Tuesday, 29 July 2025

Te Hui o Te Kaunihera ā-Rohe o Heretaunga
Hastings District Council
Risk and Assurance Committee Meeting

Kaupapataka

Attachments – Volume 1

Te Rā Hui: Meeting date:	**Tuesday, 29 July 2025**
Te Wā: Time:	**10:00 AM**
Te Wāhi: Venue:	**Council Chamber** **Ground Floor** **Civic Administration Building** **Lyndon Road East** **Hastings**

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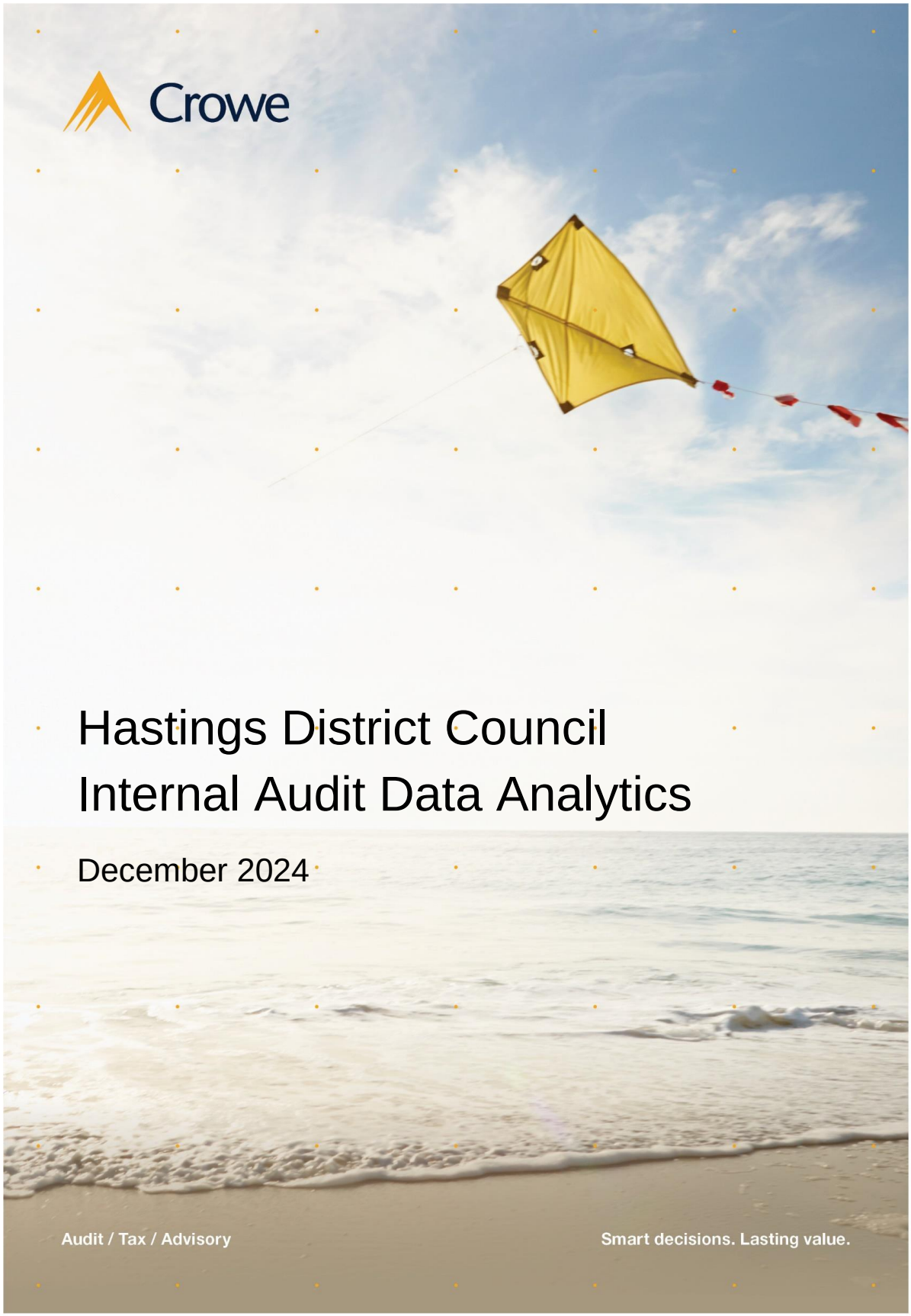
TE KAUNIHERA Ā-ROHE O HERETAUNGA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Internal Audit Data Analytics
December 2024
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Contents

1. Executive Summary

1.1. Objectives and scope

The objective of this assignment was to perform the specified tests per the Scoping Document to detect suspicious transactions and masterfile data. The testing areas were payroll and accounts payable payments and master data.

The transactional data testing included transactions during the period 1 January 2023 to 30 June 2024 with the master data testing as at the date of extraction which was 6 December 2024.

The data analysis work did not include assessment of the respective internal controls within the business processing areas and was limited to factual reporting of identified data anomalies as per the specified tests undertaken.

Completion of the specified tests was subject to the availability of data from the Council's systems. Tests where the data was unavailable are indicated in the results where applicable.

1.2. Results

This report includes a summary of the results of the payroll and finance application data testing. The results are presented in three sections:

- Accounts payable master data and transactions
- Cross matching of data between accounts payable and the payroll system
- Payroll master data and transactions

We have provided management with an Excel workbook containing the results for each area.

Each Excel workbook includes a summary results table with risk indicators and recommended actions, and the detailed transactions and master data records identified through completion of the specified tests. Individual records are highlighted in the Excel workbook that we consider require further investigation.

1.3. Basis and use of report

This report has been prepared in accordance with our Scoping Document and subject to the limitations set out in the Appendix - Basis and Use of the Report.

1.4. Risk indicators

Each test result has been given a risk indicator. The risk indicators were determined based on a subjective determination of the likelihood of the results containing fraud or error and the potential materiality of any fraud or error identified. The indicators are as follows:

L = Low

M = Medium

H = High

N/A = No results or no actions required

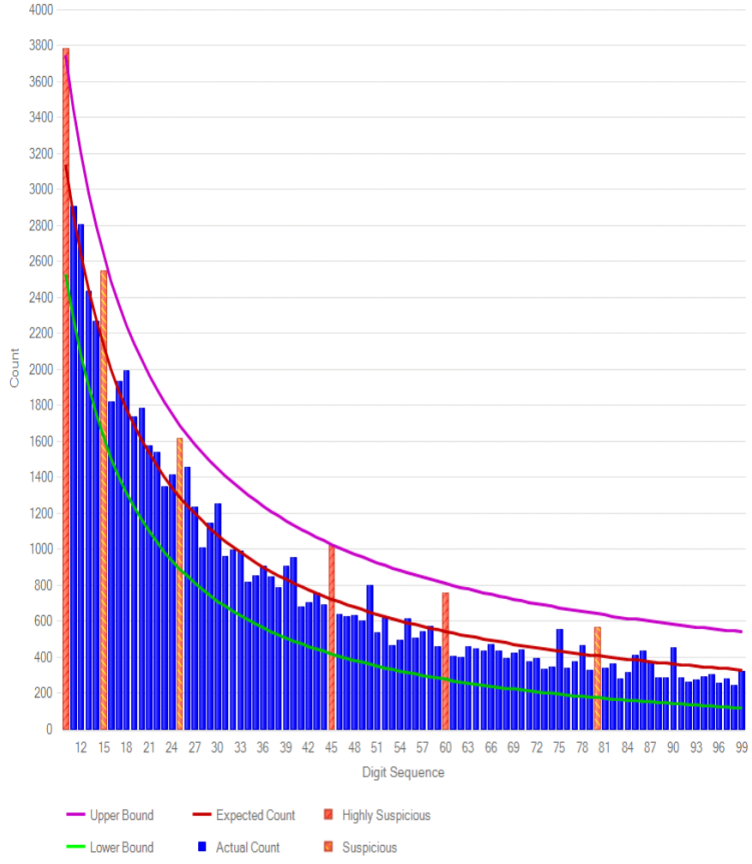
2. Results and recommendations

2.1. Accounts payable

No	Test	Result	Indicator	Recommended action(s)	Management Comment
1	Vendors with multiple bank account changes and payments made to each account	N/A this test could not be completed due to data not being provided by client	N/A	N/A	NA
2	Payment transactions with no master data recorded or deactivated suppliers.	No payment transactions to vendor who is not in the Masterfile. 64 payments to inactive vendor (may be due to timing) 40 of the 64 were negative amounts (may represent a refund).	M	Review the records highlighted to confirm the payments made were as expected and not fraudulent.	Made inactive date added and confirmed that the transaction was made before that date. Note: Payments can not be made to inactive accounts
3	Round numbered payments Excluding grants, loan repayments and HDC intra group payments	169 round numbered payments identified. All payments were over a $10,000 of which 16 were equal to or more than $100,000.	M	Review the results to identify payments to Vendors not as expected and confirm they are not fraudulent.	List filtered by supplier and checked every 2nd one (50%). No anomalies found
4	Benford's Law - Graph of expected frequencies for the first 2 digits	As shown in the graph (figure 1 on the following page) the highly significant spike patterns outside the expected upper range are payments amounts starting with the two-digit numbers 10, 15, 25, 45, 60 and 80.	M	Based on our review of the transactions at face value (no substantive testing) the spikes appear to have been caused by various vendors and amounts for regular services. Review sample of transactions to confirm there was no transaction splitting and transactions were not fraudulent.	Tested 103 or 10,301 (approximately every number 77th entry or 1%). Note: If the line was a GST line, next nearest line with actual GST exclusive values was selected No anomalies found.
5	Suppliers where all invoices were prepared and approved by the same person	2,812 PO were identified where the requisitioner and approver matched. These PO were raised for 696 vendors 361 of these PO had an amount of equal to or greater than $10,000.	H	Review the records highlighted where the PO was over $5,000 to ensure suppliers are known and transactions are not fraudulent.	All of these have been identified as the same person has requisitioned and approved a posted invoice. That is how our purchasing system works. The requisition would have needed to

No	Test	Result	Indicator	Recommended action(s)	Management Comment
					be approved by the person's "1-up" before a purchase order can be created. A random sample of entries have been checked to confirm this theory, and in each case, the person's 1-up authoriser had approved the requisition.

Figure 1 – Benford's analysis



Benford's Law states that if you randomly select a number from a natural data set of numbers, the value of the first digit(s) in that number will occur at a predictable frequency.

For example, the probability that the first digit will be a '1' is approximately 30%, rather than 11.1% as we might expect if all digits were equally likely (1 out of 9). We use Benford's Law to highlight variances from the normal expected occurrences of the first two digits in a transaction.

Anomalies that would appear as spikes and gaps against Benford's expected results could be an indication of payments being split at a certain level to avoid financial delegation limits. For example, a spike before the 5's and a gap after the 5's could indicate payments being split to overcome a financial delegation limit of $5,000.

By applying the expected results of the Benford's Law theory to the vendor payments tables, the results generally match with the expected probabilities.

As shown in Figure 1, the significant spike patterns outside the expected upper range are payments amounts starting with the two-digit numbers 10,15, 25, 45, 60 and 80.

Summary results of the payments starting with those digits have been provided in the detailed spreadsheets.

2.2. Matching masterfile data between the accounts payable and payroll systems

No	Test	Result	Indicator	Recommended action(s)	Management Comment
6	Vendors with a bank account match to the employee masterfile data	61 instances of active vendor bank details which match to an active employee. 4 matched to casual employee bank details and 44 matched to full time employees. Vendor names and employee names match for all but three.	L	Scan the records to identify any unknown Vendors. Confirm employees are not also being paid for services via invoice.	All the anomalies that were raised could be answered
7	Vendors with an address match to employee master data	29 vendors were identified with vendor address matching with the employee Masterfile data. 5 of which do not have a vendor name which matches the employee name.	M	Review the 5 Vendors highlighted where the vendor name does not match the employee name. Confirm employees are not also being paid for same services via invoice.	All the anomalies that were raised could be answered
8	Vendors with a Companies Office name or address match to an employee.	1 exact name match was identified where the employee's name was the same as the vendor's name. However, test 6 and 7 identified same similar name matches which should also be investigated.	L	Review the 1 employee identified. Confirm the payments are consistent with contractual obligations and that the vendor is not an employee. Complete recommended actions as per test 6 and 7 to identify similar names.	All the anomalies that were raised could be answered
9	Payments to Vendors with an employee masterfile data bank match approved by the employee	49 transactions shown relating to test 1. 29 of which are expense claims and 8 relate to car usage.	H	Examine the transactions to determine their authenticity. 8 transactions selected for investigation.	All the anomalies that were raised could be answered

2.3. Payroll

No	Test	Result	Indicator	Recommended action(s)	Management Comment
10 10.1	Invalid IRD number An IRD number was determined invalid if the last digit (the check digit) was not consistent with the expected value. The expected value was determined based on the IRD methodology for setting the check digit.	186 missing or blank IRD numbers and 87 invalid IRD numbers were identified.	H	Review the records identified to ensure they are valid employees.	Those with blank IRD number fields are on the raw data report multiple times due to payroll changes in the period and the correct IRD number is represented on another row/s. Datapay does not accept invalid IRD numbers so all IRD numbers entered must be valid. IRD has not been in touch regarding these which I would expect for being such a high number.
11	Duplicate IRD number in master data	1 duplicate record (matching name and IRD) was identified. The duplicate records are the same employees with different occupations, but one has 0 standard hours per week.	L	Review the records highlighted and deactivate duplicate in master data. Confirm there are no duplicate payments to the employee.	All the anomalies that were raised could be answered
12	Duplicate employee bank accounts	10 duplicate bank account records were identified of which 9 are possible family connection. 1 could be a duplicate employee.	L	Review the listing for any unknown relationships that could potentially present a segregation of duties or conflict of interest issue. In particular look into highlighted record which could be a duplicate employee.	All are Family connections, one known duplicate who is an elected member.
13 13.1	Duplicate employee address	29 duplicate postal and 11 duplicate residential addresses were identified. A Total of 8 duplicate postal addresses also appeared on the duplicate residential list. Most duplicates have the same surname and could be related.	M	Review the records highlighted where either the relationship between the employees are less obvious.	Duplicate residential addresses, the employee no longer lives there. This is not a field that is accessible by employees so is only updated upon a request to payroll staff. Duplicate postal addresses – are spousal couples
14	Employees paid after termination date (more than 1 payment run after termination)	No employees were paid, for a pay period, more than 7 days (1 pay period) after termination date.	L	Additional data analytics could be conducted based on pay date.	All the anomalies that were raised could be answered

No	Test	Result	Indicator	Recommended action(s)	Management Comment
	Note -payment date was unavailable, therefore pay period end date was used as the pay date in this test.				
15	Short duration of employment (less than 30 days)	10 records identified. Days employed ranged from 2 days to 28 days. Only one was a full time employee. All others are casual, temporary or seasonal.	L	Review the records highlighted to identify any unknown employees and confirm that the payments were as expected.	Full-time employee returned home and resigned.
16	Analysis of significant allowances (pay packet taxable allowance data was reviewed)	54 allowances were paid. 14 allowance payments were noted above $500. The highest Allowance payment being $10,830.58.	M	Allowance payments over $500 should be reviewed to ensure they are legitimate.	All the anomalies that were raised could be answered
17 17.1	Salaries paid with no match to the master data	47 employees identified with no record in the master data. 4 were paid over $100,000 in gross taxable pay.	H	Review the records to confirm that the employees exist, and payments are as expected. Employees to be included in Master Data file. Salaries should not be paid if employees are not recorded in master data.	All the anomalies that were raised could be answered
18 18.1 18.2	Overtime Statistics -10 departments with highest % of overtime to total hours. -Top 25 overtime hours and payments by individual.	1) Showing the total hours and overtime hours per division (as per Payroll Workbook) Refer to Figure 2. 2) Showing the top 25 employees with the highest total overtime hours (as per Payroll Workbook)	M	Scan the results for hours worked per employee or department and investigate if not as expected.	All the anomalies that were raised could be answered

Figure 2 – Summary of overtime over $5,000 by cost centre

The following table shows details of overtime payments during the covered period totaling over $5,000 by cost centre. The detailed amounts by employee have been provided to management in separate spreadsheets.

Home Cost Box Division	Home Cost Box Centre	$5k	$10k	$15k	$20k	$25k	$30k plus
Asset Management	Pr Crematorium		$ 14,964.07				
	Pr Landfill Staff Account						$ 58,252.20
	Pr Recycling Depot					$ 24,937.07	
	Pr Transfer Stations					$ 27,361.15	
	Pr Water Services Administration				$ 24,443.13		
Community Wellbeing & Services	Pr Clive Pool						$ 80,050.44
	Pr Closed Circuit TV	$ 5,008.09					
	Pr Hastings Sports Centre		$ 10,042.66				
	Pr Security Patrol						$ 42,866.18
	Pr Splash Planet						$ 107,520.49
	Pr Toitoi - Corporate Services Hire	$ 7,089.54					
	Pr Toitoi - Presenter Services Hire	$ 5,934.28					
	Pr Waterworld Pool				$ 20,514.67		
Marketing, Communications & Engagement	Pr Hastings isite Visitor Centre	$ 5,192.32					
Planning & Regulatory Serv	Pr Building Control			$ 18,103.46			

The total overtime earnings are summarized for each occupation, categorised by Home Cost Box Division and Home Cost Box Cost Centre. The view is filtered to include only overtime earnings of $5,000 and above.

