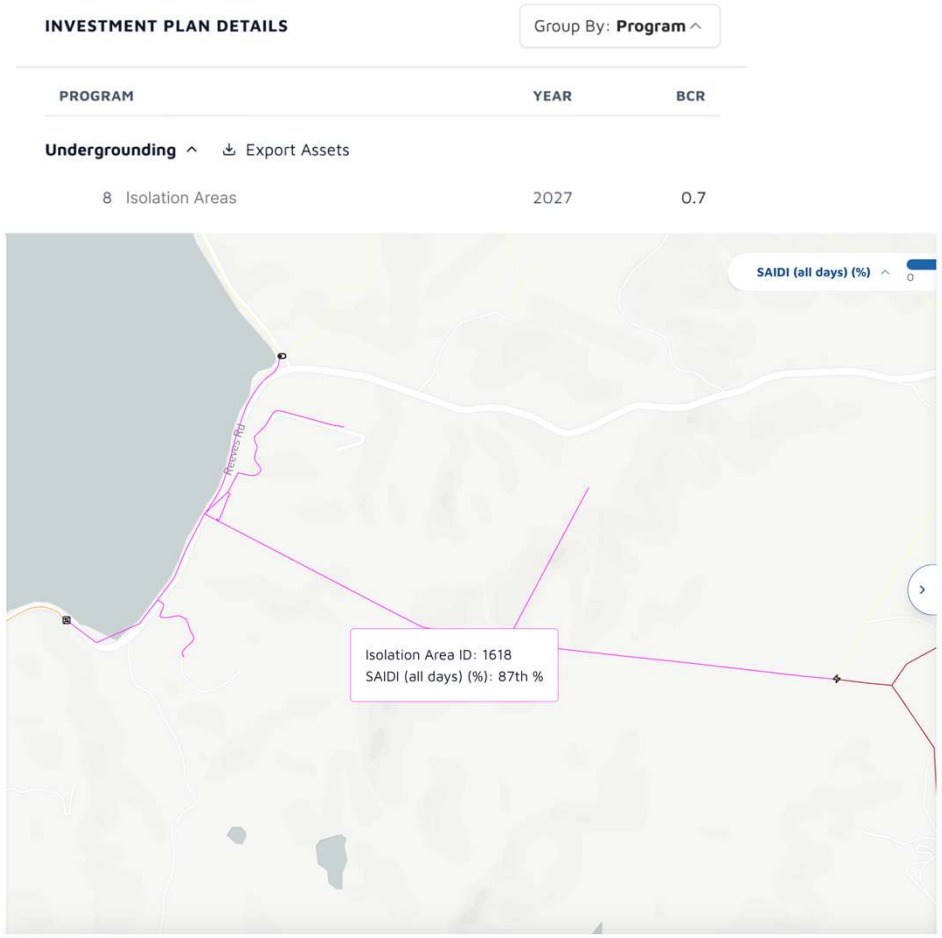
>10 years of historical outage data per circuit, outage cause, number of customers affected, lat/long

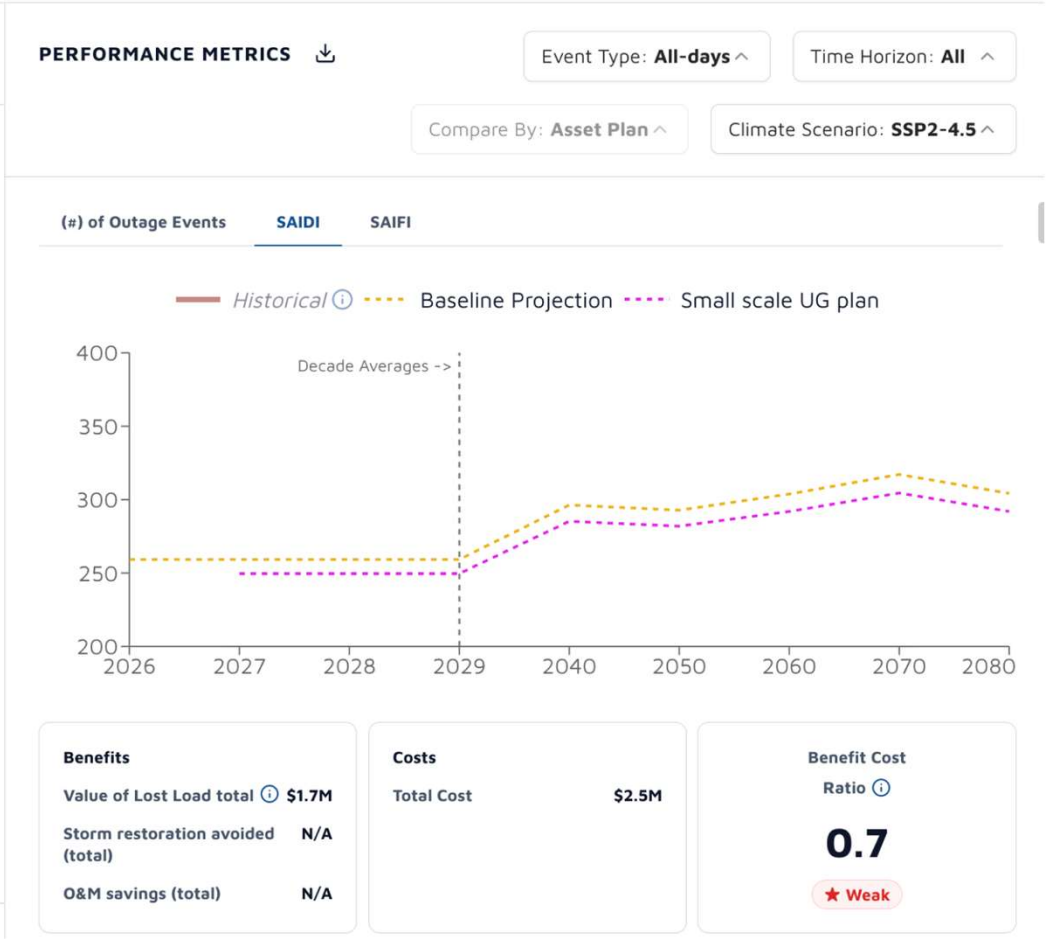
Weather & Climate

Various sources of historical weather observation, weather reanalysis; CMIP6 data for climate projections



Trial Project Overview





Key Project Phases

Phase I: Methodology and Data Transfer – Completed

- Gather and verify the data needed to build the model
- Change the data into the platform's standard format and get it ready for use in the staging environment

Key Project Phases

Phase II: Model Implementation – In Progress

- Rhizome Ingest relevant climate and weather datasets
- Implement machine learning to understand the likelihood and consequence of failure for circuits from various types of extreme weather hazards
- Develop a Cost-benefit metric for each investment-segment

