Te Whatu Ora
Health New Zealand

RISK AND ASSURANCE CAMPUS-WIDE INFRASTRUCTURE PROJECT

Campus-Wide Infrastructure Report

9 February 2023

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Te Whatu Ora
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RISK AND ASSURANCE CAMPUS-WIDE INFRASTRUCTURE PROJECT

CAMPUS-WIDE INFRASTRUCTURE REPORT

Te Whatu Ora - Health New Zealand

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APPENDICES

Please refer to the **separate Appendix Document** for the following Appendices:

Appendix 1	Te Whatu Ora Risk and Assurance Risk Tables and Matrix
Appendix 2	Methodology Details
Appendix 3	Very High Priority Risks (82) detailed
Appendix 4	Campus sizes using bed numbers
Appendix 5	Very High Priority Risk Register
Appendix 6	Detailed Sub-element Reports for each of the 29 Campuses assessed by WSP, and CSV Data of the 5 Campuses assessed by Te Whatu Ora

EXECUTIVE SUMMARY

Campus buildings and infrastructure underpins the delivery of health services for Te Whatu Ora. Effective management of risk to these assets is critical to the delivery of first-class health services to all New Zealanders, this forms the background to Te Whatu Ora's risk management strategy and risk management decision-making processes.

After the announcement of the decision to form one health entity who will own the health estate in April 21, the Infrastructure Investment Group (IIG) began working on a number of initiatives to understand and manage asset risks across the health estate. These included:

- Seismic work programme
- Risk and assurance campus-wide infrastructure project
- Climate change risk assessment of main public hospitals
- Clinical Equipment and IT Asset current state assessment methodology and pilot
- Development of an infrastructure asset risk register

This report outlines the results of the Risk and Assurance Campus-Wide Project, the assessment of failure impact of campus-wide infrastructure. This report focuses on the campus-wide infrastructure risk and identifies opportunities to manage identified risks downwards.

A programme of risk assessments was undertaken on 34 surgical campuses. The 34 campuses were selected based on their provision of medical and surgical services and role in supporting emergency management scenarios. The risk assessments focused on 14 elements and 48 sub-elements of campus-wide infrastructure.

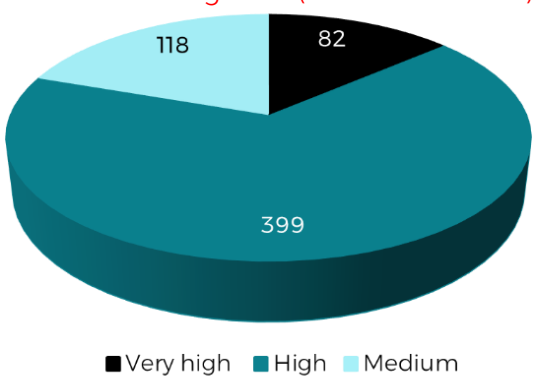
A collaborative, qualitative approach was adopted, combining the expertise of District Facilities and Asset Management Teams and WSP Subject Matter Experts or Te Whatu Ora Asset Management Infrastructure and Investment Group. WSP undertook 29 campus assessments with Te Whatu Ora completing five.

This Report is presented in the following sequence:

- Categorisation of risks identified.
- Summary of the findings.
- Evaluation of the priority risks and analyses the portfolio of risks.
- Grouping of risks and assignment of 'very- rough-costs' to the very high priority risks.
- Recommendations on the next steps for Te Whatu Ora.

A total of 1328 risk assessments were carried out across the 34 campuses. Prioritisation of these risks was carried out based on the highest likelihood and greatest consequence. Using this methodology, a list of risks was developed: Very High priority, High priority and Medium priority of which there are 599 split as shown in Figure 4:

Figure 4 (from Section 2.2) Prioritised Risks (599 in total)



Further analysis of the 82 Very High priority risks shows that:

- 13 of the risks already have projects underway for mitigation.
- One of the risks resides outside of direct responsibility of Te Whatu Ora and requires liaison with Waka Kotahi and the Territorial Local Authority.
- Four campuses (Gisborne, Hawkes Bay, Palmerston North and Kenepuru) contain 23 of these risks, which is 28% of the Very High priority risks.
- One of the risks relates to a supply chain issue at a campus which would be mitigated with a change in procedures.
- The remaining 44 risks can be mitigated by the implementation of 10 capital works programmes.

It is anticipated that the risk improvement opportunities and next steps outlined in this report will be further investigated and incorporated into Te Whatu Ora's asset management system, planning, and continuous improvement processes. In summary, these are:

- The assessments and analysis is to be extended across the remaining campuses in the portfolio.
- Mitigate Very High priority risks identified.
- Analyse High priority risks identified.
- Assess Medium priority risks identified.
- Implement some procedural updates and communication protocols across Te Whatu Ora to assist in asset and risk management.

1 INTRODUCTION

In June 2020, Report 1: The current-state assessment of District Health Board assets was published in response to a request from the Minister of Health. The report provided a consistent picture of the condition and fitness for purpose of critical health assets, including buildings & infrastructure, clinical equipment and information technology.

One of the main findings of Report 1 was that campus-wide infrastructure was in poorer condition than the main campus buildings. Many campuses were found to have significant issues with reticulated infrastructure, that had reached the end-of-serviceable life and/or are not suitable to support continually increasing operational loads.

It was concluded that the design, condition, compliance, capacity and resilience of campus critical infrastructure systems threatens the ability to deliver safe and timely health services.