Appendix

Basis and use of report

This report is prepared on the basis of the limitations set out below:

- Our procedures were performed according to the standards and guidelines of The Institute of Internal Auditors' International Professional Practices Framework. The procedures were not undertaken in accordance with any auditing, review or assurance standards issued by the External Reporting Board (XRB).
- This report has been prepared pursuant to our terms of engagement. In preparing our report, our primary source of information has been the internal data supplied to us by management and representations made to us by management. We have not, however, sought to establish the reliability of the information sources by reference to other evidence. This report presents the results of our analysis of the information we have relied upon.
- Our report makes reference to 'Data Analysis'. This indicates only that we have (where specified) undertaken certain analytical activities on the underlying data to arrive at the information presented. We do not accept responsibility for the underlying data.
- The statements and findings included in this report are given in good faith, and in the belief that such statements and findings are not false or misleading, but no warranty of accuracy or reliability is given. In accordance with our firm policy, we advise that neither the firm nor any employee of the firm undertakes responsibility arising in any way whatsoever to any persons. Our findings are based solely on the information set out in this report. We reserve the right to amend any findings, if necessary, should any further information become available.
- Because of the inherent limitations of any internal control structure, it is possible that errors or irregularities may occur and not be detected. Our procedures were not designed to detect all weaknesses in control procedures as they were not performed continuously throughout a specified period and any tests performed were on a sample basis.
- Any projection of the evaluation of the control procedures to future periods is subject to the risk that the systems may become inadequate because of changes in conditions, or that the degree of compliance with them may deteriorate.
- The matters raised in this report are only those which came to our attention during the course of performing our procedures and are not necessarily a comprehensive statement of all the weaknesses that exist or improvements that might be made. We cannot, in practice, examine every activity and procedure, nor can we be a substitute for management's responsibility to maintain adequate controls over all levels of operations and their responsibility to prevent and detect irregularities, including fraud. Accordingly, management should not rely on our report to identify all weaknesses that may exist in the systems and procedures under examination, or potential instances of non-compliance that may exist.
- Recommendations for improvement should be assessed by management for their full commercial impact, before they are implemented.
- This Report is not to be used by any other party for any purpose nor should any other party seek to rely on the conclusions, advice or any information contained within this Report. In this regard, we recommend that parties seek their own independent advice. Crowe disclaims all liability to any party other than the client for which it was prepared in respect of or in consequence of anything done, or omitted to be done, by any party in reliance, whether whole or partial, upon any information contained in this Report. Any party, other than the client for which it was prepared, who chooses to rely in any way on the contents of this Report, does it so at their own risk.

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HAWKE'S BAY REGIONAL RECOVERY AGENCY

Hawke's Bay Regional Economic Development Agency

Contents

1. Executive Summary

The devastating impact of Cyclone Gabrielle on New Zealand's Hawke's Bay region in February 2023 underscores the need for enhanced resilience in telecommunications infrastructure. This paper examines the vulnerabilities of Hawke's Bay's networks to natural disasters and other hazards, and provides recommendations for mitigating these risks. It is the first step in a process to unite government organisations and commercial providers in committing to help Hawke's Bay build back better.

This report was funded by the Hawke's Bay Regional Economic Development Agency to help contribute to building our region's resilience following Cyclone Gabrielle.

Key Findings:

- A substantial number of cell sites in the region were affected by power losses rather than direct damage to telecommunications infrastructure, highlighting the dependence of telecommunications networks on the power grid.
- The region's telecommunications infrastructure, including cell towers and fibre optic backbones, suffers from significant vulnerabilities due to a lack of redundancy, shared routes, and exposure to natural hazards such as earthquakes, floods, and tsunamis.
- Emergency services and other critical communications networks often rely on the same fragile infrastructure, exacerbating the potential impact of its failure.
- Cyclical dependencies emerge when the communications necessary to coordinate recovery efforts are also impacted.
- Theft and vandalism, as experienced in the aftermath of Cyclone Gabrielle, pose additional risks to telecommunications resilience.

The findings lead to two areas of recommendations: those for the telecommunications infrastructure owners and operators to consider in improving network and service resilience, and those that address shared dependencies with other infrastructure lifeline operators including those in the electricity and transport sectors.

Recommendations:

- Extend battery backup capabilities at *key* cellular sites to ensure a minimum of 48 hours of operation post-disaster, prioritising sites that serve as primary communications platforms for significant portions of the region. This work would require an estimated $20m.
- Install solar arrays and/or grid-scale batteries at *major* transmission sites to provide long-term power solutions, reducing dependence on the traditional power grid.
- Explore development of alternative fibre optic paths that are less susceptible to concurrent failures from shared hazards, potentially utilising Optical Ground Wire (OPGW) technology along existing power transmission infrastructure.
- Engage with the electricity sector, New Zealand Transport Agency, councils and the Hawke's Bay Regional Recovery Agency on critical infrastructure dependencies and how greater resilience can be built across the co-dependent lifeline infrastructure system in Hawke's Bay.
- Mitigate the risk of GPS signal loss affecting cellular network operations by implementing alternative terrestrial clock sources, ensuring continuous and accurate timekeeping critical for network functionality.

2. Introduction

Cyclone Gabrielle caused widespread devastation and loss of life throughout New Zealand, but the impact to Hawke's Bay was exceptional. Rescue and recovery efforts were hindered by a near-complete collapse of communications in the region. On Tuesday, February 14, 2023 there were 185 cell sites offline in New Zealand.[1] Most of these were in the Hawke's Bay Region where only 20% of the regions cell sites remained online, and restoration was hampered by roads covered due to flooding, slips, and bridge washouts.[2] With geological events an ever-present risk[3] and climate-related increasing,[4] the region must be prepared to meet future similar or worse catastrophes. Given the industry's reliance on timely physical site access when power is lost, multi-day communications outages are likely if improvements to the infrastructure are not made.

2.1 Background

After a brief introduction to the impact of natural disasters on telecommunications, we introduce several agencies involved in planning for and recovering from them. The consultancy project is introduced along with an explanation of the interventions the project intends to focus on. A summary of the paper's contents is provided before moving on to the main text. Recommendations follow the main text and next steps are suggested in the Conclusion.

2.1.1 Natural Disasters and Telecommunications Infrastructure

Numerous reports cover the risks to telecommunications as a result of natural disasters at a regional and national level. The New Zealand Lifelines Council's, "NZ Infrastructure Vulnerability Assessment, 2023 Edition" is the most thorough and recent one. A few key points should be highlighted from the existing literature.

Independent networks are not independent if they share a single point of failure, for example a shared fibre sheath, a path across the same bridge, or use of a single power transformer. Loss of power to a hilltop hosting both VHF radio and cellular services can mean loss of what might have been considered redundant communications.

Interdependencies and cyclic dependencies exist around terrestrial telecommunications infrastructure. Damage to roads can impact access to tower sites, especially when conditions are not safe to fly or land at the sites. Loss of access to sites can lead to loss of communications, hindering efforts to repair other infrastructures.

2.1.2 Groups and Agencies Involved

A number of groups and agencies are involved in the planning for and response to emergencies and natural disasters. The table below briefly summarises a few of them in alphabetical order.

1 Plummer, Benjamin. "Vodafone Boss Slams Thieves as Generators Stolen from Storm-Hit Sites." NZ Herald, March 27, 2024. https://www.nzherald.co.nz/nz/cyclone-gabrielle-thieves-take-generators-from-cell-towers-times-are-tough-dont-be-a-d-says-vodafone-boss/SENAG5QOCBFBZAHWHTM6XLESJI/

2 Telecommunications Emergency Forum. "Cyclone Gabrielle Post Incident Report." NZ Telecommunications Forum Inc, May 2023. https://www.tcf.org.nz/wp-content/uploads/TEF-Incident-Report-Cyclone-Gabrielle-11-May-2023.pdf

3 Crimp, Lauren. "Earthquake Disaster Risk from NZ's Hikurangi Subduction Zone." Radio New Zealand, May 14, 2024, sec. New Zealand. https://www.rnz.co.nz/news/national/516720/earthquake-disaster-risk-from-nz-s-hikurangi-subduction-zone

4 Morton, Jamie. "2023 among NZ's Warmest Years as New Climate Change Stocktake Lays out Impacts." *NZ Herald*, May 18, 2024, sec. New Zealand, The Country. https://www.nzherald.co.nz/nz/climate-change-2023-among-nzs-warmest-years-as-new-stocktake-lays-out-sweeping-impacts/KGF2QXS5ZFFB3AZEJINTWPISGI/

Table 1.
Groups and Agencies Involved

Department of Prime Minister and Cabinet (DPMC) Risk and Systems Government Group	The Risk and Systems Governance Group is a business unit of the DPMC. It leads the National Risk Framework, Strategic Crisis Management, and governance of the National Security and Hazard Risk system.
Hawke's Bay Emergency Management	The Hawke's Bay Civil Defence Emergency Management Group is a partnership of local authorities, emergency services and other organisations tasked with ensuring the effective delivery of civil defence emergency management in Hawke's Bay. It maintains a Civil Defence and Emergency Management Risk Register that covers the levels of risk and likely impacts from known hazards such as earthquakes and floods and the region's master emergency response plan. "Hazard and Risks Summary of Analysis, Evaluation and Prioritisation".
Hawke's Bay Lifelines Group	Also called the Hawke's Bay Engineering Lifelines Committee, the group is a regional lifelines group. "Regional Lifelines Groups coordinate activities aimed at reducing infrastructure vulnerabilities to regional scale emergencies. Lifelines Groups include representatives from lifeline utilities, emergency management, scientists and others. Lifelines Groups undertake projects looking at impacts of hazards on the region's infrastructure and ways to reduce outage risks and minimise restoration times when outages do occur". Membership is voluntary, and funding is contributed by participating organisations and local government. Funding generally covers the cost of a coordinator or facilitator. A priority of a regional group should be to identify regional infrastructure vulnerabilities, and a list of critical areas where many services co-exist.
Hawke's Bay Regional Recovery Agency (HBRRA)	In response to Cyclone Gabrielle, the Matariki Governance Group of Hawke's Bay's regional leaders established the Regional Recovery Agency (RRA) to coordinate the region's recovery planning. The RRA does not have a statutory function. It does not plan, lead, or deliver recovery initiatives. It does set priorities for recovery through its Regional Recovery Plan. One of its priorities includes the planning and prioritisation of infrastructure, including telecommunications, so that it is more resilient.
Fire and Emergency New Zealand (FENZ)	FENZ is a national organisation created in 2017 to reduce the incidence and risk of unwanted fires, and to protect and preserve life and property. Wildfire readiness and prevention is part of FENZ's remit.
National Emergency Management Agency (NEMA)	Formerly the Ministry of Civil Defence and Emergency Management (MCDEM), the National Emergency Maintenance Agency (NEMA) was established as a departmental agency inside the Department of the Prime Minister and Cabinet in 2019. NEMA's primary role is to lead and coordinate across the country's emergency management system, including central and local governments, for all hazards and risks.
New Zealand Lifelines Council	The mission of the NZ Lifelines council is "Enhancing the connectivity of lifeline utility organisations across agency and sector boundaries in order to improve infrastructure resilience." Its purpose is to "promote arrangements to improve infrastructure resilience, working across three principal attributes: **robust assets** (attributes such as structural integrity, network redundancy, etc) **effective collaboration** (both pre-event and in emergency responses) and **realistic end-user expectations** (informed by understanding of network vulnerabilities)".
Telecommunication Carriers Forum (TCF)	The TCF is a group of service providers that represents 95% of all telecommunications customers in New Zealand. It works to develop policies and regulations, and to create standards and codes for the industry to operate by.
Telecommunications Emergency Forum (TEF)	The TEF is a a forum within the TCF created to coordinate the industry's emergency response telecommunications-impacting events. The TEF acts as a conduit between NEMA, government, other critical infrastructure entities and TEF members to restore telecommunications services. It also works to assess the resilience of networks and to mitigate threats to service.

2.3 Consultancy Project

2.3.1 Justification

Cyclone Gabrielle left many parts of the region without power or communications for days following the event. This analysis aims to help identify specific infrastructures where greater resilience is needed in order to help the region "Build Back Better".

2.3.2 Scope and Outputs

The outputs of this consultancy relate to helping the REDA and the RRA understand where key communications assets are located and how they're tied together.

With this understanding, an analysis is made to understand where trunk fibre routes and key radio towers are vulnerable to future hazards. The analysis is meant to create recommendations for working with utility owners and landowners on making the necessary infrastructure resilient enough to withstand future crises. While it has gathered data that will enable them, it is not intended to provide specific vulnerability assessments for any particular location or infrastructure.

A Geographic Information System has been produced as part of this assessment that is a single source of truth for regional communications, and can underpin interventions to strengthen the region's resilience.

2.3.3 Project Consultant

Jonathan Brewer has been involved in New Zealand's telecommunications industry for twenty years. As a network and radio engineer he's worked on projects in Hawke's Bay for farms, power utilities, maritime safety, and all of the region's WISPs. Alongside his New Zealand practice he consults to development finance and international aid agencies, and has published papers on the economics and regulation of telecommunications in Asia.

2.4 Intervention Areas

The target of interventions is vulnerable infrastructures and systems in the Hawke's Bay Region. Planned interventions are to:

- Raise awareness of the issues
- Gain consensus on the issues
- Perform vulnerability assessments
- Find technical solutions
- Find funding to remedy identified vulnerabilities

2.5 Paper Contents

The paper opens with a review of the methodology of data collection, mapping and analysis. Gaps in data and weaknesses of methodology are touched on. It moves on to a briefing on the types of risks that telecommunications infrastructure is most vulnerable to. It discusses critical sites, some findings, and finishes with a set of recommendations.

3. Methodology

This study considers information in the public domain and confidential information supplied by infrastructure providers servicing the Hawke's Bay. The main method of aggregation and analysis is through a Geographic Information System (GIS) maintained by Hawke's Bay Regional Council (HBRC).

3.1 Data Sources

With the exception of some military and police services, all licensed radio transmitters are public record and available for viewing in the Register of Radio Frequencies. Licence records are useful for determining where broadcast and cellular towers are located, where emergency services are active, and where microwave backbones have been built. Radio licences were added to the GIS via a point in time extract made in September 2023.

Fibre optic cable routes for the GIS, both backbone and access, was sourced from Chorus, One, Spark, Two Degrees, and Unison. During this project Unison's fibre network was sold to Tuatahi First Fibre. All parties consider their detailed fibre optic cable locations to be confidential information.

Power infrastructure data including lines, structures, and transformers was supplied by FirstLight, Transpower, and Unison. While Transpower data is made public, local lines infrastructure details are confidential.

Information on Hazards was already available in HBRC's GIS, sourced from GNS Science.

3.2 Methodology Weaknesses

The Department of Prime Minister and Cabinet believes that ad hoc and inadequate information sharing is one of four barriers to strengthening resilience.[5] The primary weakness of this study is that all of the data utilised was captured on an ad-hoc basis at a static point in time. Without a regular process of update some data will become stale. While less of an issue for fibre optic cables and power lines, radio based infrastructure changes regularly.

Through confirming radio licences with providers, we found the public Registry of Radio Frequencies contains a fair amount of inaccurate or stale data. It also carries transmission licences that carriers may use only a few times a year, or only for particular customers inside their buildings.

One remedy for this issue is regular communication with providers to confirm which licences are actually in use. An alternative remedy is for providers to share layers from their own GIS systems for integration into HBRC's system in real-time. Spark suggested they could allow Hawke's Bay to pilot such a system with them.

The TCF believes such provider-to-council data sharing arrangements are unsustainable, and suggests a centralised approach to data sharing is supported by the industry. Until such a platform exists, Hawke's Bay should insist on regular static GIS layer updates or shared layers from all of the providers with infrastructure in the region.

Network information supplied by 2degrees fell far short in detail compared to information supplied by Chorus, One, RCG, and Spark. The study would be improved by additional high-level interaction between Hawke's Bay and the company's CEO.

Ashfall can be a significant hazard to the power networks feeding telecoms services and can prevent solar arrays from working. We do not have an ashfall map in the GIS.

Wildfires regularly destroy telecommunications equipment. The 2023-2024 summer saw significant damage to networks in Canterbury. The GIS should be updated to include a wildfire risk map sourced from FENZ.

WISP network links have not been added to the GIS due to late arrival of their data. Given the proven resilience of their mainly solar-powered infrastructure, it would be useful to dedicate additional resources to integrating all of their data.

Finally while we know about infrastructure, we don't know about its catchment or that of its dependencies. A remote cellular tower may provide backhaul to three other cellular towers, but their catchments might all be very small. Even though it supports other sites, it might be less critical than a broadcast tower delivering radio signals to thousands of people. Coverage modelling using a terrain model can help remedy this weakness by determining which towers serve which addresses.