Key Project Phases

Phase III: Validation, Closeout, and gridADAPT Evaluation – In Progress

- Release the platform into production
- Validate the results and create measures to assess the accuracy of the extreme weather projections and asset fragility analysis
- Incorporate the outputs into climate risk and cost-benefit analysis
- Evaluate Rhizome's gridADAPT product and complete the project outcomes report

Data Transfer

Data Requirements

- **Asset Data**
  - Shape Data - Conductors
  - Point Data - Poles, Crossarms, Transformers, Protection Devices
- **Network Data**
  - Topology - Feeders, Connectivity, Downstream Assets
- **Outage and Customer data**
  - Historical outage data
  - ICPs per asset
- **Vegetation data**
  - Management system data, assessments, cut meters
  - LiDAR Summary Level

Data Transfer Easy Wins

- We exchanged data via a Microsoft Teams Channel
- Extracted data into excel templates provided by Rhizome or our own raw data
- Rhizome happily accepted raw outage data (un normalised etc), vegetation database and LiDAR summary data
- Seamless data consumption — only minor clarifications required from Rhizome

Data Transfer Easy Wins

- Transformer Data Upload Template Example

	A	B	C	D	E	F	G
2	07 TRANSFORMER DATA MAPPING						
3							
4	SECTION 1: DATA SOURCE INFORMATION						
5	Source System:GIS						
6	File Name(s):TRANSFORMERS.xlsx						
8							
9	SECTION 2: FIELD MAPPING						
10	**Rhizome Field Name**	**Priority**	**Description**	**Your Field Name**	**Your File Name**	**Access Operation**	**Example Values**
11	transformer_id	REQUIRED	Unique identifier	G3E_FID	TRANSFORMERS.xlsx		15645263
12	conductor_ids	REQUIRED	Conductor(s) attached	XFMR_CONDUCTORS	TRANSFORMERS.xlsx		15532926, 16358691
13	circuit_segment_ids	REQUIRED	Circuit segment(s) attached				
14	circuit_ids	REQUIRED	Circuit(s) attached	CIRCUIT	TRANSFORMERS.xlsx		HV_KAWERAU - 2742 - KAWERAU
15	location	REQUIRED	Geographic coordinates	LONGITUDE, LATITUDE	TRANSFORMERS.xlsx		178.231, -36.432
16	date_placed_in_service	REQUIRED	Installation date (most recent)	DATE_COMM	TRANSFORMERS.xlsx		2022-17-01
17	date_removed_from_service	REQUIRED	Removal date (if applicable)	ABANDON_DATE	TRANSFORMERS.xlsx		2024-08-16
18	transformer_type	RECOMMENDED	service, substation, stepdown, etc	XFMR_KVA_RATING	TRANSFORMERS.xlsx		300
19	voltage_class	RECOMMENDED	Voltage rating (kV)	VOLTAGE_CLASS	TRANSFORMERS.xlsx		11kV
20	mounting_type	OPTIONAL	Pad, pole, etc.	CLASSIFICATION	TRANSFORMERS.xlsx		POLE MOUNTED
21	pole_id	OPTIONAL	If pole-mounted which pole?	POLE_G3E_FID	TRANSFORMERS.xlsx		16324317
22	date_first_placed_in_service	OPTIONAL	Original installation (if rebuilt)				
23	icp_count	RECOMMENDED	ICP Count per transformer	ICP_COUNT	TRANSFORMERS.xlsx		3

	A	B	C	D	E	F	H	J
1	G3E_FID	XFMR_CONDUCTORS	CIRCUIT	LONGITUDE	LATITUDE	DATE_COM	XFMR_KVA_RATING	CLASSIFICATION
2	15645263	30,15518232,15526608,15	HV_KAWERAU - 2742 - KAWERAU	176.7008476	-38.09934239	1978-01-01	200	PADMOUNT STANDARD
3	16358670	5532926,16358691,163586	HV_KAWERAU - 2742 - KAWERAU	176.7019176	-38.09731316	2020-10-06	300	TOTAL PAD
4	15647271	15553694,15539719	HV_KAWERAU - 2742 - KAWERAU	176.7048367	-38.09478099	1993-07-29	300	POLE MOUNT
5	15644747	5493565,15533167,162918	HV_KAWERAU - 2742 - KAWERAU	176.7071382	-38.09298509	1975-05-20	300	PADMOUNT STANDARD
6	15647242	5515995,15532241,153652	HV_KAWERAU - 2742 - KAWERAU	176.7086105	-38.08738203	1996-02-27	500	PADMOUNT STANDARD
7	15647270	15493820	HV_KAWERAU - 2742 - KAWERAU	176.7021553	-38.10294528	1978-04-24	30	KIOSK Large Steel
8	16322124	15493548,15528146	HV_KAWERAU - 2742 - KAWERAU	176.7020464	-38.10480675	2019-01-31	100	PADMOUNT MICRO
9	15835457	5528184,15528290,153324	HV_KAWERAU - 2742 - KAWERAU	176.6995905	-38.10285003	2012-03-27	200	KIOSK EXTERNAL
10	15646830	5528184,15528290,15532499,15536807,15537165,15493821,155		176.6995905	-38.10285003	1967-05-13	200	KIOSK Large Steel
11	16310127	16323203	HV_KAWERAU - 2742 - KAWERAU	176.7057139	-38.0955121	2018-01-20	200	PADMOUNT STANDARD
12	16323122	15494015	HV_KAWERAU - 2742 - KAWERAU	176.6977479	-38.10914381	2019-03-05	50	PADMOUNT MICRO
13	16311488	93,15524359,15523882,15	HV_KAWERAU - 2742 - KAWERAU	176.6995024	-38.09989425	2018-02-07	300	PADMOUNT MINI
14	16322757	16322770,16322768	HV_KAWERAU - 2742 - KAWERAU	176.7002095	-38.10558005	2019-03-05	50	PADMOUNT MICRO
15	16311766	04,16311779,16311780,16	HV_KAWERAU - 2742 - KAWERAU	176.7011045	-38.09513094	2018-02-23	300	PADMOUNT STANDARD

Data Transfer Challenges

- We have 3x core network data sets covering protection devices:
  - **GIS**: Assets, Topology, Connectivity
  - **Outage Database**: ICPs, Isolators, Connectivity
  - **SCADA**: Protection devices, Assets, Connectivity

- These have evolved independently over time, with limited historical attempts to cross validate all 3x

- To get the best outcome, we needed to connect these datasets

Data Transfer Challenges

- We had never drilled into the idea of SCADA device only connectivity traces in GIS
- Rhizome were eager to understand the assets between SCADA controlled devices to model the impact of asset failure
- Required a re-validation of all SCADA controlled devices in GIS
- Using FME (Feature Manipulation Engine) we ran asset connectivity traces between SCADA verified devices, providing valuable data for both the Rhizome Trial and future internal consumption

Climate Data

- Rhizome use ERA5-Land 9km grid model for historic climate data
- We would have preferred NIWA's VCSN (Virtual Climate Station Network) historic timeseries using a 5km national grid – however requires licensing agreement
- National Climate Projections Dataset used for future climate predictions
  - High-resolution climate projections for NZ (5km grid)
  - Downscaled from global climate models (IPCC AR6 / CMIP6)
  - Covers historic baseline + future scenarios to 2100 across multiple emissions pathways

Modelling Considerations

Key questions

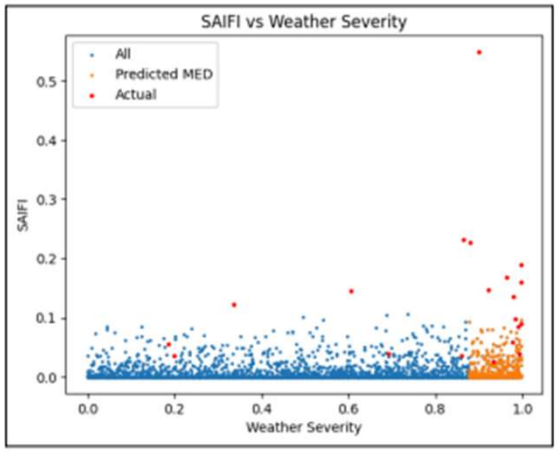
- How are extreme weather hazards changing over time within Horizon Networks service area?
- What does it mean to reliability at a system level and specific part of the network?
- Which locations and assets have the highest reliability risk?
- What are the return from various interventions?
- How do we optimise the intervention plan if we need to change planning constraints?

Key Models

- Extreme weather event model
- Feeder-level outage model
- Asset failure risk model
- Asset consequence model
- Asset events model
- Asset SAIDI/SAIF model
- Sub-feeder risk model
- Intervention CBA model
- Investment optimisation

Extreme weather event modelling

- Climate change projection data and historical reanalysis data
- Key variables considered are wind, precipitation, and temperature
- Four Shared Socioeconomic Pathways (SSPs) modelled
- Track both frequence and intensity
- Bia-correction of projections against historical data
- > 4000 experiments using different ML models
- ~74% accuracy for MED vs 21% of the benchmark



Logistic regression model

Feeder level risk modelling

- Land cover class, vegetation coverage, historical reliability data, and asset data, historical reanalysis, and projected climate data
- Classification of Major Event Days vs normal days
- Model training and validation
- Model uncertainty consideration and “best estimate” of outages change forecast

Asset risk modelling

- Literature-based fragility curves for estimating PoF
- Hight risk vegetation indicator derived from LiDAR data for conductor PoF calculation
- Normalise asset PoF using historical failure data
- Machine learning model derived feeder level outages
- Asset consequence calculation and SAIDI risk calculation using PoF, connectivity, and feeder level outage model

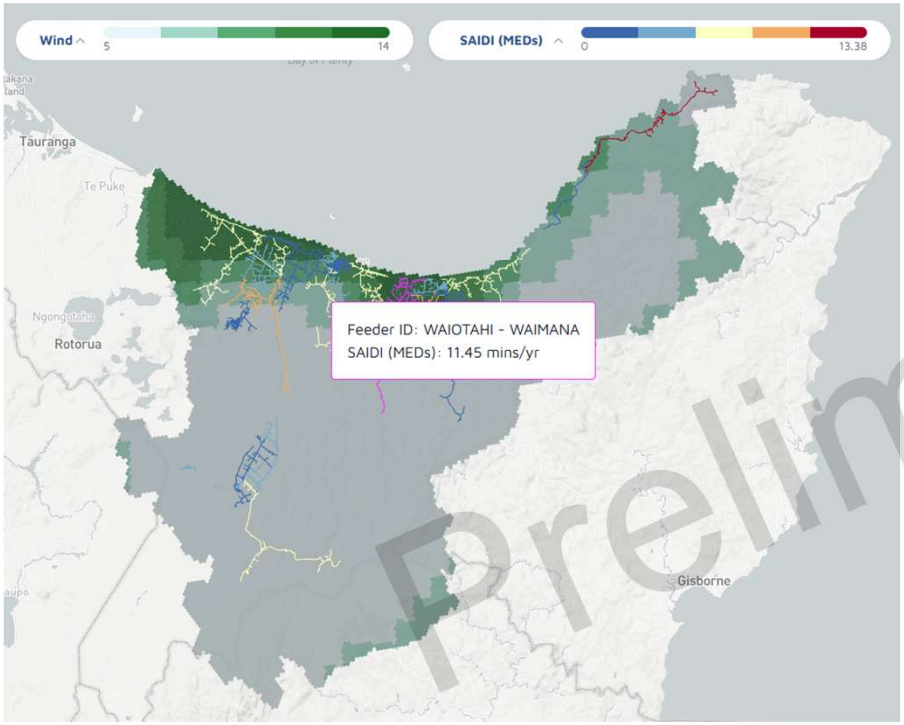
Investment planning

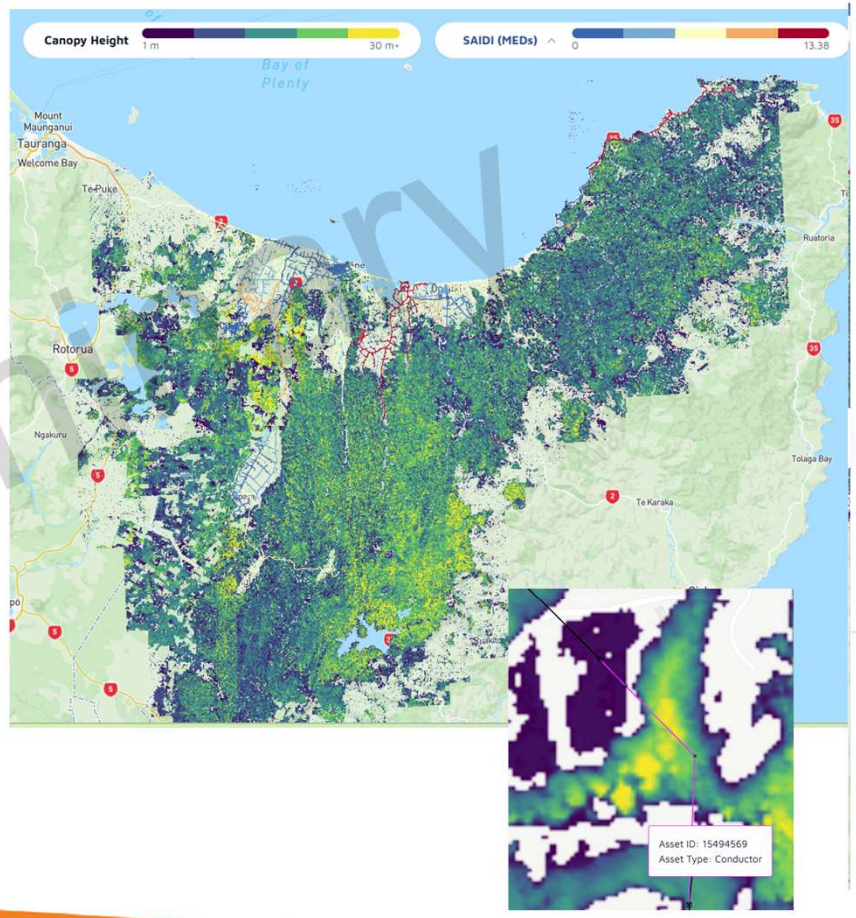
- Intervention types: pole replacement, vegetation trimming, and undergrounding
- VoLL is used to quantify cost and benefit
- Calculate SAIDI reduction for each potential investment in the system
- Optimisation engine to find the investments that maximises reduction in VoLL or SAIDI given the constraints