5 New Zealand Government. "Strengthening the Resilience of Aotearoa New Zealand's Critical Infrastructure System: Summary Discussion Document," June 2023. https://consultation.dpmc.govt.nz/national-security-group/critical-infrastucture-phase-1-public-consultation/user_uploads/dpmc--summary-dd--strengthening-the-resilience-of-ci.pdf

4. Hazards and Risks

On a national basis 80% of cell site outages due to Cyclone Gabrielle were related to power loss[6] and not due to loss of site or backhaul. Of 1,600 impacted cell sites, only two suffered damage to telecoms infrastructure.[7] In Hawke's Bay multiple factors affected many sites. Due to backhaul outages, many cell sites did not come back online immediately when their power was restored.

4.1 Natural Hazards

Natural disasters impact telecommunications in two ways: they can physically damage infrastructure both above and below ground, and they can cut power to infrastructure that often has little in the way of backup. The table below describes the most significant hazards to the Hawke's Bay region. The GIS system created for this project tracks most hazards, but has no information on space weather, volcanic ashfall, or wildfire risks.

6 Speidel, Ulrich. "Why NZ's Communications Networks Broke down in Cyclone Gabrielle." RNZ, March 3, 2023. https://www.rnz.co.nz/news/national/485259/why-nz-s-communications-networks-broke-down-in-cyclone-gabrielle

7 Wilson, Nick, Adele Broadbent, and John Kerr. "Cyclone Gabrielle by the Numbers – A Review at Six Months." Public Health Expert Briefing, August 15, 2023. https://www.phcc.org.nz/briefing/cyclone-gabrielle-numbers-review-six-months

Table 2
Natural Hazards

Active Faults	Faults that have ruptured and/or caused ground deformation within the last 125,000 years are considered by GNS Science to be active. Fault Avoidance Zones are buffers around known fault traces or identified likely fault rupture zones. In general development of these areas should be avoided. "Planning for Development of Land on or Close to Active Faults" is a good reference for understanding the risks.[8]
Detention Dams	Detention dams are built to retain streams and to catch surface water runoff for irrigation and to regulate stream water flow. Several dams exist from Napier south to Elsthorpe and are catalogued by HBRC. Failure of dams due to excess rain or earthquakes can lead to severe flooding.
Flood Risk Areas	Much of the settled area of Hawke's Bay is built around flood plains, and flooding is the most common hazard for the region. Flooding is well understood and HBRC maintains maps of flood zones.
Liquefaction	During an earthquake, areas of wet, loose, and sandy or silty soil can change so they behave more like a liquid than a solid. This can lead to sliding surface soil and cracks in the ground. Liquefaction is a significant risk throughout the region.
Space Weather	Space weather is the impact of solar activity on electromagnetic conditions in near-space around Earth. Geomagnetic disturbances resulting from adverse space weather can negatively impact radiocommunications, timing sourced by satellite, electrical grids, and navigation systems.
Tsunami Inundation	Tsunamis are fast travelling waves caused by large disturbances of the ocean floor, like volcanoes, earthquakes, or landslides. Waves can get taller as the sea becomes more shallow. Hawke's Bay's geography means that it has one of New Zealand's highest risks of tsunami inundation.
Volcanic Ash	While Hawke's Bay is distant from areas of pyroclastic fall, solid material ejected from a volcano, many parts are within the predicted ash cloud of central North Island volcanoes. Power can be impacted in areas experiencing more than 1mm of ash fall, as wet ash can cause shorting at substations.[9] Solar arrays at off-grid sites are at significant risk and will need regular cleaning in times of ashfall to maintain power levels. Sites with generators or air conditioners may need daily filter cleanings or replacements.
Wildfire	Unwanted, uncontrolled fires burn thousands of hectares of mostly rural land in New Zealand every year. In addition to destroying telecoms towers, fires have a significant impact on supporting aerial infrastructure including overhead power lines and fibre optic cables.

8 Janine Kerr, Simon Nathan, Russ Van Dissen, Peter Webb, David Brunsdon and Andrew King. "Planning for Development of Land on or Close to Active Faults." Ministry for the Environment, July 2003. https://environment.govt.nz/publications/planning-for-development-of-land-on-or-close-to-active-faults-a-guideline-to-assist-resource-management-planners-in-new-zealand/

9 GNS Science | Te Pū Ao. "Ash." Accessed March 27, 2024. https://www.gns.cri.nz/our-science/natural-hazards-and-risks/volcanoes/ash/

4.2 Theft and Vandalism

Theft, vandalism, and loss of satellite services are three additional risks to consider when planning for telecommunications resilience.

Theft was an issue for all residents and businesses immediately following Cyclone Gabrielle, but the impact on telecommunications was outsized. None of the carriers contacted for this study supplied information about permanent generators at their sites in the region. Satellite and street-view photos suggest that few, if any cell sites have them installed. With no permanent backup capacity, cell sites run on portable or trailer-towed generators in the event of power outages. Of the five generators stolen from cell sites, four of them were from sites in Hawke's Bay.[10] Theft risk is highest when communications are most needed.

Vandalism of cell sites, often driven by conspiracy theories around the negative effects of 5G, has had a more significant impact on communications overall, but instances haven't been aligned with natural disasters. A spate of 17 attacks in early 2020,[11] 10 of them arson attacks,[12] has tapered off but hasn't entirely stopped. In 2022 a tower near Hawke's Bay at Matamau was set of fire and damaged beyond repair.[13] While these attacks are not often aligned with natural disasters, when made on shared rural infrastructure they can easily cut entire communities off from communications.

10 Keall, Chris. "Spark Boss on Spate of Stolen Generators, Direct Financial Cost of Cyclone." *NZ Herald*, March 27, 2024. https://www.nzherald.co.nz/business/spark-boss-on-spate-of-five-stolen-generators-direct-financial-cost-of-cyclone-gabrielle/TKX2H2K3HFHWTF642ZATFXWYZQ/

11 Pasley, James. "17 Cell Phone Towers in New Zealand Have Been Vandalized since the Lockdown, Coinciding with a Boom in 5G Conspiracy Theories." *Business Insider*, May 20, 2020. https://www.businessinsider.com/17-cell-towers-have-been-vandalized-in-new-zealand-since-lockdown-began-2020-5

12 One NZ. "Vodafone, Spark and 2degrees Warn Arson Attempts on Cell Sites May Impact Phone and Internet Connectivity in Auckland," May 15, 2020. https://media.one.nz/news/industry/arsontcf

13 *Hawke's Bay Today*. "Vandals Destroy Cellphone Tower 'beyond Repair,'" March 27, 2024. https://www.nzherald.co.nz/hawkes-bay-today/news/cellphone-tower-destroyed-by-vandals/PZKBAEWSV5JDWYE57DZNQFK2NY/

4.3 Loss of Satellite Signals

All modern cellular networks depend on accurate clock signals in order to function. Most source their clock signals from Global Navigation Satellite Systems (GNSS), generically known as GPS. Upon loss of GNSS signals, equipment can generally hold its clock for some time – a few hours to a day[14] – but will eventually stop transmitting when it no longer has accurate time. Disruption of global GNSS systems is a significant risk with increased activity in space and is recognised as such by several nation's risk registers.

14 Datta, Rajendra Nath. "Synchronization and Holdover in Telecommunication." *EE Times* (blog), March 10, 2011. https://www.eetimes.com/understanding-the-concepts-of-synchronization-and-holdover/

5. Critical Sites

5.1 Site Classifications

No one measure of criticality exists to describe telecommunications infrastructure in New Zealand – each major operator tends to have their own classification system. This makes it difficult for external assessment to determine what levels of resilience operator sites should be provided with.

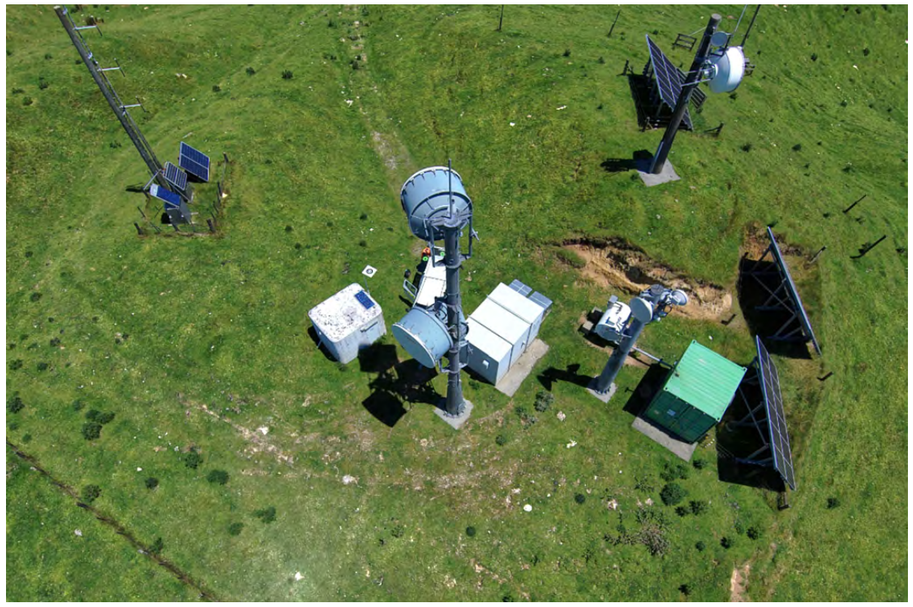
Depending on their classification and use, sites might have more or less battery backup. They might have a permanent on-site generator, or a portable one kept at a service organisation. The table below summarises operator feedback on site classifications.

Two Degrees and Kordia did not provide feedback on site classifications. For Kordia we can assume all of their sites supporting emergency services, broadcasting, and their microwave trunk network are supported as if they were highest tier cellular sites.

WISP operators generally have footprints small enough that critical sites are known by name and not classification. They're frequently off-grid and as such can have longer run-time than cellular sites, especially when weather conditions are favourable.

Table 3
Site Classifications

Provider	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Chorus	None	Bronze	Steel		
One	Silver	Gold	Platinum	Pt - Hub	Pt - Fixed
RCG			Hub Site		
Spark	Bronze	Silver	Gold		



Pukeorapa, Chorus

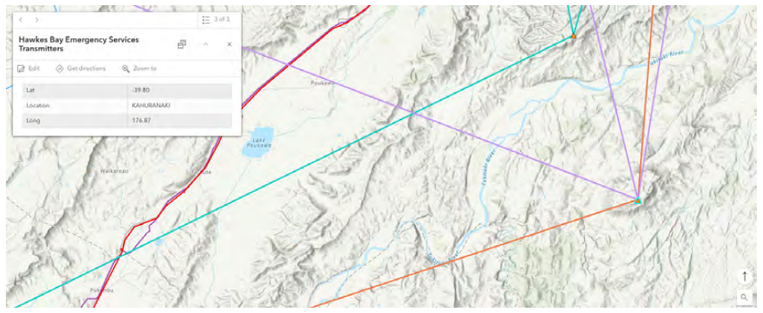
5.2 Gateway Sites

Cell sites often serve as gateways to other cell sites, especially in rural areas. Without understanding the catchment of dependent sites it's difficult to estimate the importance of linking hubs, but it's worth citing locations that serve other sites – generally between one and three others. Of the carriers only One has a special designation to indicate a site is a linking hub.

WISP networks in Hawke's Bay have grown in an organic and opportunistic manner. They often start from high sites unattractive to cellular operators. As customer demand picks up they build smaller local access towers to offload traffic, linking them back to their original high sites. As a result some WISP high sites can support ten or more different local access towers. Two Peaks Southeast of Waipukurau is a good example of the phenomenon. Here we see eight licensed microwave links operated by WISP Aonet (purple) and four links at an adjacent site operated by Chorus (red).

5.3 Emergency Services

For this paper Fire, Ambulance, Police, Maritime Safety, and Civil Defence are considered to be Emergency Services. Due to legal restrictions the GIS and this paper don't explicitly identify any sites or frequencies held by Police. Sites known to have any kind of Emergency Services transmitter are indicated on the map with a triangle but with no further details. As shown below with Kahuranaki and Mt. Erin south of Hastings, Emergency Services frequently coincide with Microwave Trunk sites. Microwave backbones shown below are Chorus (purple), Kordia (teal), and Vital (orange).



5.4 Multi-tower locations

Coverage, access to power, and favourable lease conditions are all drivers for site selection. When aligned, most operators will find a site attractive. The Resource Management Act is another. Limits on the visual impact of sites – especially where they are on a ridgeline – often leads to many small towers being built instead of a single larger ones. This phenomenon can be seen below just East of Waipukurau, where from North to South we have an Aonet tower, a Spark tower, and a One tower that also hosts 2degrees.

5.5 Multi-operator single towers (RBI and RCG)

Two sets of government rural broadband funding brought two generations of multi-operator sites.

In 2012 the first Rural Broadband Initiative (RBI) funded Vodafone (now known as One) to build 3G towers across rural areas, with the stipulation that towers be large enough to host equipment from multiple operators, including WISPs. The RBI tower at Patoka shown right is owned by Vodafone but also hosts Chorus, Spark, and two WISP networks.

In 2017 the second Rural Broadband Initiative (RBI2) funded a new joint-venture company called the Rural Connectivity Group (RCG) to build smaller towers with a single set of equipment on each – with equipment shared by the three mobile network operators. These towers are better suited for smaller communities. They use less power and are less visually imposing than large multi-operator sites.

6. Findings

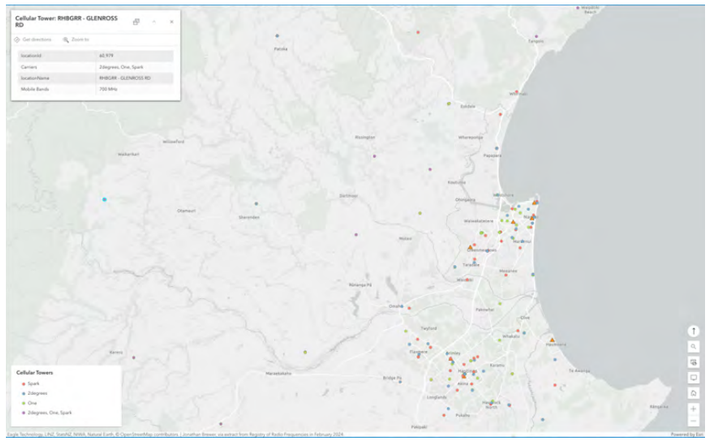
6.1 Tower Locations

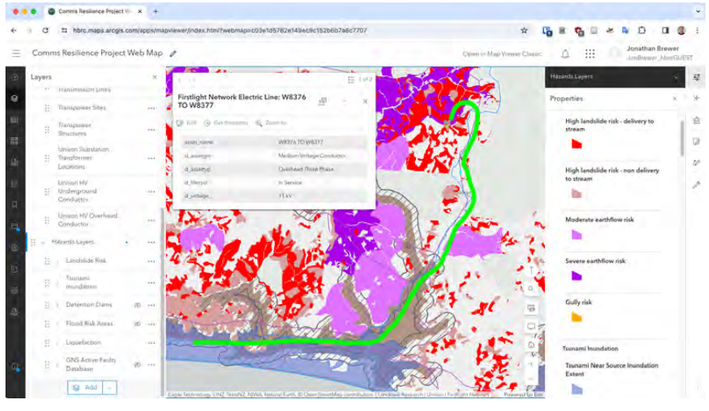
Outside of urban and suburban areas most cell towers are located on good ground in low hazard locations. The map below is an excerpt from the HBRC GIS system showing the locations of One, Spark, Two Degrees, and shared towers around Napier and Hastings.

Power lines servicing towers are generally at far higher risk than the towers themselves. They often traverse multiple hazard areas between the nearest substation and the transformer serving the tower. Looking at Morere, host to three cell phone towers and microwave links connecting Māhia, we see that while the towers are only exposed to landslide risk, their power feeder (highlighted green and identified in the top-centre box) crosses areas of landslide, earthflow, and liquefaction risk, and tsunami inundation areas.

While Morere is perhaps the most extreme case in the region, every critical tower location should be assessed for the risks to its power feeders.

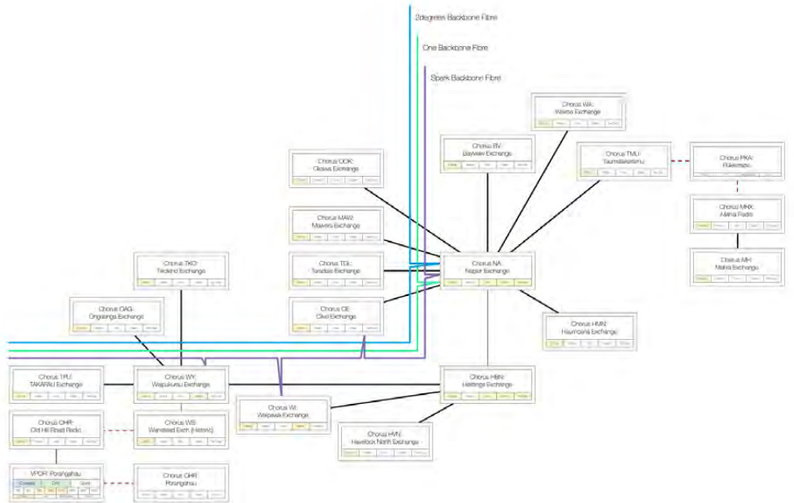
An interdependency worksheet has been made documenting the backhaul, power feeder, and power transformer for every cellular tower in the region to aid this future work. It's available for viewing by members of the working group on application.