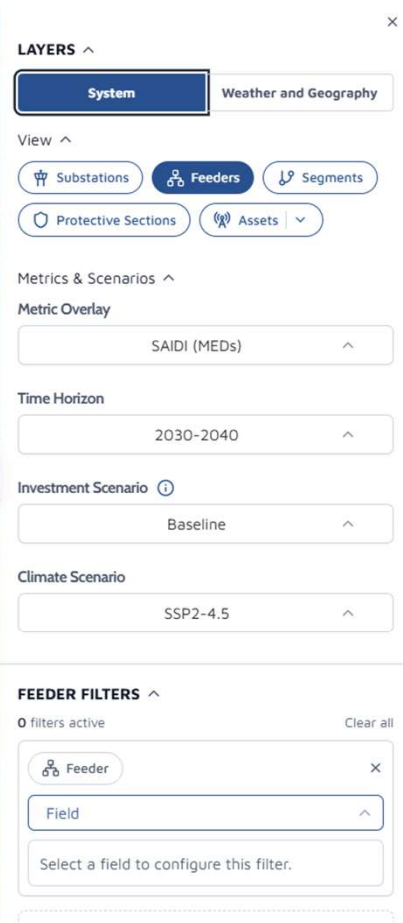
Preliminary Outputs from the Application

Landing Page

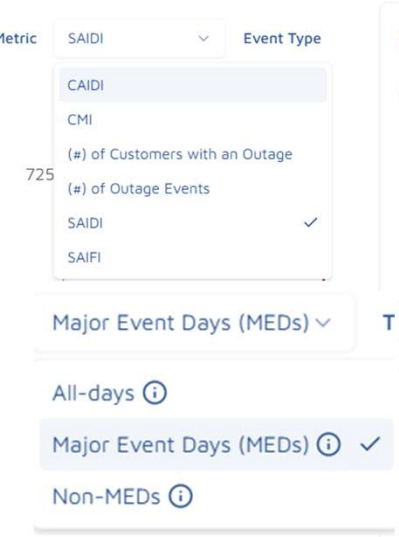
Map View

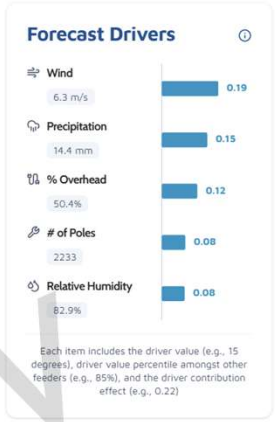






System Level View

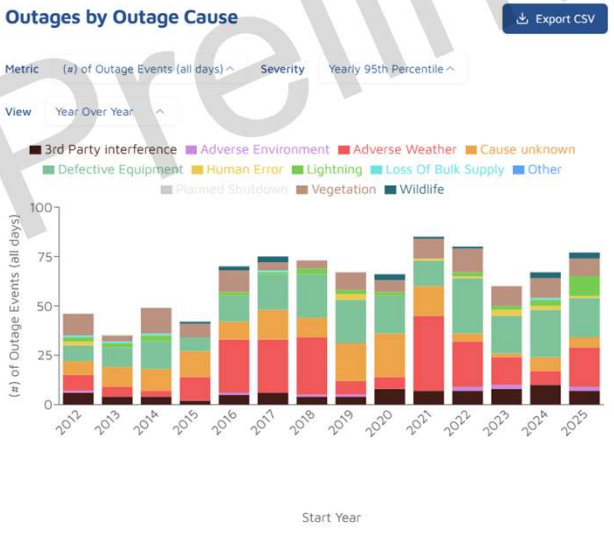


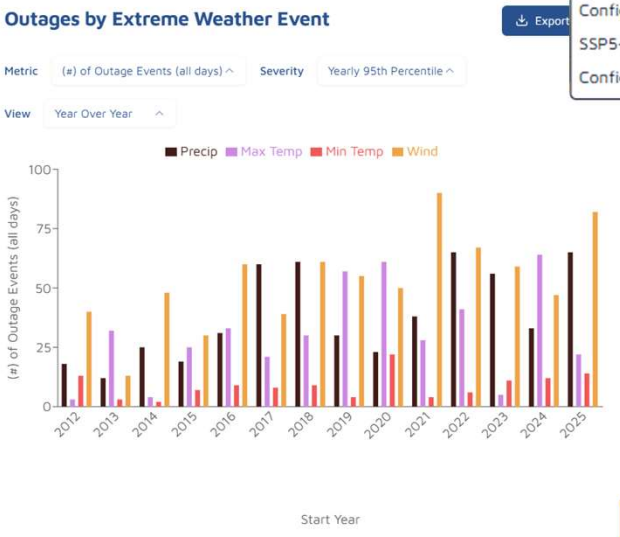


2026
SSP1-2.6: 107.92 mins/yr
Confidence Interval (25th-75th %): 87.99 mins/yr-130.09 mins/yr
SSP2-4.5: 109.14 mins/yr
Confidence Interval (25th-75th %): 86.47 mins/yr-132.47 mins/yr
SSP3-7.0: 95.04 mins/yr
Confidence Interval (25th-75th %): 75.57 mins/yr-116.14 mins/yr
SSP5-8.5: 102.92 mins/yr
Confidence Interval (25th-75th %): 72.44 mins/yr-151.56 mins/yr

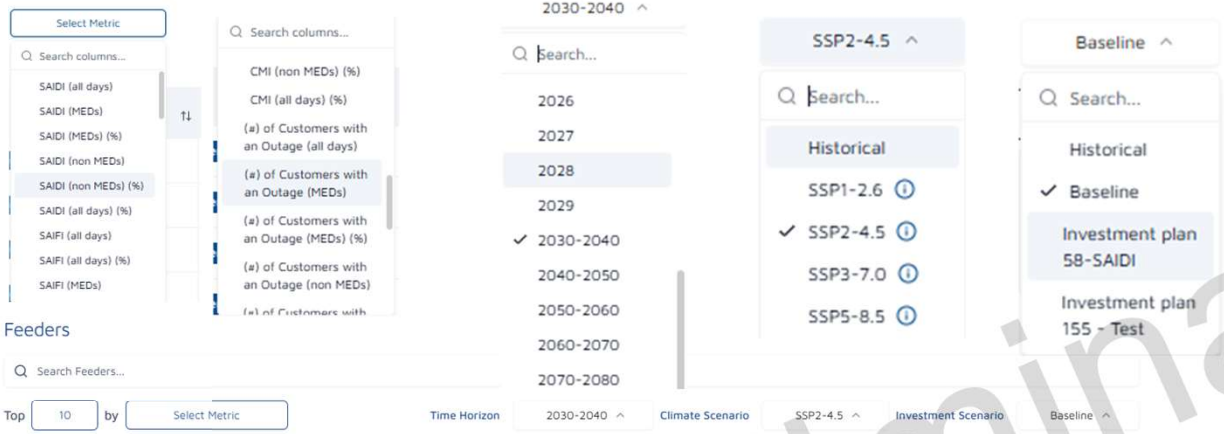
2026
SSP1-2.6: 10,583.67
Confidence Interval (25th-75th %): 7,519.86-14,811.18
SSP2-4.5: 12,821.5
Confidence Interval (25th-75th %): 8,435.23-17,736.33
SSP3-7.0: 10,785.7
Confidence Interval (25th-75th %): 7,309.49-15,022.28
SSP5-8.5: 10,284.97
Confidence Interval (25th-75th %): 6,103.71-16,436.05

Whole of Network View



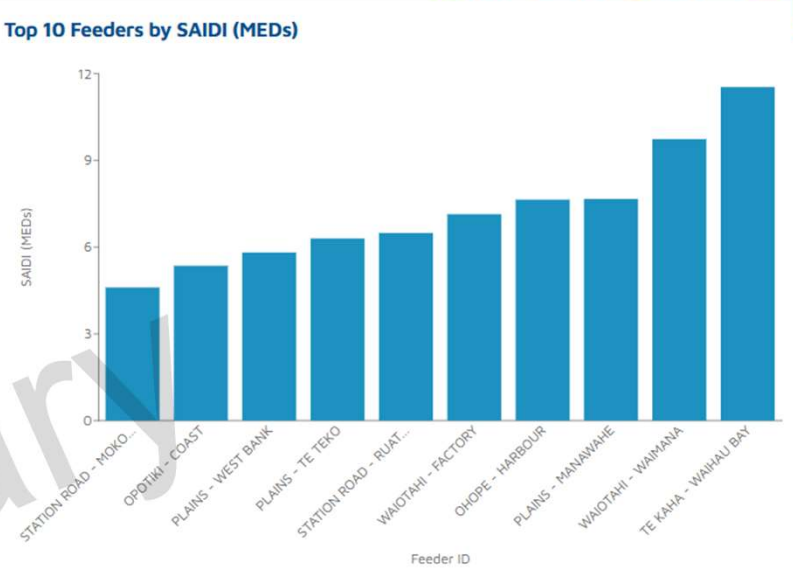


Feeder and sub-feeder

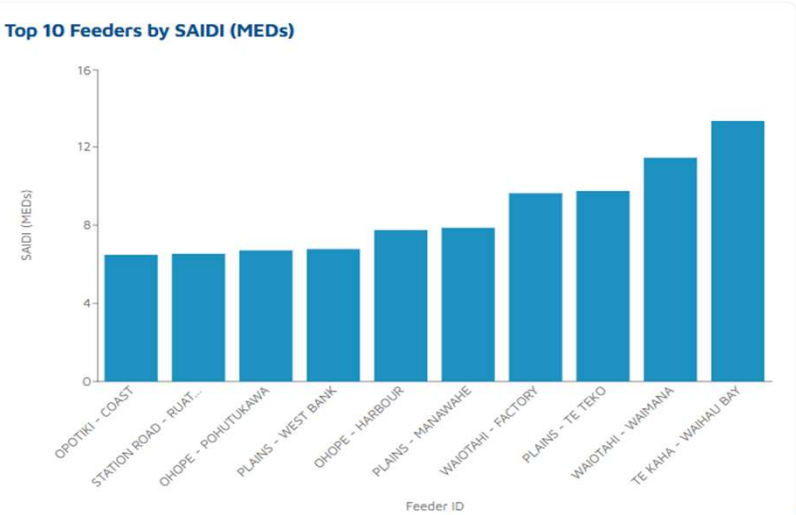


Export CSV | Edit Columns (47) | Reset

Actions	Feeder ID	Conductor Length	(#) of poles	(#) of transformers	SAIDI (MEDs)	SAIDI (non MEDs)	(#) of Customers with an Outage (MEDs)	(#) of Outage Events (MEDs (annual avg.)
View Feeder	TE KAHA - WAIHAU BAY	97,193.4 m	822	181	13.38 mins/yr	13.7 mins/yr	442.37	1.24
View Feeder	WAIOTAHI - WAIMANA	186,198.14 m	1,583	296	11.45 mins/yr	15.36 mins/yr	884.34	2.82
View Feeder	PLAINS - TE TEKO	140,749.41 m	1,120	228	9.75 mins/yr	6.52 mins/yr	421.65	1.35
View Feeder	WAIOTAHI - FACTORY	42,103.93 m	376	59	9.63 mins/yr	2.5 mins/yr	1,884.7	1.19
View Feeder	PLAINS - MANAWAHE	172,828.05 m	1,210	237	7.86 mins/yr	4.67 mins/yr	488.3	2.07
View Feeder	OHOPE - HARBOUR	78,703.56 m	417	125	7.74 mins/yr	1.7 mins/yr	231	0.94
View Feeder	PLAINS - WEST BANK	55,653.31 m	393	77	6.77 mins/yr	3.16 mins/yr	353.66	0.67
View Feeder	OHOPE - POHUTUKAWA	33,873.27 m	122	31	6.71 mins/yr	3.62 mins/yr	323.42	0.28
View Feeder	STATION ROAD - RUATOKI	124,004.05 m	1,098	202	6.53 mins/yr	11.73 mins/yr	494.19	1.68