6.2 Telecoms Exchanges

With the exception of Mahia and Porangahau all Exchanges in the region are connected via fibre. The diagram below is a high-level layout of the regions exchanges showing logical fibre connections between exchanges, and from carriers to exchanges. In the diagram solid lines represent fibre and dotted lines microwave links. While comment on the topology was sought from providers, none was provided.



6.3 Trunk Fibre Routes

The fibre backbones serving Hawke's Bay have little diversity or resilience. Throughout much of the region providers share the same routes, if not the same cable sheathes. Particular vulnerabilities exist in areas including:

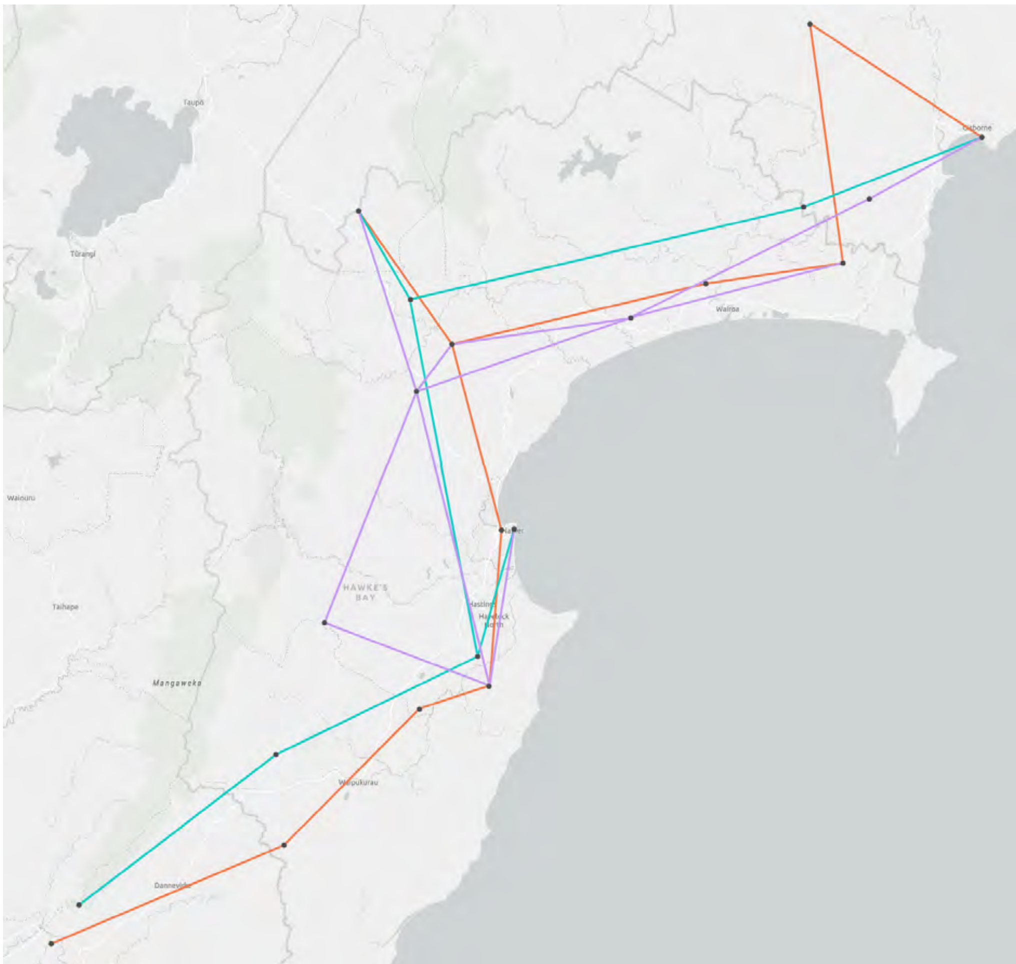
- The Napier Taupo Road, where all major fibre backbones follow the same path and are exposed to flood risk, fault zones, and high landslide risk zones.
- The Napier Esplanade, where all major fibre backbones are located along the same tight corridor are exposed to liquefaction risks, flood risks, and tsunami inundation risk for both near and distant sources.
- State Highway 2 between Rakatatahi and Takapau, where all major backbones cross the same well defined fault avoidance zones and flood risk zones.

Interconnections between trunk networks and access networks like Chorus and Tuatahi First fibre and cellular networks are very sparse. One and Two Degrees connect their backbones to exchanges only in Napier and Hastings. One also branches out of their backbone further north to a microwave link feeding their cellular network, but they're the only carrier to do so. Through historic fibre established prior to the breakup of Telecom NZ, Spark's backbone is present at Clive, Havelock North, Napier, Waipawa, and Waipukurau. Backhaul from other regional exchanges to these interconnection points is handled by Chorus fibre.

Maps detailing single point of failure vulnerabilities have been removed from this report at the request of operators and the TCF.

6.4 Trunk Microwave Routes

Chorus, Kordia, and Vital maintain microwave trunk systems in the region. The Chorus system connects non-fibre connected parts of their network back to their core. Vital's system carries Ambulance, trunked radio, and broadband traffic. Kordia's system carries a wide range of users including broadcast, infrastructure, and emergency services.



While Vital and Chorus share some sites, Kordia's network is generally independent. The exception to this independence is on the northern route to Taupo. Between Napier and Taupo there's a point where all three networks converge on a single tower. While the tower is free from geologic hazards, its one aerial power feeder traverses a few kilometre long stretch of bush and is vulnerable to falling trees. This single point of convergence of communications is a significant risk to the region.

6.5 Cellular Gateway Sites

This review found that aside from major transmission sites, no cellular hub sites are provisioned with permanent generators. This following list is of locations, some of which contain multiple towers and all of which share the same power feeders. As this list aggregates carriers, it provides insights about regional network resilience a single carrier would not normally see. Some sites below are also used by WISPs and radio networks.

Table 4
Cellular Gateway Sites

Site	Operator Code	Dependent Operators	Cell Tower Dependencies
215 Hastings Street Napier	NAPH	2degrees	2
Hastings Central	HSCL	2degrees	2
Hazlewood Street Woolwich	WLWH	2degrees	3
Long Range Road	RHBLRR	RCG	2
Mahora	MAHR	2degrees	3
Maraekakaho	W1MKT	One	2
McLean Park	CNAP	Spark	2
Mount Threave	MTHV, W1THV	2degrees, One, RCG	3
Pandora	PAND	2degrees	2
Patoka RBI	W1PTO, CAOK	RCG, Spark	2
Raupunga	W1RPG, CRUP	One, Spark	4
Cricklewood Station	RHBCWS	RCG	3
Wakarara	RHBWKR	RCG	2
Richmond Road Clive	CLIV, W1CLV	2degrees, One	3
Sherenden RBI	SHDN, CSHN, W1SHD	2degrees, One, RCG	3
Taradale	W1TRD	One	2
Tukituki	CTKI	2degrees, One, Spark	4
Waipukurau Cell	WPKU, W1WPK, CWAI	One, RCG, Spark	4

In the case of Mount Threave, Patoka, Rapunga, Clive, Sherenden, Tukituki, and Waipukurau, multiple cellular networks can be impacted by single points of failure in power delivery.

6.6 Non-Cellular Gateway Sites

WISPs, mobile radio operators, utilities, and other non-cellular network operators have significant numbers of microwave links that are as important as cellular gateways. They centre on a few sites that are as important as Trunk Microwave sites or those with Emergency Services. These sites include:

Table 5
Non-Cellular Gateway Sites

Site	Site Users
Kauahei	Aonet, Chorus, Inet, Spark, Vital
Mount Threave	Aonet, One, Engage, Two Degrees, Vital
Roy's Hill	Aonet, One
Te Puna / Te Mata Peak	Aonet, Chorus, One
Two Peaks	Aonet, Chorus

Mt Threave, Aonet

7.0 Recommendations

Addressing risk in the most economic and impactful way will require prioritising gateway sites and radio, broadcast, and WISP sites with significant coverage.

7.1 Enhance battery capacity at key cellular sites

Feedback from carriers indicates that battery backup to cellular sites is under-provisioned in the face of natural disasters, no matter how important a site is. One provisions between 3-6 hours of run-time in battery capacity to its cellular towers, Spark 4-8 hours, and RCG 8 hours. 2degrees did not respond to questions about battery backup, but we can assume their sites have a similar specification.

All carriers rely on the ability to deliver portable generators and staff to sites that have suffered power outages. This design is appropriate to handle the failure of individual power feeders but is not scalable to region-wide power outages. It also fails when sites are inaccessible due to impassible roads and/or poor weather.

Some operators take access conditions into account for the purpose of power planning. With sites that are all rural and remote, RCG provides the longest battery run time of any provider. They have also committed to increasing battery backup to 24 hours at their most critical sites in the region.

Given the principle that the first 48 hours are the most important for saving lives following a natural disaster, all sites that are the primary communications platform for any part of the region should be provisioned with 48 hours of standby power. While it's not reasonable to expect every tower and all advanced wireless broadband services to be kept online during a disaster, basic telephony and messaging via coverage frequencies (700 and 850 or 900 MHz) should be supported.

The TCF and mobile operators have raised significant concerns regarding the 48 hour target. They believe that several factors make this target challenging to achieve. Among their concerns are the National Environmental Standards for Telecommunications Facilities (NESTF), which restrict the size of battery cabinets, potential objections or additional costs imposed by landowners, the need for battery replacements every three to five years, practical issues related to the size and weight of batteries, the substantial power requirements of cellular sites, and the high associated costs.

The TCF has estimated that adding 24 hours of lithium-ion battery backup could cost up to $90,000, suggesting that 48 hours might cost around $180,000. However, based on power requirements provided by one operator, it appears that basic coverage at a mobile site could be maintained for 48 hours with 100-120 kWh of storage, roughly equivalent to the capacity of the battery in an electric ute. This suggests there may be more cost-effective solutions to meet the 48-hour backup power target.

Cabinetised 100 kWh batteries are now a standard offering for off-grid systems. Some Chinese vendors include Blue Carbon, BSLBATT, BYD, EV Lithium, GreenSun, and JMHPower. Most of their offerings have a twenty year design life, occupy around 2 cubic metres of space, weigh around 1.3 tonnes, and sell for less than $80k USD one-off.

Looking to western solutions, Sweden's Polarium makes a Lithium battery designed for telecommunications that's already in use by multiple providers in NZ. It can be configured for 120 kWh of capacity in a standard outdoor rack 600 wide, 800 deep, and 1.8 metres tall, weighing less than 700 kg, at a cost of $80k NZD.[15] Installation and a cabinet could add an additional $30k on average given compliance costs and the site-specific engineering required for a concrete pad to hold the cabinet.

Most 100-120 kWh solutions reviewed for this paper consume less than half of the cabinet footprint allowed by the NES and meet height requirements for all area types.[16]

With around 167 towers providing 700 MHz coverage in Hawke's Bay between the three operators and their joint-venture rural company RCG, the investment required to bring the region up to 48 hours of complete autonomy should be less than $20m. It would be a small sum for twenty-year assets providing to a region that likely contributes around $68m in annual mobile revenues to the three operators.[17]

The resistance to providing 48 hours of power from the TCF is unlikely to do with the cost of providing for Hawke's Bay, but the cost of providing a similar service level across the entire country. Increased resilience here would be met with demands for the same from other regions around Aotearoa and a national investment could cost the three operators around $700 million dollars.

15 Complete Comms quote for SLB48-250-146-2, 24 April 2024. System would include nine units.
16 National Environmental Standards for Telecommunication Facilities: Users' Guide. Ministry for the Environment, 2009. https://environment.govt.nz/assets/Publications/Files/nes-telecommunications-facilities.pdf
17 Based on a 3.15% share of around 2.16 billion dollars of mobile revenues in 2023.

Counties Energy's Revolve Berm Battery. Photo: Juha Saarinen, interest.co.nz

This level of investment in infrastructure – especially long-term infrastructure like power systems – no longer aligns with the business models of the mobile operators. All three retail providers have recently sold their towers to TowerCos. So far they've retained ownership of their active equipment including power systems, but their ownership of power systems doesn't make financial sense.

TowerCos with their longer investment horizons would be better placed to own power systems on behalf of operators, and at least one is actively exploring the proposition.

With the facts considered, Hawke's Bay should continue to insist that key communications platforms can operate independently for 48 hours when disaster strikes. Feedback from the industry suggests that it's an unreasonable proposition for them alone, and instead they would look to work with lines companies and carriers on innovative solutions to meet the target.

7.2 Alternative energy or grid-scale backup for critical sites

Trunk microwave towers, towers that provide emergency services, gateway sites, and locations that provide to multiple telecommunications companies should all be considered critical and should be provisioned with power that takes into account the likely restoration time for the site. In some locations this could be one or two weeks.

The TCF and some providers discount the use of solar to power telecommunications infrastructure, but when augmented with appropriate batteries and the generators already present at transmission towers, it can be a viable solution.

Kahuranaki, a major transmission site south of Havelock North, suffered a power fault during cyclone Gabrielle that resulted in a multi-day outage of VHF communications to another lifeline provider.

Like many transmission sites Kahuranaki is sited on freehold land owned by Chorus, a parcel carved out of the surrounding farm decades ago by the post office when the site was built. The Chorus land at Kahuranaki is around a hectare. Covering just ten percent of the site at Kahuranaki with solar panels would allow for off-grid operation of a 10 kW load with only 410kWh of battery storage.[18]

At Mt. Erin, Kordia has a 2.5 hectare block of land. At Gwavas Chorus is sited on Crown land. At Te Waka Chorus sits on an 0.37 hectare block of land, and at Taraponui their land holdings are 17 ha. At Pukeorapa the Chorus tower sits on private land, but despite not owning the land, the site has already been converted to fully off-grid with just around 100 m² of solar panels.

Where no large structures exist and space is at a premium – for example at the cellular towers just East of Waipukurau town – grid scale batteries, which could be operated by an energy generator or the local lines company, could be installed without solar to ensure continuous communications in the event of a long-term power loss.

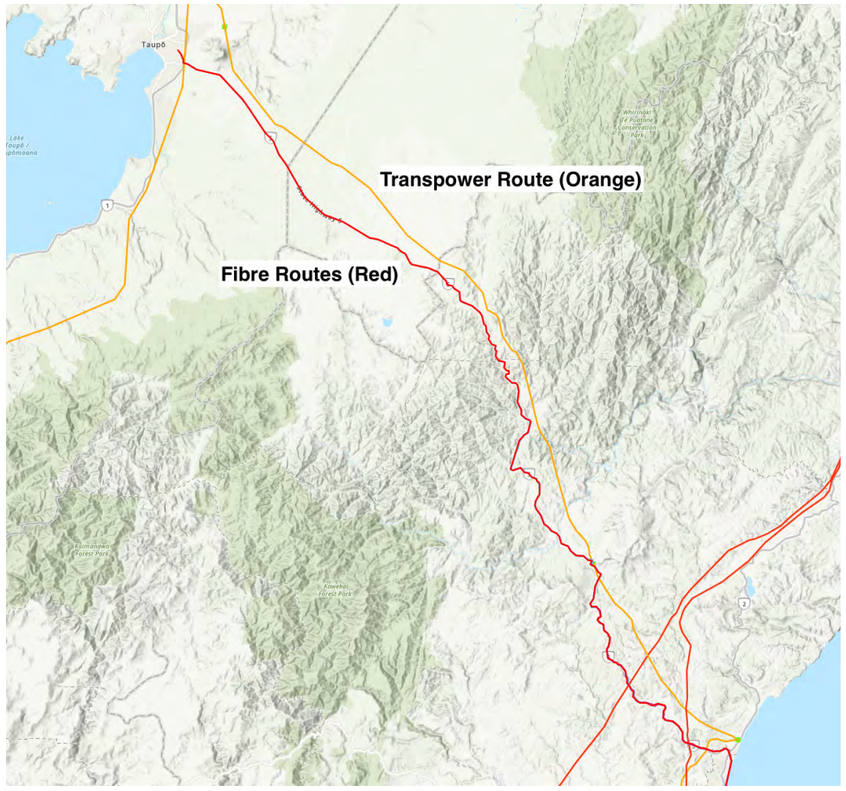
Early grid-scale battery projects such as Mercury's Tesla Powerpack 2 trial in 2018 were limited in commercial appeal. That project cost $2m NZD for a 2 MWh battery,[19] or around $612 USD per kWh of storage. The US Government's National Renewable Energy Laboratory found that by 2022 similar batteries cost around $482/kWh, and predicts costs could be as low as $245/kWh by 2030.[20] Based on a straight line interpolation of these price points, we can expect projects built in late 2024 to cost around $400 USD /kWh, or around $650k NZD per megawatt hour of storage at today's exchange rates.

One recent example of a lines-company operated grid-scale battery is the Counties Energy Berm Battery.[21] At 240 kWh it's twice what's necessary to support coverage frequencies from a cell tower for 48 hours. By using recycled car batteries it also keeps costs down to around $75,000.[22] The downside of these recycled batteries is a larger cabinet than would be required using new parts.