Show: 20 | 1 - 10 of 10 records



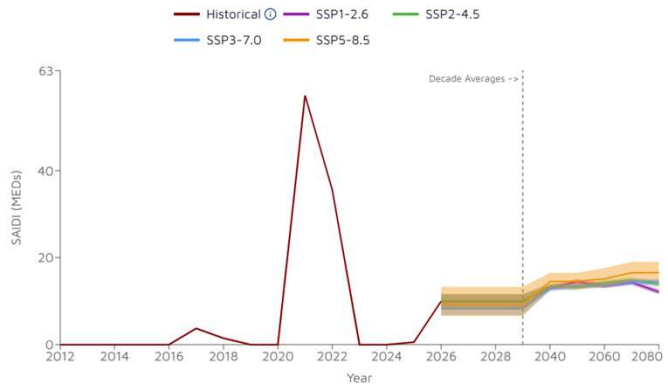
Feeders > TE KAHA - WAIHAU BAY

View on map

Performance Metrics

Export CSV

Metric: SAIDI | Event Type: Major Event Days (MEDs) | Time Horizon: All



Forecast Drivers

Wind	11 m/s (100th %)	0.33
Precipitation	17.8 mm (98th %)	0.12
% Overhead	92.9% (95th %)	0.10
# of Poles	62 (68th %)	0.10
Min Temperature	11.4 °C (59th %)	0.06

Each item includes the driver value (e.g., 15 degrees), driver value percentile amongst other feeders (e.g., 85%), and the driver contribution effect (e.g., 0.22)

Summary Stats

Feeder TE KAHA - WAIHAU BAY

GENERAL

Feeder ID	TE KAHA - WAIHAU BAY
Total Meters	714
Average Canopy Coverage	34.71%
Wire Above Ground	90.23%

ASSETS

Poles	822
Transformers	181
Conductors	97,193.4 m

Related Infrastructure

Isolation Areas | **Segments** | Assets

Segments

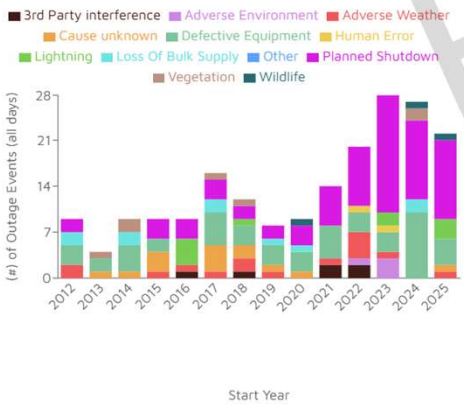
627 segments found

Segment ID	Risk Score (%)	Customers Served
15497384	100th %	186
16380093	100th %	79
15496233	100th %	194
15502691	100th %	130
15497922	100th %	137
15501522	100th %	156
15499345	100th %	230
15498625	100th %	179

Outages by Outage Cause

Export CSV

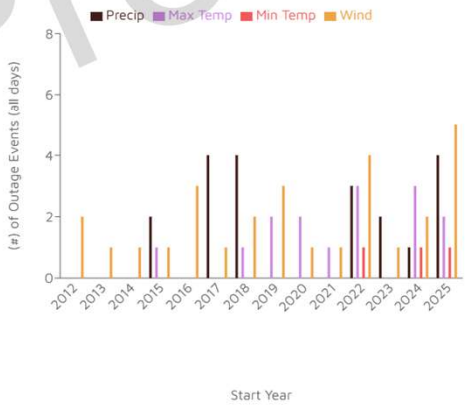
Metric: (#) of Outage Events (all days) | Severity: All Severities | View: Year Over Year



Outages by Extreme Weather Event

Export CSV

Metric: (#) of Outage Events (all days) | Severity: Yearly 95th Percentile | View: Year Over Year



Related Infrastructure

Isolation Areas | Segments | **Assets**

Asset: Poles

Asset ID	Likelihood of Failure (Avg. Year)	Downstream Customers	Age	Pole Length	Risk Score (%)
P23005	0.37%	213	60.60	12 m	100th %
P23110	0.37%	156	60.60	12 m	100th %
P23142	0.37%	130	60.60	12 m	100th %
P23143	0.37%	130	60.60	12 m	100th %
P23145	0.37%	119	60.60	12 m	99th %
P23179	0.37%	110	60.60	12 m	99th %
P23181	0.37%	110	60.60	12 m	99th %
P23183	0.37%	108	60.60	12 m	99th %
P23213	0.45%	89	55.60	14 m	99th %
P23028	0.13%	207	60.60	10.67 m	99th %

Show: 10 | 1 - 10 of 822 records | Previous | Page 1 of 83 | Next

Segments > 15497384

General:

Segment ID:	**15497384**
Feeder ID(s):	**TE KAHA - WAIHAU BAY**

Risk:

Risk Score	**1 (100th %)**

Risk Factors:

Customers Served	**186 (98th %)**
Nearby Risky Vegetation	**Yes**
(#) of poles:	**8**
Avg. Pole PoF (avg. annual)	**0.00057 (81st %)**
(#) of transformers:	**0**
Conductor Length:	**512.6 m**
(#) of reclosers:	**0**
(#) of conductors:	**1**

Assets

Asset

Poles

Asset ID	Likelihood of Failure (Avg. Year)	Downstream Customers	Age	Pole Length	Risk Score (%)
P23057	0.017%	186	55.60	10.5 m	96th %
P23059	0.017%	186	55.60	10.5 m	96th %
P23051	0.017%	191	55.60	10.5 m	96th %
P28526	0.021%	186	55.60	10.67 m	96th %
P23060	0.021%	186	55.60	10.67 m	96th %

Assets

Conductors | Poles

Asset ID	Likelihood of Failure (Avg. Year)	Downstream Customers	Age	Nearby Risky Vegetation	Voltage
15496233	Not specified	195	56.90	No	11000

Show: 10 | 1 - 1 of 1 records

Assets > Poles > P23057

General:

Asset ID:	**P23057**
Asset Type:	**Pole**
Installation Date:	**Dec 31, 1970**

Risk:

Risk Percentile	**96th %**

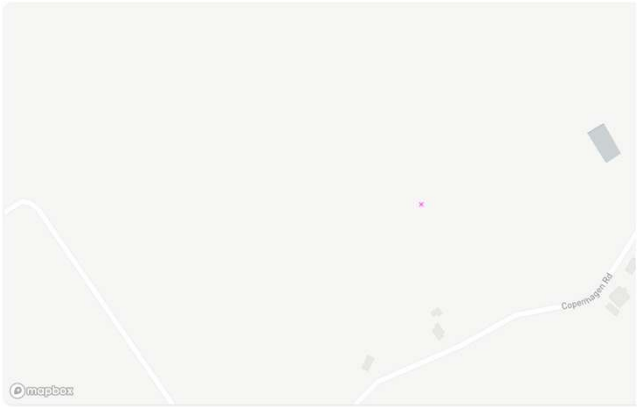
Risk Factors:

Type:	**concrete**
PoF (avg. annual)	**0.017% (74th %)**
Downstream Customers	**186 (93rd %)**
Age:	**55.60 (65th %)**
Length:	**10.5 m**

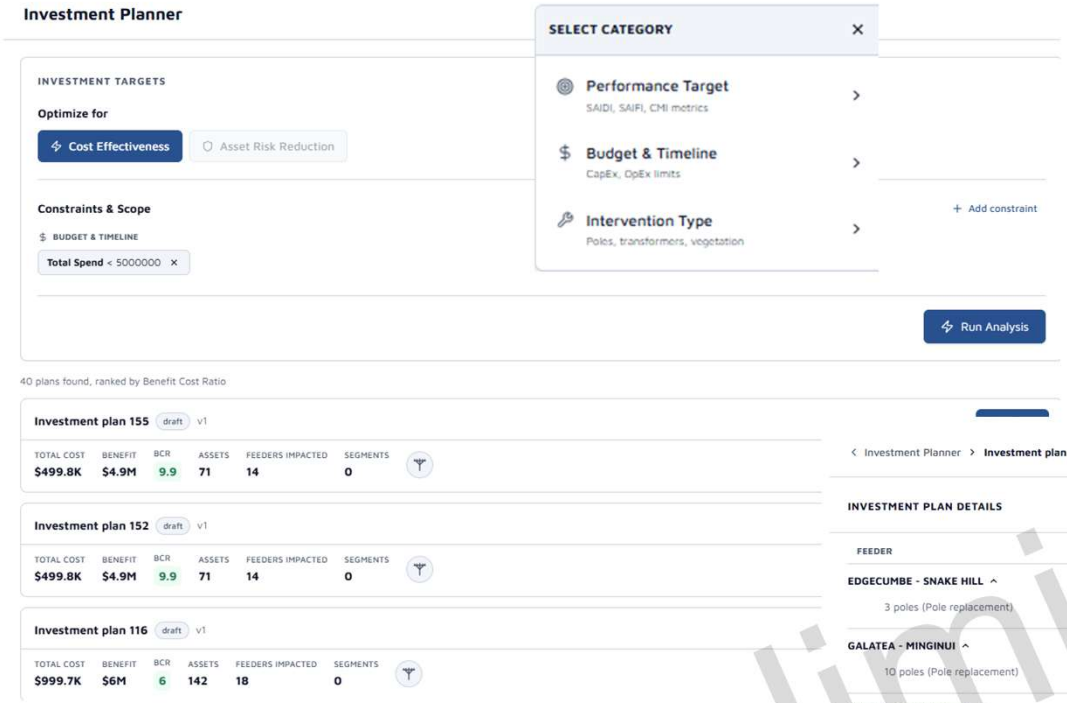
Associated Infrastructure

Feeder(s): **TE KAHA - WAIHAU BAY**

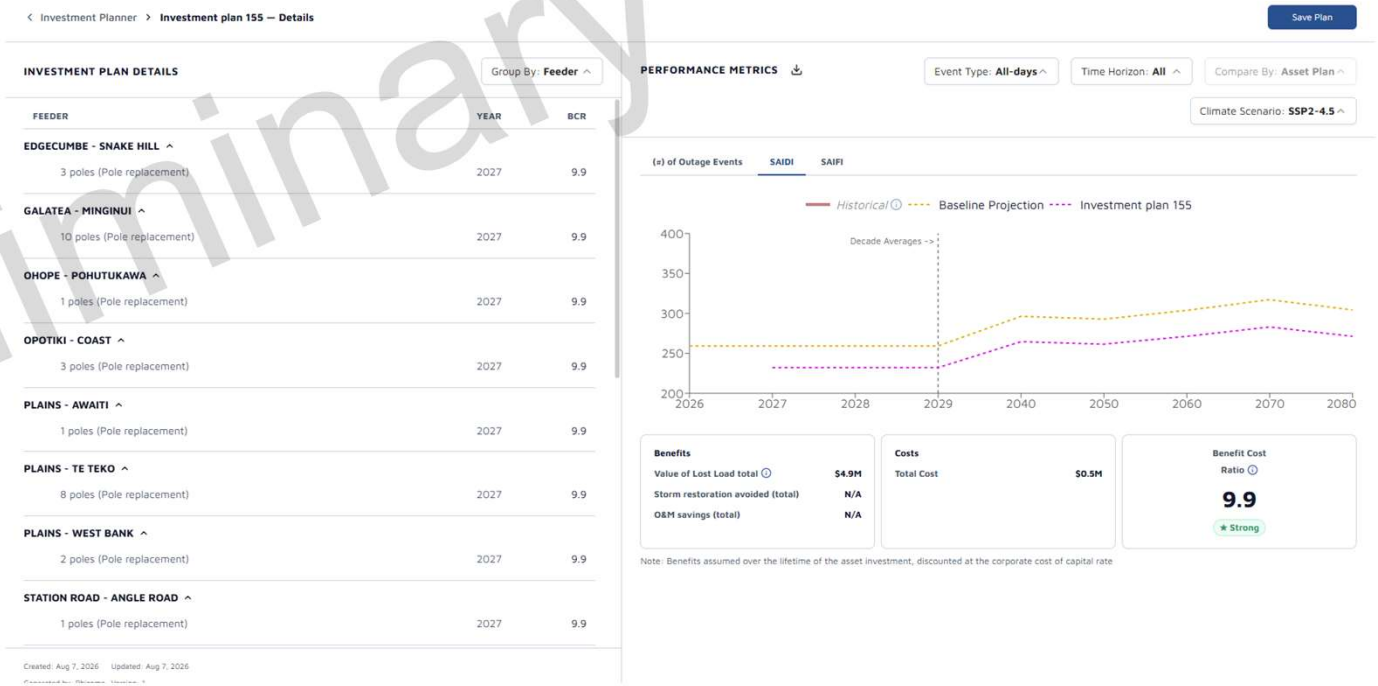
Segment(s): **15497384**



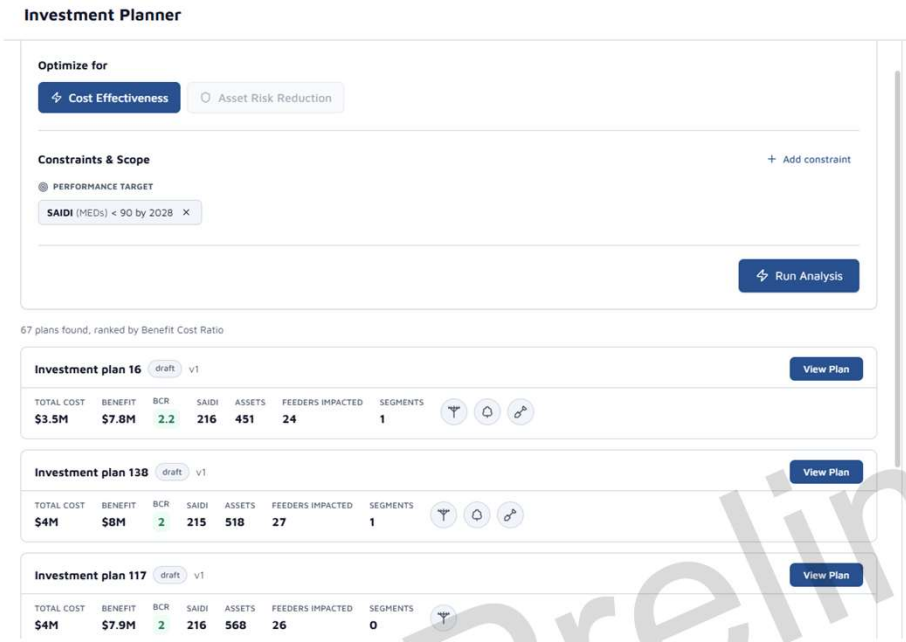
Investment Plan – VoLL

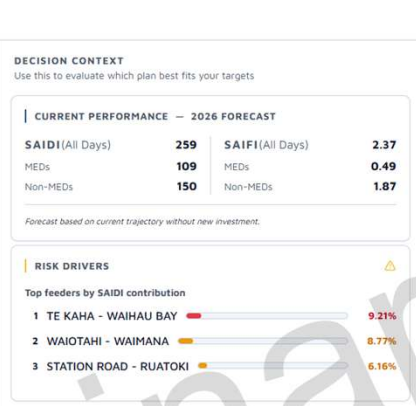


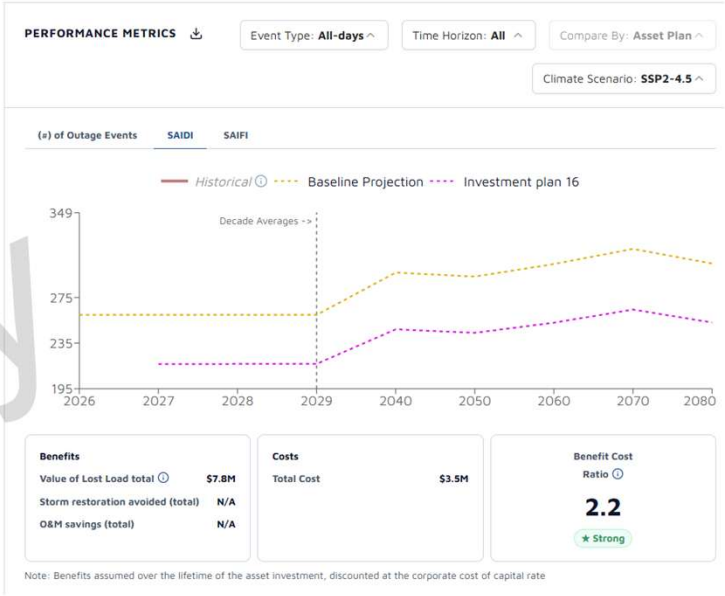
A	B	C	D
Asset ID	Asset Type	Risk Score (%)	Feeder ID
P26005	pole	0.9999342148542859	PLAINS - TE TEKO
P26000	pole	0.9998684297085718	PLAINS - AWAITI, PLAINS - TE TEKO
P31901	pole	0.9998026445628577	WAIOTAHI - WAIMANA
P13705	pole	0.9996710742714295	STATION ROAD - PIRIPAI
P13706	pole	0.9996052891257154	STATION ROAD - PIRIPAI
P11741	pole	0.9995395039800014	WAIOTAHI - FACTORY
P11750	pole	0.9994737188342873	WAIOTAHI - FACTORY