18 Based on NIWA's total meteorological year calculations for Kahuranaki, given 1,000 square metres of panels generating a maximum of 272kW of energy and 80% depth of discharge on standard LiFePo4 batteries.
19 Colthorpe, Andy. "Hydro-Redispatch, Energy Trading Trial for New Zealand's 2MWh Tesla Powerpack." Energy-Storage.News, January 17, 2018. https://www.energy-storage.news/hydro-redispatch-energy-trading-trial-for-new-zealands-2mwh-tesla-powerpack/
20 Cole, Wesley, and Akash Karmakar. "Cost Projections for Utility-Scale Battery Storage: 2023 Update," 2023. https://doi.org/10.2172/1984976
21 Scoop News. "Counties Energy Repurposes End Of Life EV Batteries To Recharge New EV Cars | Scoop News." Press Release, June 4, 2024. https://www.scoop.co.nz/stories/BU2406/S00020/counties-energy-repurposes-end-of-life-ev-batteries-to-recharge-new-ev-cars.htm
22 Saarinen, Juha. "Counties Energy Tries out Berm Battery Concept." interest.co.nz, June 4, 2024. https://www.interest.co.nz/technology/128086/using-recycled-nissan-leaf-batteries-counties-energy-deploys-240-kwh-stored

7.3 Diverse fibre optic backbone path

The vulnerabilities of the region's fibre optic networks were made clear by cyclone Gabrielle. GIS data demonstrates the extreme vulnerability of the region's fibre trunks even today. The most reasonable solution to the lack of diversity is a new path, following a route with exposure to different hazards.



An Optical Ground Wire (OPGW) trunk along Transpower's transmission towers is likely the most cost effective way of establishing an alternative path North and South from Hawke's Bay. While not without its challenges, such an exercise would use a technology known to and understood by Transpower. To avoid legal pitfalls – including Transpower's own legislative mandate, the easiest path forward may be for an organisation like a local fibre company to lease space on Transpower's towers to operate the fibre. A legal pathway for such a venture was enabled by the Telecommunications (Property Access and Other Matters) Amendment Act 2017.

The TCF has expressed concerns about the proposal for an OPGW path out of the region. They questioned the necessity for additional diversity and the assumption that it inherently enhances resilience. They also raised concerns about the requirement for carriers to build additional infrastructure and pointed out that one fibre optic path remained active during Cyclone Gabrielle. Additionally, they noted that OPGW cables can be susceptible to damage from lightning strikes. However, some individual providers were more supportive of the concept, and one operator has committed to exploring the opportunity in detail.

7.4 Stable Terrestrial Clock Source

Nearly all cellular towers in the region source their clock via GPS antennas at each tower. Loss of GPS services due to accident or sabotage is a significant risk that appears in national risk registers around the world. It's been a common theme in Russia and Ukraine over the past two years,[23] and GPS jamming equipment is available and inexpensive.
Alternative terrestrial clock sources have been available and standardised for many years, and should be installed on a regional basis. While they still source their time via satellite, some can keep accurate time in the absence of GPS signal for up to a month. The most appropriate technology today for distributing time signals is IEEE's 1588v2 protocol, which is a point-to-point (P2P) time protocol. Chorus has a consultation open now on providing such a service to its customers.

For locations where it's impractical to take a terrestrial clock service via fibre, and microwave links in place do not support modern P2P time protocols, local clocks with Rubidium oscillators can, once first synchronised via satellite, hold a stable time for weeks or months in the event of a loss of satellite communications.

The TCF has expressed reservations about the assertion that loss of GPS signal would result in a complete loss of communications. Instead, they believe it could lead to increased interference with TDD deployments. They are also actively participating in the development of a business continuity plan led by NEMA, which includes strategies for managing the loss of satellite-based timing.

23 Burgess, Matt. "GPS Signals Are Being Disrupted in Russian Cities." *Wired*, December 15, 2022. https://www.wired.com/story/gps-jamming-interference-russia-ukraine/

7.5 Improve Physical Site Security at Remote Locations

While security cameras alone won't put off the most determined criminals, their use can be part of a layered approach that can help protect both permanent and temporary equipment. Flood lights, audible alarms, and concrete pads with ground anchors can also be added at road accessible towers or those known to be theft or vandalism-prone to help ensure their continued operation.

The TCF believes that the problem of site security should be addressed by Civil Defence and Emergency Management, rather than by telecommunications providers.

Te Waka, Chorus

8. Feedback to the Recommendations

More than a dozen individual organisations provided feedback to a draft of this paper, and the TCF provided feedback on behalf of its members. Much of that feedback has been integrated into the report, adding details and removing sensitive information where requested. Below is a summary of that feedback.

Mobile companies
- Want more resilient grid power infrastructure serving their towers.
- Want councils to keep roads open so they can deliver generators to their towers when power fails.
- Are resistant to installing additional backup battery capacity across the network.
- Generally question the idea that solar is a credible means of powering their infrastructure due to the space required for it.

Wireless Internet Service Providers (WISPs)
- Noted that their solar sites stayed online during Cyclone Gabrielle.
- Are concerned with their ability to refuel generators at hub sites due to their inability to source fuel and bypass road closures.

The Telecommunications Carriers Forum
- Questions the recommendations as being realistic or achievable.
- Thinks a cost-benefit analysis is required before changes are made.
- Thinks that resilience through diversity is unrealistic.
- Wants CDEM to handle physical site security during emergencies.
- Would like the region to support amendments to the NESTF.
- Wants the council to make more public land available to telcos.

A lines provider
- Notes that they are reliant on generators and the grid for power.
- Cannot guarantee uninterrupted supply of power.
- Does not build redundancy specifically for telecommunications users.
- Believes that backhaul failure was as much a cause for communications outages as loss of power.
- Sees power resilience for cell sites as the responsibility of telecommunications operators.

Multiple responders
- Would like their staff to have permanent identity cards establishing their identities as lifelines service providers, which would allow them priority access to fuel and access to bypass travel restrictions.

Some of these comments have implications for a range of other agencies and infrastructure operators which will need to be discussed between relevant agencies. Infrastructure sector agencies have indicated a willingness to engage with other lifeline utility operators to discuss critical dependencies and building resilience across the wider lifeline infrastructure system.

9. Conclusion

"To date, the New Zealand government has not taken a comprehensive or coordinated approach to critical infrastructure regulation. No agency has policy or regulatory responsibility for New Zealand's critical infrastructure system." [24]

While geologic hazards remain probable but unpredictable, science points to risks from climate hazards increasing. Both the frequency and the intensity of extreme weather events is on the rise,[25] and our infrastructure must be prepared for it.

In this context, it is important that the region continues to work with operators, lines companies and Councils to effect changes that will improve the resilience of critical infrastructure particularly in the telecommunications sector.

As noted above, there is a willingness to engage with electricity and transport sector agencies to build critical infrastructure resilience. However, telecommunications infrastructure owners and operators still need to consider improving their network and service resilience, and those that address shared dependencies with other infrastructure lifeline operators, particularly those in the electricity and transport sectors.

Important next steps for the region include:

- Addressing the weaknesses of the report methodology. This could be done by appointing a data steward tasked with regular interactions with infrastructure providers to ensure the data the council holds on their networks is current and complete.
- Working with Spark and other willing providers to integrate their network information into Hawke's Bay's GIS in real time via shared GIS layers.
- Convening a workshop to review the Hawke's Bay Towers: Power and Dependencies output, and agreeing between the region and providers which sites should be targeted as priorities for improvements in resilience.
- Developing shared policy guidelines for telecommunications networks used by regional government entities. The guidelines should specify levels of resilience operators must maintain to be considered preferred suppliers.
- Ensuring policy guidelines are cited as weighted factors for all future procurements of telecommunications services.
- Publishing these guidelines and sharing them with the region's significant commercial entities, suggesting all of Hawke's Bay's business community also take telecommunications resilience into account when making purchasing decisions.

Without significant improvements in resilience another similar multi-day communications outage is likely to happen again in the near future. It's imperative the region do everything it can to protect against this eventuality.

24 New Zealand Government. "Strengthening the Resilience of Aotearoa New Zealand's Critical Infrastructure System: Summary Discussion Document," June 2023. https://consultation.dpmc.govt.nz/national-security-group/critical-infrastucture-phase-1-public-consultation/user_uploads/dpmc--summary-dd--strengthening-the-resilience-of-ci.pdf

25 Ministry for the Environment. "The Science Linking Extreme Weather and Climate Change," February 3, 2023. https://environment.govt.nz/news/the-science-linking-extreme-weather-and-climate-change/

9. Appendices

9.1 Glossary of Terms

CDEM: Civil Defence and Emergency Management
Exchange: a building used as a hub for fixed line telecommunications
GIS: Geographic Information System
GNS: the Institute of Geological and Nuclear Sciences Limited
GNSS: Global Navigation Satellite Systems
Hazard: A dangerous natural phenomenon that may cause loss of life, property damage and disruption.
HBRC: Hawke's Bay Regional Council
Lifelines Council: a national organisation that supports regional lifelines groups.
Lifelines Group: a regionally-focussed group representatives from lifelines utilities, governments, emergency management organisations, scientists, and others who work towards the resilience of lifelines utilities
Lifelines Utilities: entities that provide essential infrastructure services to the community including water, wastewater, transport, energy and telecommunications.
NEMA: National Emergency Management Agency
Matariki (HBREDS): Matariki is the Hawke's Bay Regional Economic Development Strategy.
Risk: The combination of the probability of an event and its negative consequences.
RRA: Regional Recovery Agency
RRF: Registry of Radio Frequencies
VHF: Very High Frequency, a band used for personal and vehicle radio communications that has better radio propagation than cellular frequencies, but far lower bandwidth.
WISP: Wireless Internet Service Provider

9.2 Organisations supplying information

Many interested parties were invited to provide inputs to this study. The author would like to thank the following for their assistance.

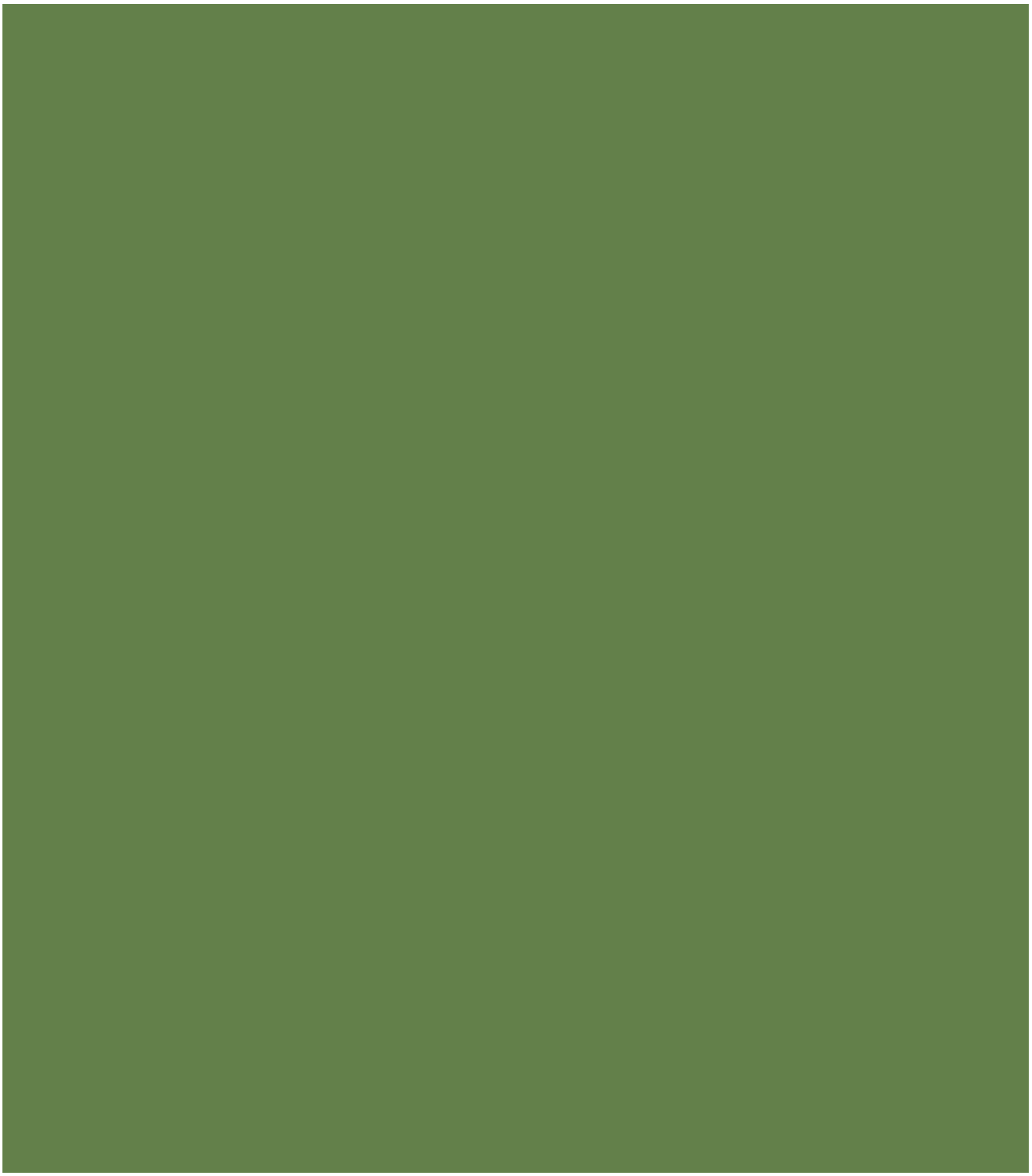
- Aonet
- 2degrees
- Centralines
- Chorus
- Evolution Wireless
- Firstlight
- Gecko
- Gisborne.Net
- Hawke's Bay Regional Council
- Inspire
- Kiwirail
- Napier City Council
- Napier Harbourmaster
- One (Vodafone)
- Port of Napier
- Rural Connectivity Group
- Spark
- Telecommunication Carriers Forum
- Transpower
- Vital
- Unison

8.3 Cellular Tower Information

A Google Sheet produced for the study contains a set of 223 Radio Spectrum Management Location IDs that have cellular services licenced, or support locations that have cellular services. It identifies tower information, operator site codes, backhaul method, backhaul location, and power supply information including FirstLight and Unison transformer areas and ids.

HAWKE'S BAY REGIONAL RECOVERY AGENCY

Hawke's Bay Regional Economic Development Agency



HERETAUNGA HASTINGS DISTRICT COUNCIL

Enterprise Risk Management Policy & Framework

[Approval Date TBC]

Enterprise Risk Management Policy & Framework

Policy expert	Chief Risk Officer
Policy owner	Council
Owner Group	Office of the Chief Executive
Approval date	TBC
Version	7.0
Review date	TBC

Change History

Amendment (s)	Date	Updated by and authority
First Release	12 Sep 2012	Updated by Business Service Manager. Authorised by Leadership Management Team
Annual Review V1.1 Minor changes to text for clarification	16 Sep 2013	Updated by Business Service Manager.
Full Review V2.0 Overview of risk management updated to reflect ISO 31000 standard. Guiding principles from the ISO 31000 standard included in risk framework. Roles and responsibilities, and conflict of interested included in Policy section. Need for risk management to be integrated in to all business activities reinforced throughout.	9 Feb 2017	Updated by Business Service Manager.
Audit & Risk V2.1 Protection of personal safety added to policy objectives. Risk matrix included as Appendix 1.	28 Feb 2017	Updated by Business Service Manager. Confirmed by Audit & Risk Subcommittee.
PWC feedback incorporated V2.2 CE commitment statement added Reference to Risk Handbook included. Enhancements include; - Annual policy review, principles moved to Policy section, risk process overview included, Additional guidance relating to consultation and treatment plans. Risk	11 May 2017	Updated by Business Service Manager.

Amendment (s)	Date	Updated by and authority
register management and monitoring Glossary of Terms added.		
Purpose amended to include community outcomes	21 Jun 2017	Updated by Business Service Manager. Confirmed by Council
Draft removed. Version published	13 Jul 2017	Updated by Business Service Manager. Approved by Council 13 July 2018
Annual review. Moved to new policy template: - Add Architecture section. Include Council responsibilities in Purpose and Roles & Responsibilities. - Updated risk principles to match ISO31000:2018 - Updated Risk Appetite and Tolerance. - Risk Impact and matrix revised. - Minor amendments to Risk Process Analysis and Evaluation sections.	3 Aug 18	Updated by Risk and Corporate Services Manager. Approved by Council 31 January 2019
Annual review: - Architecture section updated to reflect current structure. - Risk appetite section added and tolerance statements included.	10 July 20	Updated by Risk and Corporate Services Manager. Approved by Council 8 December 2020
V5 changes include: - Supporting documentation listed 3 LOD model included in the framework. - Reference to the HDC Water Safety Plan included. - Opportunity risk descriptions added and community impact scale added. - Risk Appetite statement updated to match LTP.	17 Nov 21	Updated By Risk and Corporate Services Manager.
Annual review version 5.2 – No change recommended Note: Delayed due to Cyclone Gabrielle	6 July 23	Updated by Chief Risk Officer
Annual review version 6.0 - Lead Team meeting frequency changed - Updated 3 lines model added. - Risk Appetite table and statements updated.	14 June 24	Updated by Risk Manager and Chief Risk Officer
Annual review version 7.0 - Transferred to new branding policy -	27 June 2025	Updated by Risk Manager and Chief Risk Officer

Contents

Item 12

1. Purpose

The purpose of this document is to describe the Hastings District Council (HDC) Enterprise Risk Management (ERM) framework, including the architecture, strategy and protocols, and how ERM is used to manage significant risks that affect successful achievement of the organisation's objectives.