P11764	pole	0.9994079336885732	WAIOTAHI - FACTORY
P26016	pole	0.9993421485428591	PLAINS - TE TEKO
P13650	pole	0.9992105782514308	STATION ROAD - CITY SOUTH
P13651	pole	0.9992105782514308	STATION ROAD - CITY SOUTH
P10024	pole	0.9991447931057167	STATION ROAD - CITY SOUTH
P10701	pole	0.9990790079600026	STATION ROAD - MOKORUA
P13668	pole	0.9990132228142885	STATION ROAD - MOKORUA
P11765	pole	0.9989474376685744	WAIOTAHI - FACTORY
P13655	pole	0.9988816525228603	STATION ROAD - CITY SOUTH
P21112	pole	0.9984869416485758	STATION ROAD - TANEATUA
P21114	pole	0.9984869416485758	STATION ROAD - TANEATUA
P11781	pole	0.9984211565028617	WAIOTAHI - FACTORY

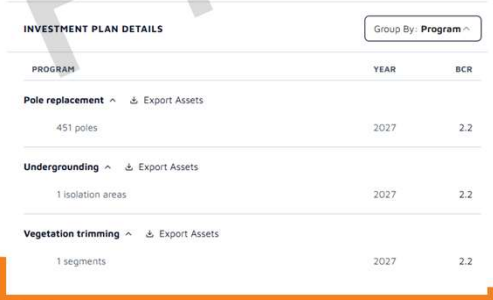


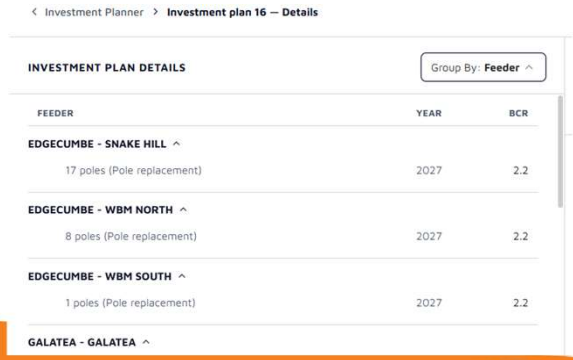
Investment Plan – SAIDI











Next steps

- Complete development of the application
- Review and validate outputs delivered
- User acceptance test and training
- Address issues and improvements identified
- Evaluate against key objectives
- Project close out report