Note: A Risk Management Handbook that includes a summary of the strategy and protocols described in this document is provided as a quick reference for staff.

1.1. Background

"Organisations of all kinds face internal and external factors and influences that make it uncertain whether, when and the extent to which they will achieve or exceed their objectives[1]". The effect this uncertainty has on the organisation's objectives is 'risk'.

Risk management provides a structured approach that can be applied to any discipline or undertaking to reduce uncertainty and enhance value.

Risk management achieves this by creating visibility of operational risk (including assumptions and uncertainties), and by describing consequences to be avoided or opportunities to be pursued.

Successful implementation of risk management relies on informed and engaged staff, and incorporation of risk management into 'business as usual' activities. Risk management within HDC is supported by senior leadership in a 'no blame' reporting culture. All staff are expected to engage in identifying and communicating risks associated with their work.

1.2. Governance Oversight

Collectively the Councillors are responsible for setting risk management tone and objectives, and for oversight of the organisation's strategic risks. This includes determining acceptable levels of risk exposure (refer to Risk Appetite and Tolerance) and confirming that management operate within the limits defined.

1.3. Chief Executive Commitment

To ensure we can deliver the Council's long term plan and work programme safely and effectively, it is important we understand and address the risks we may face. Through the application of good risk management we can minimise the possibility of harm and loss, whilst taking advantage of opportunities to innovate. I am committed to ensuring that all Council staff are well equipped to follow good risk management practices. This is particularly important when it comes to protecting our people, our community and our environment.

Risk management enhances our service culture and should be engrained in our DNA. Risk management is a continuous journey of learning and its application underpins our ability to deliver positive outcomes for our community.

Nigel Bickle, Chief Executive

[1] ISO 31000:2018 Risk Management –Guidelines, Introduction, Page v.

2. Architecture

2.1. Reporting Structure

The overarching responsibilities for managing risk within HDC are as follows:

- Overall responsibility for ensuring risks are mitigated resides with the Council as the governing body.
- The responsibility for ensuring robust risk management practices are in place is delegated to the Risk and Assurance Committee.
- The Executive Lead Team (LT) is ultimately responsible for ensuring risk are effectively managed.

Risk information flows down from the Council, and is reported up from Groups and business teams as shown in the diagram below:

In addition to this regular information flow, issues that arise between reporting cycles will be raised with the appropriate forum in a timely manner to allow effective treatment decisions to be made.

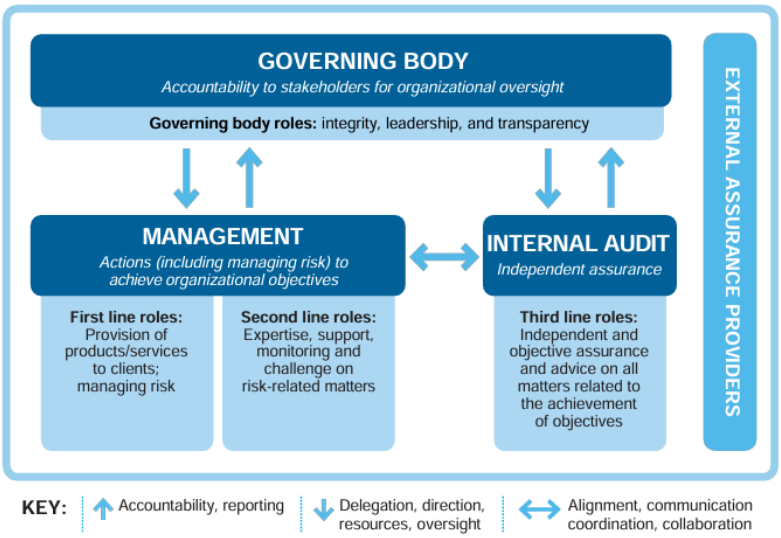
Business units and underlying teams may adopt or adapt this framework to meet their needs as deemed appropriate by the line manager. However, in all cases high risk issues identified by these teams must be escalated to LT or Risk and Assurance Committee as described in this framework.

2.2. Supporting Documentation

This Framework is supported by the Risk Assurance Charter and Risk Management Handbook.

2.3. Roles and Responsibilities

Roles and responsibilities within this framework are based on the 3 lines of defence as outlined in the image below (*taken from The Institute of Internal Auditors, An update of the Three Lines of Defence, 2020*).



Role	Responsibility
All Staff	Actively involved in managing risk. Consult with and keep line managers informed about risk as appropriate.
Risk Owners	Accountable for management of assigned risks. Consult with and keep LMT informed about risk as appropriate.
Chief Risk Officer and Risk Manager	Provide advice and support to Risk Owners and staff, as well as undertaking Assurance Reviews as defined in the Risk Assurance Charter.
Group Manager	Have practices in place within their Group to: - Identify, assess and monitor risks. - Assign responsibility for managing risks. - Develop and implement treatment plans to reduce risk exposure. - Regularly review risk controls and treatments. - Appropriately communicate and escalate risks as required. - Consider new, emerging and changing risks. - Support and encourage staff to engage in risk identification and response actions.

Lead Team (LT)	Assess and monitor the organisation wide risk profile. Regularly review risk controls and treatments. Set priorities and allocate resources for risk mitigation.
Councillors (Elected Members)	Responsible for setting risk management tone and objectives. Define the organisation's risk appetite. Confirm that risk is managed within prescribed tolerance. Review the Tier 1 strategic risk register and seek assurance that adequate controls are in place and effective.

2.4. Conflict of Interest

Any conflicts of interest identified through the risk management process shall be handled in accordance with the Conflict of Interest and Gifts policy held on Infokete.

3. Strategy

HDC is committed to managing risk to the organisation and community in an on-going and proactive manner. Effective risk management enhances the ability of HDC to achieve the strategic objectives defined in the Long Term Plan (LTP) and meet its statutory obligations.

HDC manages risks in order to:

- Improve decision making.
- Identify innovations.
- Clearly document risk exposure.
- Appropriately communicate and report on risks.
- Integrate risk management culture into our business.

This framework and policy, supported by the HDC Risk Management Toolkit, outlines the organisational risk management objectives and commitment in order to achieve proactive identification and mitigation of risks that arise as part of the organisation's activities.

3.1. Scope and Applications

The scope of the Risk Management framework and policy is organisation wide and will be fully integrated into the organisation's strategic, operational and project planning activities. The development of the framework and process has been informed by the approaches used in these activity and planning areas.

3.2. Guiding Behaviours and Measures

In line with organisation's risk management principles and industry best practice, the framework guides staff to:

- Identify, assess, treat and monitor risks.
- Appropriately communicate and escalate risks.
- Consider new and emerging risks.

Guiding Behaviours	Measuring Success
•The Chief Executive and Group Managers lead and promote risk management.	•Risk roles and responsibilities are well understood.
•We have a "risk smart" culture where risks are systematically managed, monitored and reported.	•Staff know how and when to discuss risk with management based on good process and a supportive environment.
•We ensure that staff are equiped with the skills and guidance needed.	•There are few surprises; risk reporting provides early warning.
•Our people are encouraged and supported to escalate risks as appropriate.	•Council's objectives and outcomes are met and the Council's reputation and image are protected.
•We openly and constructively engage in risk discussion at all levels.	•Risk management within Council is continuously reviewed and improved.
•We integrate risk management in to all decision making and planning.	•Internal and external stakeholders are confident that Council manages risk within acceptable levels.
•We proactively manage threats in line with risk appetite to reduce the consequence and likelihood of not meeting objectives.	•Risk management occurs throughout the development and implementaiton of any business plan, policy, programme or project.
•We proactively innovate to improve our delivery of objectives.	•All Groups speak the same risk language and respond to risk in a consistent way.

4. Policy Statement

In setting our objectives HDC will consider and take into account the risks associated with achieving those objectives.

HDC recognises that it is prudent to systematically manage and regularly review its risk profile at a strategic, operational and project level. The organisation does this by applying this risk management policy and protocols, which defines the management practices required to support the realisation of Council objectives. Not only does HDC wish to minimise relevant threats, but also to maximise its opportunities through innovation.

4.1. Mandate and Commitment

Elected members and senior leadership support the use of risk management as a key management tool, and expect risk management to be an integral part of decision making. Managers and staff in roles responsible for managing risk will be provided with adequate training and systems to support the open and honest communication of risk information.

The risk management system will be monitored on a frequency considered appropriate by elected members and senior leadership.

4.2. Objectives

The Council's risk management objectives are:

- Protection of personal safety is ensured in all undertakings.
- HDC has a current comprehensive understanding of its risks.
- All sources of risk are assessed before undertaking any activity.
- The organisation's risks are managed within the risk criteria (appetite) that have been established for the particular activity.

4.3. Principles

For risk management to be effective, the following principles should be applied at all levels within HDC:

a) Integrated part of all organisation activities.

b) Structured and comprehensive approach.

c) Customised and proportionate to the organisation's needs.

d) Inclusive to achieve timely involvement of stakeholders.

e) Dynamic so that appropriate changes are made in a timely fashion.

f) Best available information applied to risk analysis.

g) Human and cultural factors are considered at each stage.

h) Continual improvement achieved through learning and experience.

4.4. Risk Appetite and Tolerance

Risk appetite refers to the amount of risk Council is willing to accept or retain in pursuit of its goals. Depending on the nature of the activity different levels of risk may acceptable, which in turn has the potential to create different degrees of variation in the achieved performance. As a result, there will be a range of outcomes that the Council may need to accept. This range in outcomes is the organisation's risk tolerance.

In this sense risk management is about finding an acceptable balance between the impact on objectives should a risk be realised and the implications of treating the risk. Therefore, the financial cost, potential service level impacts and other consequential risks associated with a different approach must be considered. It should be recognised that all actions and approaches come with their own risks which should be considered throughout the risk management process.

4.5. HDC Risk Appetite Statement

The Council's over-arching risk appetite statement is as follows:

The Hastings District Council is responsible to the rate payers of the District to enable democratic local decision-making and action by, and on behalf of, communities to promote the social, economic, environmental, and cultural well-being of communities in the present and for the future.

To achieve these outcomes Council has a **conservative** appetite toward risk that would adversely affect core services. In contrast, there is a desire to leverage opportunities that enhance outcomes for the community. As a result, there is a willingness to accept more risk associated with innovation or solutions that create long term benefits.

Accordingly, whilst the overarching risk appetite may be conservative, Council recognises that it is not possible, or necessarily desirable, to eliminate all of the risks inherent in its activities. In some instances acceptance of risk within the public sector is necessary due to the nature of services, constraints within operating environment or a limited ability to directly influence where risks are shared across sectors.

Therefore, in relation to the specific strategic objectives Council's risk appetite may vary depending on the circumstances and trade-offs implicit in the specific context. Resources within business units and projects are aligned to priority outcomes based on the specific risk appetite, and arrangements are in place to monitor and mitigate risks to acceptable levels.

In situations where a greater level of risk taking may be considered appropriate to achieve a specific objective, Council will establish a risk appetite statement specific to the work programme. These objective specific risk appetite statements should developed by applying the risk appetite framework described in **Appendix 2** and be approved by the executive Lead Team, or Council in the case of a Long Term Plan objective.

4.6. Risk Appetite Terminology

	Rating	Philosophy	Tolerance for Uncertainty Willingness to accept uncertain outcomes or variations.	Choice Willingness to select an option puts objectives at risk	Trade-off Willingness to trade off against achievement of other objectives.
5	Flexible	Will take justified risks to deliver expected outcome.	Fully anticipated. Events may be Likely.	Will choose option/s with highest return; accepting possibility of failure.	Willing
4	Justified	Will take strongly justified risks to deliver expected outcome.	Expect some Events are Possible.	Will choose to put at risk, but will manage impact	Willing under right conditions
3	Measured	Preference for delivering expected outcome over taking risk.	Limited Events may be Possible.	Will accept if limited and heavily out-weighed by benefits	Prefer to avoid
2	Conservative	Extremely conservative. Strong preference for delivering expected outcome.	Low Events are rare.	Will accept only if essential, and limited possibility/extent of failure	With extreme reluctance
1	Averse	Avoidance of risk is a core objective Confident of delivering expected outcome.	As Low As Reasonably Practicable (ALARP). Events are very rare.	Will always select the lowest risk option.	Never

5. Risk Process

Risk management at HDC is based on each team, business unit and all levels of management identifying, recording and assessing risks to their area of work.

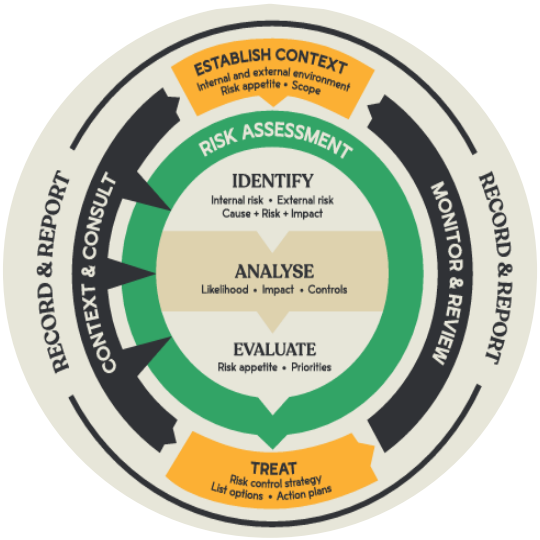
5.1. Integrated Risk Management

Each team must integrate the following risk assessment process into existing planning and decision making processes so that risk management principles can be applied. This will normally involve undertaking risk assessments as early as possible in a business process so that the greatest opportunity exists to mitigate potentially negative outcomes, or take advantage of innovations (e.g. all Asset Management Plans should contain a robust risk assessment).

The type of risk assessment used should be matched to the potential consequences. So where risk of failure is high a structured risk assessment process should be applied (i.e. bow tie), whereas for low risk activities a simple register could be sufficient.

5.2. Risk Process Overview

The following diagram provides an overview of the risk management process. The risk management process should be a logical progression from establishing context, risk identification and assessment through to treatment of these risks. Recording and reporting, communication and consultation, and regular monitoring and reviews are required throughout the process.



5.3. Risk Process Map

To support the risk process shown in 5.2 a process map has been developed to provide step-by-step guidance. The diagram below shows the high-level activities that form this process. For further detail refer to the Promapp process or the HDC Risk Management Handbook.

5.4. Communication and Consultation

Effective risk management is based on continuous communication between internal and external stakeholders, and should include open two-way communication at all levels. This will help to ensure that individual risks are well understood so that robust risk ratings, risk treatment plans and monitoring requirements are established to increase confidence in successfully achieving Council goals.

5.5. Establish Context

An important part of the risk management process is to consider the context for the activity being undertaken. Most importantly this involves developing a clear understanding of the key goals and objectives, and that the performance measures for these outcomes are considered.

When defining the context for a risk assessment, it is important to consider:

- The nature and type of hazards and consequences that might arise.
- How likelihood and impact are defined.
  IMPORTANT: By default the corporate standard definitions should be applied. However, in special cases it might be appropriate to define a tailored approach (e.g. for a major strategic project). If this is required the Chief Risk Officer or Risk Manager must be consulted.
- Whether combinations of risk should be taken in to account, and if so, how they should be considered.
- The level at which risk becomes acceptable or tolerable.
  IMPORTANT: By default the Tolerance statement in this framework should be applied. Any variation form this should be approved by LT.

At this stage of the process communication and consultation is important. To fully understand the context consideration should be given to consulting other affected parties or stakeholders and wider management.

5.6. Risk Identification

Risk workshops are considered an effective way to initially identify risks associated with HDC business and operations. Workshops should include a wide range of internal and external stakeholders to uncover the full scope of risks that may exist.

When considering the source of risk each of the factors on the impact scale (People Safety, Financial, Service Level, Compliance, Reputation and Environment) should be considered for potential threats or opportunities.

Risks are recorded in a risk register held by each group. Risk details will record an accurate description of the risk, cause and effect to provide clarity for analysis and preparation of treatment plans. Ownership for each Risk should be allocated to a member of the team responsible for the Risk Register on which the risk is recorded.

5.7. Risk Analysis

Risk score is based on the likelihood and impact of an identified risk occurring.

An inherent assessment of the risk should be made based on the assumption that no measures are in place to control the risk. This establishes the raw risk to which the organisation is exposed. A subsequent risk analysis should then be performed to understand the current risk considering all the controls in place to mitigate the issue. The difference between these two assessments provides an indication of the degree of risk mitigation achieved and effectiveness of controls.

To determine the impact rating for a risk analysis the normal practice is to use the impact category (i.e. personal safety, financial, service level, compliance, reputation or environment) that has the greatest/highest level of impact to combine with the likelihood assessment.

As any risk analysis is subject to the state of knowledge at a specific point in time it is good practice to regularly update the assessment as the environment and state of knowledge changes.

The default organisation wide impact and likelihood definitions are included in **Appendix 1**. These definitions provide a consistent language to encourage consistent assessment of risk. However, they are not absolute and should be used as a guide to validate the intuitive assessment of risk.

Approved likelihood, impact and risk matrixes can be found in the following documents:

- HDC Risk Management Toolkit.
- HDC Health & Safety Manual.
- HDC Water Safety Plan

Customised likelihood, impact and risk matrixes may also be developed for projects to reflect the specific needs of the projects. These matrixes must be approved by the Risk team for alignment with the corporate framework.

Note: There may be slight differences between the descriptions used in each area. This is intended so that the risk management tool is appropriately matched with the activity.

5.8. Risk Evaluation

The current risk score established during the risk analysis is then used to determine whether the risk is tolerable by comparison with the Council risk appetite. Any risks that are not tolerable should be prioritise based on the risks score in order to identify the most important issues for treatment. This allows for effective allocation of resources to achieve the greatest benefit.

Threats classified as High or Extreme cannot be tolerated and treatments must be put in place to reduce the risk. In those situations where there is a low risk tolerance, all effort should be made to ensure the residual risk of the event occurring is As Low As Reasonably Practicable (ALARP). Refer to the Risk Tolerance statement and Escalation section for further guidance on tolerable risk and risk treatment requirements.

5.9. Risk Treatment

Development of risk treatments and action plans is key to the success of risk management, as this is how an increase in confidence for achieving key objectives is delivered.

When choosing a treatment option it is important to recognise that a new approach is likely to introduce new risks that need to be considered. The aim should be to achieve a balanced outcome for HDC and the customer/community using the service (e.g. introducing additional temporary traffic management for site safety might create confusion for drivers reducing the effectiveness of the control).

In general there are four options to consider when treating a threat risk known as the 4Ts (refer to Appendix 3 or the Risk Management Toolkit for further information):

- *Tolerate*: Accept or retain the risk and its likely impact.
- *Treat*: Take action to control or reduce the risk.
- *Transfer*: Move the risk to another party, for example through insurance.
- *Terminate*: Stop performing the activity to avoid or eliminate the source of risk.

IMPORTANT: The Health and Safety at Work Act and Regulations contain specific requirements on the hierarchy of controls for risk treatment. Refer to the reference to the H&S manual for details.

When considering opportunity risk the following treatment options known as the 4Es should be considered (refer to Appendix 3 or the Risk Management Toolkit for further information).

- *Exist*: Monitor those opportunity that have minimal potential reward.
- *Explore*: When the likelihood of an opportunity being realised is probable, but the expected benefit is minor, the issue should be explored to see if the impact can be increased.
- *Expand*. Opportunities that present a substantial beneficial impact and will probably occur should be expanded across the Council to gain the greatest benefit.
- *Exploit*: When the Impact of an opportunity is major, but the likelihood is only possible, the outcome should be exploited to improve the chance of realising the benefit.

While Opportunities will be deliberately taken to realise a benefit, it is important to recognise the relationship between risk & reward. As a result, an assessment of the threat risks that come with the opportunity must be undertaken to ensure any downside risk is within the Council appetite before taking action to Explore, Expand or Exploit an opportunity.

To determine the most appropriate risk treatment option(s) the following factors should be assessed;

- impact on service levels,
- cost,
- feasibility, and
- effectiveness.

Treatment and action plans should include;

- Description of the proposed actions and due date for implementation,
- When appropriate, include reasons for selecting the treatment options,
- Identify who is responsible for completing the action and any other resources needed,
- When appropriate, identify performance measures for the control, and
- The reporting and monitoring requirements.

However, allocation of the treatment actions does not imply ownership of the risk itself. Risk ownership remains with the manager responsible for the risk. Treatment plans are to be updated on a regular basis and a note on current progress of treatment actions recorded as well as any changes in detail.

5.10. Risk Escalation

Risk owners are responsible for ensuring that risks are escalated to the appropriate level of management or to Council when necessary. Risks scored as High or Extreme according to the appropriate Risk Matrix must be reported to the next level of management and/or Council, whichever is appropriate.

The management team receiving an escalated risk shall review the issue and decide which level of the organisation is best placed to own, and be responsible for treating, the risk. Based on this decision the risk may be:

1. Accepted onto that management team's risk register, or
2. Escalated further, or
3. Referred back to the team or business unit for action.

The following table outlines the threat risk action and escalation requirements:

Risk Descriptors	Impact	Action
Extreme Urgent and active management is required. Must identify treatments and implement action plans.	Would stop a number of key objectives being achieved. May cause widespread financial loss, or loss of reputation and confidence in HDC.	Immediate escalation to relevant Group Manager and/or LT. Consider escalation to relevant Council committee or sponsor. Include in Enterprise risk register.
High Senior management attention is needed. Must identify treatments and implement action plans.	Would interrupt the quality or timeliness of HDC's business objectives or outcomes. May result in significant financial loss, capability reduction or impact on the reputation of HDC.	Escalation to Group Manager. As applicable may need escalation to Council committee, sponsor or LT. Include in Group risk register.
Medium Risks require effective internal controls and monitoring. Management responsibility must be specified.	Would interfere with the quality, quantity or timeliness of HDC's business objectives. May have minor financial loss, capability reduction or impact on the reputation of HDC.	A strategy must be in place focusing on monitoring and reviewing existing controls. Include in Group risk register.
Low Routine procedures are sufficient to deal with the impacts.	Minimal impact on HDC's business objectives. Minimal financial loss, capability reduction or impact on the reputation of HDC.	A strategy should be in place focusing on monitoring and reviewing existing controls. Include in Group risk register if appropriate.

The following table outlines the opportunity risk action and escalation requirements:

Risk Descriptors	Impact	Action
Platinum Senior management informed. Responsibility for management oversight must be specified	Would enhance a number of key objectives. May result in substantial financial gain, or enhance reputation and confidence in HDC.	Escalation to relevant Group Manager and/or LT. Consider expanding application across Council to maximise the benefits realised. Include in Enterprise risk register.
Gold Senior management attention is needed. Should identify treatments and implement action plans.	Would noticeably improve the quality or timeliness of HDC's business objectives or services. May result in financial benefits, improved efficiency or enhanced reputation.	Escalation to Group Manager. Focus on exploiting the benefits. Include in Group risk register.
Silver Risks require effective internal controls and monitoring. Management responsibility must be specified.	Would improve the quality or timeliness of HDC's business objectives or services. May result in minor financial benefit, improved capability or enhanced reputation.	Activity should focus on exploring the potential benefits. Include in Group risk register.
Bronze No specific action required.	Minimal benefit to HDC's objectives. Negligible financial or reputation benefit.	No specific action required Monitor for change in context.

5.11. Risk Monitoring and Review

Risk monitoring provides for ongoing tracking of risk trends and treatment actions. Regular risk monitoring maintains visibility of risk activity and provides oversight for managers of the risks within business. Risk monitoring provides a common communication mechanism for maintaining awareness.

To facilitate this, management needs to provide feedback to relevant groups on risks accepted onto their risk register so staff are kept informed of progress on significant risks.

Risk monitoring is achieved by including Risk Management as an agenda item for all team and management meetings and is referred to in regular management reports. During management meetings risk reviews should monitor:

- Whether each risk still exists,
- Whether new risks have arisen,
- Whether the likelihood and/or impact of risks have changed,
- Report significant changes which affect risk priorities, and
- Deliver assurance on the effectiveness of risk controls.

Having risk as an agenda item at all scheduled meetings (e.g. monthly team meetings) enables risk registers to be reviewed and risk actions to be tracked on a regular basis. This approach supports the involvement of staff and integrates risk management into business as usual activities. Risks, risk treatments and actions inform planning and everyday business activities.

5.12. Risk Recording & Reporting

Risks are to be recorded in Quantate or in Risk Registers based on a standard template and stored in Content Manager. Using a standard template for risk registers enables risks to be collated across business units and between levels of management. The registers also provide for reporting of risk trends and logging actions in response to identified risks.

6. References

The primary reference and guidance document for the development of the risk management framework is the ISO 31000:2018 Risk Management – Guidelines.

Other relevant risk management publications will be used to aid application of standards and other related techniques to particular business situations. These publications include but are not limited to HB 436 Risk Management Handbook.

7. Review

The risk management policy and framework will be regularly reviewed to ensure it remains relevant to the organisation culture and needs. Reviews shall be performed at least annually, and submitted to Risk and Audit Committee for comment before being approved by Council.

8. Definitions

Term	Definition
Consequence	The consequential effect on strategy or operational processes as a result of a risk event occurring. Note: The consequences that an event will have on the organisation will only be evident after impact has occurred.
Current Risk	Existing level of risk taking in to account the controls in place. Note: can also be called Residual Risk.
Impact	The effect on People, Finances, Service Levels, Compliance or Reputation when a risk event occurs. This is the direct and measurable impact. Standard terms for rating Impact are: Severe, Major, Moderate, Minor & Insignificant.
Inherent Risk	Level of risk before any control activities are applied.
Likelihood	An evaluation or judgement regarding the chances of a risk even occurring. Often described as a 'probability' or 'frequency'. Standard terms for rating Likelihood are: Almost Certain, Probable, Likely, Possible and Rare.
Mitigation Control	Any measure or system that is intended to reduce the impact (consequence) of an event should it occur.
Opportunity	Risk that can enhance or have a positive impact on objectives.
Prevention Control	Any measure or system that is put in place to stop a threat causing loss.
Risk	The effect that uncertainty about internal or external factors has on achieving HDC's objectives. The effect on objectives can be positive or negative.
Risk Assessment	The process of risk identification and analysis.
Risk Analysis	A systematic use of available information to determine the likelihood of specific events occurring and the magnitude of their consequence.
Risk Appetite	The amount and type of risk an organisation is prepared to pursue or retain to achieve its strategic goals.
Risk Management	Management activities to deliver the most favourable outcome and reduce the volatility or variability of outcomes.
Risk Register	Document used to record risks, including the associated risk score and treatment plan.
Risk Score	The combination of consequence and likelihood assessments for a risk to derive an overall rating or priority for the risk.
Risk Tolerance	The degree of variability in attainment of goals, or capacity to withstand loss that an organisation is prepared to accept to achieve strategic goals.
Risk Treatment Plan	Actions aimed at reducing the likelihood and/or consequence of a risk.
Threat	Risk with adverse or negative impact on objectives.

9. Appendix 1: Likelihood, Impact and Risk Matrix Tables

9.1. Likelihood Assessment Table

Likelihood	Probability (*per annum*)	Time Based Descriptor
Rare	<10%	Unlikely to occur within a 10 year period, or in exceptional circumstances.
Possible	10% - 40%	May occur within a 10 year period.
Likely	40% - 70%	Likely to occur within a 5 year period.
Probable	70% - 90%	Likely to occur within a 1 year timeframe
Almost Certain	>90%	Likely to occur immediately or within a short period of time.

9.2. Impact Assessment Table – Opportunity

	Opportunity / Benefit		
Impact	Financial	Citizen Benefit	Service Innovation
Substantial	A beneficial difference in budget of more than 50% OR $4M.	Changes directly benefit citizens across the entire district.	Service delivery time improved by more than 50% OR Entirely new service delivery method identified.
Major	A beneficial difference in budget between 25 - 50% OR $1M-$4M.	Changes directly benefit citizens of multiple communities.	Service delivery time improved by 25-50% OR Implementation of a leading edge practice.
Moderate	A beneficial difference in budget between 10 - 25% OR $200k-$1M	Changes directly benefit citizens of a single community	Service delivery time affected by 10-25% OR Able to implement current best practice.
Minor	A beneficial difference in budget of less than 10% OR between $10k-$200k.	Changes directly benefit members of a single group or association.	Service delivery time affected by less than 10% OR Efficiency gain in current process.
Insignificant	Insignificant budget impact OR less than $10k impact	Little or no citizen benefit.	Maintain status quo

9.3. Impact Assessment Table - Threats

	Threat						
Impact	**Harm to People** *(ALWAYS assess first)*	Service Degradation	Financial Loss	Compliance	Environment	Reputation	Community
Severe	Fatality or permanent disability involving 1 or more people. OR Health impacts to >100 people.	Service delivery time reduced by more than 50% OR Total facility closure.	An adverse difference in budget of more than 50% OR $4M.	Fine or prosecution for failing to meet multiple core legal requirements	Adverse effects resulting in permanent/ irreversible change to the environment.	Sustained (3+ days) national or one-off International media attention OR Trust severely damaged and full recovery questionable	Complete loss for an extended period (1+ month) of food/water security, housing, employment or societal wellbeing (eg social isolation) affecting an entire community.
Major	Serious injury/ illness, temporary disability involving 1 or more people. OR Health impacts to <100 people.	Service delivery time reduced by 25-50% OR Partial facility closure.	An adverse difference in budget between 25 - 50% OR $1M-$4M.	Fine or prosecution for failing to meet a single core legal requirement.	Long term or significant adverse environmental effects where remediation is possible	Sustained (3+ days) regional attention or one-off national media attention OR Trust recovery involves considerable cost and management attention	Complete loss of food/water security, housing, employment or societal wellbeing (eg social isolation) affecting an entire community for more than 1 week.
Moderate	Medical attention required for 1 or more people. OR Medium term health impact to 1-10 people	Service delivery time reduced by 10-25% OR Hours of service reduced.	An adverse difference in budget between 10 - 25% OR $200k-$1M	Warning about/or adverse public exposure for a non-compliance.	Medium term change or scale of environment impact	Significant regional public interest or media attention OR Trust recovery exceeds existing budget	Noticeable reduction in availability of food/ water, housing, employment or societal wellbeing affecting a large number of people in a community
Minor	First aid needed. Short term health impacts to a few people.	Service delivery time reduced by less than 10% OR Customer queue management required	An adverse difference in budget of less than 10% OR between $10k - $200k.	Self-detected non-compliance.	Short term or minor effect on ecosystem functions	Attention of group / local community or media OR Modest cost to recover trust	Short term reduction in availability of food/ water, housing, employment or societal wellbeing affecting a number of people in a community
Insignificant	No treatment required. No noticeable physical impact.	No noticeable impact on service delivery.	An adverse budget impact OR less than $10k impact	Non-compliance of no consequence	Little or no change to environment	Individual interest or no media attention OR Little effort to recover trust	No noticeable impact on food/ water security, housing, employment or societal wellbeing

* Note: Food security, housing and employment are social impact factors identified by the World Health Organisation Social Dimensions of Climate Change discussion draft.

9.4. Risk Matrix and Heat Map

Likelihood	Threat Impact					Opportunity Impact					Likelihood
	Insignificant 5	*Minor 20*	*Moderate 40*	*Major 80*	*Severe 100*	*Substantial 100*	*Major 80*	*Moderate 40*	*Minor 20*	*Insignificant 5*	
Almost Certain 0.7	Low 3.5	Medium 14	High 28	Extreme 56	Extreme 70	Platinum 70	Platinum 56	Gold 28	Silver 14	Bronze 3.5	*Almost Certain 0.7*
Probable 0.45	Low 2.25	Medium 9	High 18	Extreme 36	Extreme 45	Platinum 45	Platinum 36	Gold 18	Silver 9	Bronze 2.25	*Probable 0.45*
Likely 0.3	Low 1.5	Low 6	Medium 12	High 24	Extreme 30	Platinum 30	Gold 24	Silver 12	Bronze 6	Bronze 1.5	*Likely 0.3*
Possible 0.2	Low 1	Low 4	Medium 8	Medium 16	High 20	Gold 20	Silver 16	Silver 8	Bronze 4	Bronze 1	*Possible 0.2*
Rare 0.17	Low 0.85	Low 3.4	Low 6.8	Medium 13.6	High 17	Gold 17	Silver 13.6	Bronze 6.8	Bronze 3.4	Bronze 0.85	*Rare 0.17*

Notes on matrix heat map:

- In this matrix it can be observed that by redefining High risks they may become Golden opportunities, but conversely Platinum opportunities can become Extreme threats if pushed too far.
- An event with Severe impact is considered High risk even if the chance of occurrence is Rare. An event with Insignificant impact is considered Low risk even if it is Almost Certain to occur.

9.5. Calculated Risk Score Ranges

Risk Descriptors		Low	High
Extreme	**Platinum**	**>28**	**<=70**
High	**Gold**	**>16**	**<=28**
Medium	**Silver**	**>7**	**<=16**
Low	**Bronze**	**>0**	**<=7**

10. Appendix 2: Risk Appetite Framework

10.1. Risk Appetite Objective Specific

In this framework risk appetite is a tool to guide how much risk to take to achieve an objective, while risk management is a tool to address those risks that have been taken. As a result, the following key properties of risk appetite are important:

1) The organisation's risk appetite will vary depending on the objective being considered. Therefore, understanding the value of the business objective is important to establish the risk appetite.
2) Accepting risk when undertaking an activity may enable work to progress faster, but will be associated with the chance that the outcome achieved may vary from what is expected.
3) Risk appetite is intended to provide a safe space to operate within when making a decision that involves a level of uncertainty. This means that the Council is prepared to accept a chance of an adverse event to in order to achieve a desired benefit.

The following sections provide guidance on defining the size and chance of bad, or good, event that may be acceptable for each risk appetite level. This is referred to as the risk taking preference.

10.2. Risk Appetite Mapping to Risk Impact & Likelihood.

Because risk appetite implies accepting the chance of some kind of event, there is a strong correlation with the likelihood and impact sales used to assess risks. Therefore, to ensure alignment between risk appetite and risk assessments, the HDC risk matrix has been used to map risk appetite levels to probability and impact scales.

In the table below the risk appetite scales (Adverse to Flexible) are overlaid on the Council risk matrix. As Extreme risk is always out of appetite, the risk appetite mapping excludes these ratings to avoid excessive risk taking.

Likelihood	**Threat** **Impact**				
	Insignificant	*Minor*	*Moderate*	*Major*	*Severe*
Almost Certain	Measured	Justified	Flexible	Extreme	Extreme
Probable	Measured	Justified	Flexible	Extreme	Extreme
Likely	Conservative	Measured	Justified	Flexible	Extreme
Possible	Averse	Conservative	Measured	Justified	Flexible
Rare	Averse	Averse	Conservative	Measured	Justified

10.3. Risk Taking Preferences.

By using the risk appetite mapping on the risk matrix above it is possible to define the chance and the scale of an event that would be acceptable to Council for each level of risk appetite. Due to the combinations created by the matrix there will be a range in the acceptable combinations of chance and event. For example, if an event has a high probability of occurring the value at risk will need to be low, whereas an event that has a low chance of occurring could have a relatively high value at risk.

When this mapping is applied across the different categories in the impact tables, the following descriptions of acceptable risk taking can be established.

Finance:

Risk Category	Low Range	High Range
Flexible	High chance (90%) of loss up to 25% of budget.	Possibility (10%-40%) of a loss up to 90% of budget.
Justified	High chance (90%) of loss up to 10% of budget.	Rare chance (less than 10%) of a loss up to 90% of budget.
Measured	High chance (90%) of loss up to $10K.	Rare chance (less than 10%) of a loss up to 50% of budget.
Conservative	Likely chance (40%-70%) of loss up to $10K.	Rare chance (less than 10%) of loss up to 25% of budget.
Averse	Possibility (10%-40%) of loss up $10K.	Rare chance (less than 10%) of loss up to the higher of 10% of budget or $10K.

Service:

Risk Category	Low Range	High Range
Flexible	High chance (90%) that response time or hours of service reduced by up to 25%.	Possibility (10%-40%) that response time or hours of service reduced by up to 90%.
Justified	High chance (90%) that response time or hours of service reduced by up to 10%.	Rare chance (less than 10%) that response time or hours of service reduced by up to 90%.
Measured	High chance (90%) of negligible (<5%) impact on response time or hours of service.	Rare chance (less than 10%) that response time or hours of service reduced by up to 50%.
Conservative	Likely chance (40%-70%) of negligible (<5%) impact on response time or hours of service.	Rare chance (less than 10%) that response time or hours of service reduced by up to 25%.
Averse	Possibility (10%-40%) of negligible (<5%) impact on response time or hours of service.	Rare chance (less than 10%) that response time or hours of service reduced by up to 10%.

Reputation:

Risk Category	Low Range	High Range
Flexible	High chance (90%) of significant regional public interest or additional budget needed to recover trust.	Possibility (10%-40%) of sustained national or international media attention.
Justified	High chance (90%) of attention from a local community or group. Modest cost to recovery trust.	Rare chance (less than 10%) of sustained national or international media attention
Measured	High chance (90%) of individual interest.	Rare chance (less than 10%) of sustained regional media attention or national exposure.

Conservative	Likely chance (40%-70%) of individual interest.	Rare chance (less than 10%) of significant regional media attention.
Averse	Possibility (10%-40%) of individual interest with no media attention.	Rare chance (less than 10%) attention from a local community or group.

Safety / Compliance

In the case of Safety of People and legal Compliance the risk appetite will always be Averse. That requires mitigations to ensure the risk is **As Low As Reasonably Practical (ALARP)**.

10.4. Tolerable Outcomes.

Based on the risk-taking preferences described there will be occasions when actual performance differs to the intended outcome. As a result, it is possible to monitor the degree of variation in achieved performance from the original objective to ensure that risk taking is occurring within acceptable bounds.

To define the tolerable range above or below the intended target that matches each risk appetite the scales in the risk impact scales can again be used. This approach ensures alignment with the other ratings and helps to calibrate the entire system based on experienced when monitoring objective delivery.

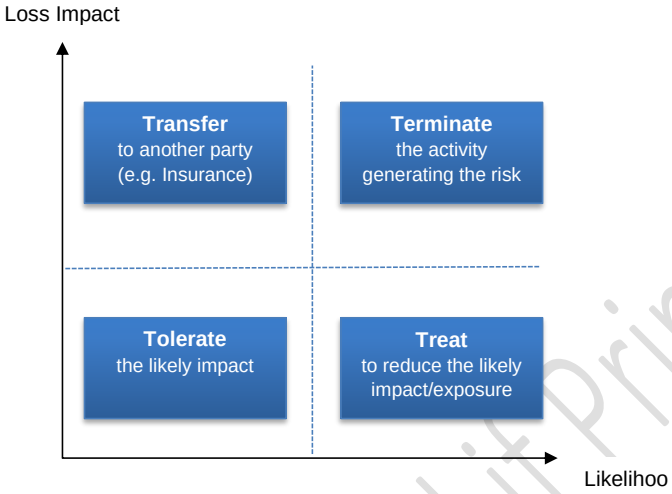
Using the impact table scales the following risk tolerance bands for each risk appetite stance can be defined:

Risk Category	Outcome Range
Flexible	90% range based on intended target (45% under or 45% over target).
Justified	50% range based on intended target (25% under or 25% over target).
Measured	25% range based on intended target (12.5% under or 12.5% over target).
Conservative	10% range based on intended target (5% under or 5% over target).
Averse	5% range based on intended target (2.5% under or 2.5% over target).

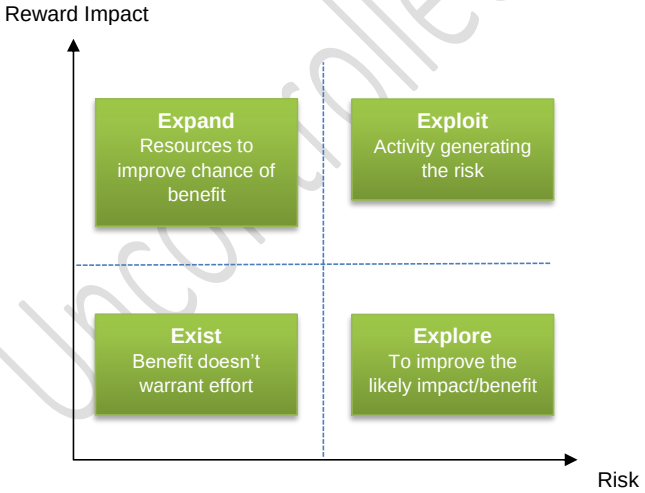
11. Appendix 3: Risk Control Techniques

The following diagrams illustrate how risk treatment strategies are generally applied to risks based on where they risk is placed on a risk heat map.

11.1. Treatments for Threat Risk



11.2. Treatments for Opportunity Risk



IMPORTANT: Before pursuing an opportunity an assessment of the unintended consequence must be undertaken. This is required to confirm that any potential threat risks that might arise are within the Council risk appetite. By doing so it is possible to confirm an appropriate balance between risk vs reward is maintained.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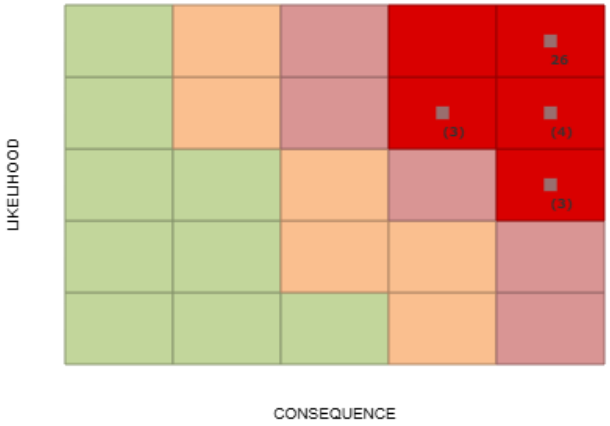
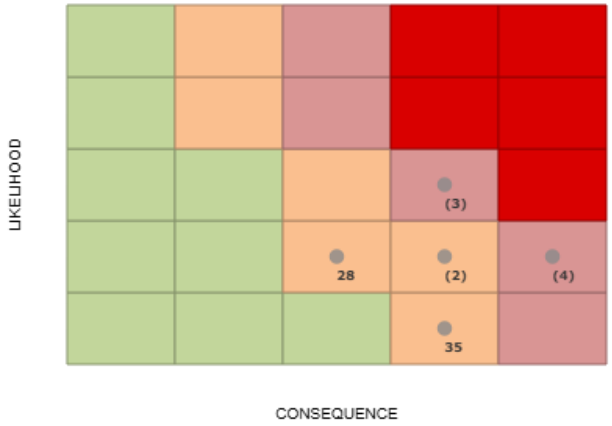
DRAFT Tier 1 HDC Strategic Risk Register (Council)

The register below includes the top risks facing Hastings District Council.
The register includes a description and assessment of the Inherent Risk, which is the risk level Council would face if no controls were in place, and the Current Risk, which is the risk level after the current controls have been considered.

Inherent Risk



Residual Risk



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Strategic Threat Risk Register

#ID	Description	Details	Inherent risk	Controls	Control	Current risk
2	**Natural or man-made disaster exposure**	Natural and man-made disasters covers major disasters or emergencies due to a natural hazard or human-made events affecting community safety or property.	Extreme	Asset Management Plan; Building Act and Code; Earthquake Prone Building Regulation; Infrastructure capacity; Land use planning; Lifelines Planning; Resource Consenting; Response and Business Continuity Planning.	Sufficient	**High**
3	**People Health, Safety & Wellbeing**	Exposure to health & safety risks (as a result of activities undertaken or directed by Council) which could result in serious health effects to workers, customers and public.	Extreme	Education, Training, Coaching; Incident and Hazard Reporting; Insurance; Monitoring and Compliance; Security Measures.	Strong	**High**
21	**Significant Operational Service Failure**	Operational failure that may have a material impact on the delivery of Council services to the community.	Extreme	Communications Plan; Insurance; Legal Advice; Policy and Procedure; Response and Business Continuity Planning; Separation of Duties.	Strong	**High**
22	**Water Quality & Quantity**	As a result of climate change and human activities, there may not be a sustainable quantity of quality water to support the communities economic, social and environmental wellbeing aspirations.	Extreme	Communications Plan; Monitoring and Compliance; Policy and Procedure; Response and Business Continuity Planning.	Sufficient	**High**
23	**Financial Sustainability**	Due to over committing to work programmes the financial sustainability of the Council may be compromised affecting delivery of all LTP goals.	Extreme	Asset Management Plan; Contingency funds; External Audit; Policy and Procedure; Roles and Responsibilities.	Strong	**High**
25	**Growth planning**	Poor timing or under-recovery of growth investment may lead to unexpected cost escalation adversely affecting Council's financial position and ability to achieve LTP objectives.	Extreme	Asset Management Plan; Communications Plan; Community Engagement & Consultation; Contingency funds; Demand Monitoring Land use planning.	Sufficient	**High**
26	**Failure of climate adaptation**	Lack of knowledge, protracted decision making or insufficient application of resources may cause climate change adaptation measures to fail adversely impacting economic, social and cultural wellbeing.	Extreme	Asset Management Plan; Building Act and Code; Communications Plan; Contingency funds; Insurance; Land use planning; Policy Direction; Response and Business Continuity Planning.	Sufficient	**High**

#ID	Description	Details	Inherent risk	Controls	Control	Current risk
28	**Significant statutory reform**	Failure to proactively adapt to statutory changes could adversely affect economic, environmental, social or cultural wellbeing, and cause significant delays and/or barriers to Council's delivery of LTP objectives.	Extreme	Appropriate Relationship Management; Appropriate Resources; Communications Plan; Community Engagement & Consultation; Education, Training, Coaching; Roles and Responsibilities.	Sufficient	**Medium**
32	**Cyber Security Threat**	Increasing sophistication of cyber attacks may cause Council to be unable to defend a significant cyber attack, resulting in an inability to communicate through normal channels, operate core functions or stand up a response, severely impacting Council's reputation, and potential legal implications and/or fines.	Extreme	Appropriate Resources; Communications Plan; Contingency funds; Education, Training, Coaching; Policy and Procedure; Response and Business Continuity Planning; Roles and Responsibilities; Systems and technology.	Strong	**Medium**
35	**Legal Liability**	Decisions made without sufficient justification or delegated authority may be successfully challenged resulting in Council being found liable for costs, reparations with consequential loss of trust in confidence.	Extreme	Contingency funds; Delegations; Insurance; Peer Review; Skilled Staff.	Strong	**Medium**
39	**Societal Polarisation**	Combinations of inequity, income disparity and misinformation/Truth decay may result in societal fragmentation and polarisation affecting safety of Council staff, property, and services.	Extreme	Accountability and Transparency; Communications Plan; Community Engagement & Consultation; Education, Training, Coaching; Incident and Hazard Reporting; Response and Business Continuity Planning; Security Alarms; Security Measures.	Sufficient	**Medium**

Strategic Opportunity Risk Register

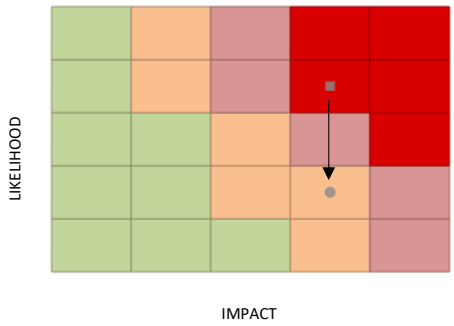
#ID	Description	Details	Inherent risk	Controls	Control	Current risk
30	**Demonstrate good ESG&C practices**	Successfully and proactively addressing Environmental, Social, Governance (ESG) and Cultural expectations during decision making processes would contribute to improving equity of resources, enhanced community wellbeing, enrichment of the natural environment, increased trust of and a positive reputation for Council, attraction as an employer and to gain a head start on complying with potential future legislation.	**Silver**	Accountability and Transparency; Asset Management Plan; Communications Plan; Community Engagement & Consultation; Education, Training, Coaching; Land use planning; Legal Advice; Organisation Culture; Performance Review & Planning; Policy and Procedure; Policy Direction; Roles and Responsibilities.	Strong	**Gold**
36	**Successful Strategic Partnerships**	Provision of sufficient capacity and capability within the organisation to manage relationships with other agencies, would lead to successful partnerships and a collaborative, effective approach to projects. This would result in a positive reputation with communities, better outcomes for the community and other stakeholders, and potentially limit financial costs for each partner.	**Bronze**	Accountability and Transparency	Sufficient	**Gold**
40	**Generative AI Efficiency**	Proactive implementation of Generative Artificial Intelligence tools may lead to improved operational efficiency and increased productivity enhancing delivery of council services and meeting additional demand without significant increase in cost.	**Silver**	Independent Expert Advice; Policy Direction	Limited	**Gold**

HDC Strategic Risk One Page Summary

Threat #39: Societal Polarisation

Details

Combinations of inequity, income disparity and misinformation/Truth decay may result in societal fragmentation and polarisation affecting safety of Council staff, property and services.



Trend: ↑

Risk Analysis

	INHERENT	CURRENT
LEVEL OF THREAT	Extreme	**Medium**
LIKELIHOOD	Probable	Possible
IMPACT: Harm to People	Major	Major

Controls

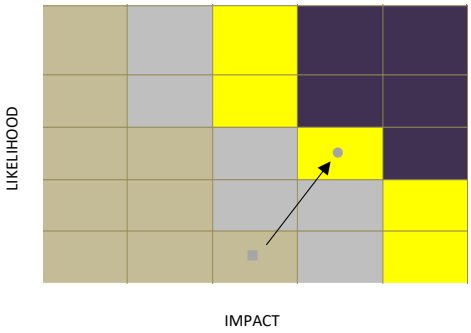
CONTROL
Accountability and Transparency: Open Council meetings & reporting of decisions
Communications Plan: Media releases and social media management
Community Engagement & Consultation: Proactive engagement on topic of concern.
Education, Training, Coaching: Conflict resolution training
Incident and Hazard Reporting: Post event review and improvements
Response and Business Continuity Planning: Plans to cope address disruption
Security Alarms: Duress alarms
Security Measures: Kaitiaki at public sites

HDC Strategic Risk One Page Summary

Opportunity #40: Generative AI Efficiency

Details

Proactive implementation of Generative Artificial Intelligence tools may lead to improved operational efficiency and increased productivity enhancing delivery of council services and meeting additional demand without significant increase in cost.



Trend: ↑

Risk Analysis

	INHERENT	CURRENT
LEVEL OF OPPORTUNITY	**Bronze**	**Gold**
LIKELIHOOD	Rare	Likely
IMPACT: Citizen Benefit	Moderate	Major

Controls

CONTROL
Independent Expert Advice: Vendor advice
Policy Direction: AI use policy

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