This led to a more detailed Risk & Assurance Project being initiated in two phases. Phase one was a pilot undertaken internally by Te Whatu Ora and DHBs of five hospital campuses. The 2021 pilot was a success and was followed up in 2022 with phase 2, where WSP completed a further 29 campuses, collated and evaluating the risks from all 34 campuses. This was achieved through a collaborative, systematic assessment of 48 sub elements from 14 elements with Campus subject matter experts (SMEs), against common assessment criteria and a risk grading framework.

Reporting has been in the form of Campus Reports, assessment data uploaded into the Te Whatu Ora HART system, and this report.

1.1 ASSESSMENT PURPOSE

The key drivers of this campus-wide infrastructure risk assessment initiative are to:

- Enhance the safety for staff, patients, service providers, users of Te Whatu Ora facilities and the public of New Zealand.
- Deliver evidence-based risk assessment content for campus-wide infrastructure, to support a prioritised pipeline of capital investments, improve asset management performance and capability.
- Increase the awareness of critical site wide infrastructure risks at a campus, regional and national level.
- Identify opportunities to proactively identify, engage and communicate with all stakeholders in a structured and consistent manner, and identify potential risks that could impact the normal provisions of services in the event of failure or disruption.
- Reduce the number of unscheduled campus critical infrastructure asset failures that impact the provision of clinical services.
- Support the improvement of asset management practices including prioritisation of infrastructure investment.

1.2 CAMPUSES

The Risk and Assurance campus-wide infrastructure project involved 34 Te Whatu Ora campuses. Campus selection was by Te Whatu Ora based on their provision of medical and surgical services in addition to support in emergency management scenarios. Table 1 below schedules the campuses assessed.

Table 1: Risk and Assurance Campus-Wide Infrastructure Project Campuses

Campus ID	Campus Name	District Descriptor	Region
57	Kaitaia Hospital	Te Whatu Ora – Health New Zealand Te Tai Tokerau	Northern
56	Bay of Islands Hospital	Te Whatu Ora – Health New Zealand Te Tai Tokerau	
63	Whangarei Hospital	Te Whatu Ora – Health New Zealand Te Tai Tokerau	
59	Dargaville Hospital	Te Whatu Ora – Health New Zealand Te Tai Tokerau	
98	North Shore Hospital	Te Whatu Ora – Health New Zealand Waitematā	
99	Waitakere Hospital	Te Whatu Ora – Health New Zealand Waitematā	
1	Auckland City Hospital	Te Whatu Ora – Health New Zealand Te Toka Tumai Auckland	
3	Greenlane Clinical Centre	Te Whatu Ora – Health New Zealand Te Toka Tumai Auckland	
32	Middlemore Hospital	Te Whatu Ora – Health New Zealand Counties Manukau	
31	Manukau Super Clinic	Te Whatu Ora – Health New Zealand Counties Manukau	
82	Waikato Hospital	Te Whatu Ora – Health New Zealand Waikato	Te Manawa Taki
90	Thames Hospital	Te Whatu Ora – Health New Zealand Waikato	
28	Rotorua Hospital	Te Whatu Ora – Health New Zealand Lakes	
45	Taupo Hospital	Te Whatu Ora – Health New Zealand Lakes	
6	Tauranga Hospital	Te Whatu Ora – Health New Zealand Hauora a Toi Bay of Plenty	
7	Whakatāne Hospital	Te Whatu Ora – Health New Zealand Hauora a Toi Bay of Plenty	
108	Gisborne Hospital	Te Whatu Ora – Health New Zealand Tairāwhiti	
78	Taranaki Hospital	Te Whatu Ora – Health New Zealand Taranaki	
48	Palmerston North Hospital	Te Whatu Ora – Health New Zealand Te Pae Hauora o Ruahine o Tararua MidCentral	Central
107	Whanganui Hospital	Te Whatu Ora – Health New Zealand Whanganui	
27	Wellington Hospital	Te Whatu Ora – Health New Zealand Capital, Coast and Hutt Valley	
23	Kenepuru Hospital	Te Whatu Ora – Health New Zealand Capital, Coast and Hutt Valley	
44	Hutt Valley Hospital	Te Whatu Ora – Health New Zealand Capital, Coast and Hutt Valley	
40	Hawke's Bay Hospital	Te Whatu Ora – Health New Zealand Te Matau a Māui Hawke's Bay	
95	Wairarapa Hospital	Te Whatu Ora – Health New Zealand Wairarapa	
51	Nelson Hospital	Te Whatu Ora – Health New Zealand Nelson Marlborough	Te Waipounamu
55	Wairau Hospital	Te Whatu Ora – Health New Zealand Nelson Marlborough	
101	Grey Base Hospital	Te Whatu Ora – Health New Zealand Te Tai o Poutini West Coast	
13	Christchurch Hospital	Te Whatu Ora – Health New Zealand Waitaha Canterbury	
11	Burwood Hospital	Te Whatu Ora – Health New Zealand Waitaha Canterbury	
10	Ashburton Hospital	Te Whatu Ora – Health New Zealand Waitaha Canterbury	
67	Timaru Hospital	Te Whatu Ora – Health New Zealand South Canterbury	
68	Dunedin Hospital	Te Whatu Ora – Health New Zealand Southern	
72	Southland Hospital	Te Whatu Ora – Health New Zealand Southern	

KEY

	Te Whatu Ora carried out the Risk and Assurance assessment.
	WSP carried out the Risk and Assurance assessment.

1.3 CAMPUS-WIDE INFRASTRUCTURE

'Campus-wide Infrastructure' is the term used to describe the common building and infrastructure campus assets that support buildings, clinical services and activities carried out on the hospital campuses. This includes roads, reticulated services, buried services, tunnels and common support systems

Table 2 lists 'campus-wide infrastructure' broken down into 14 elements and 48 sub-elements that are within the scope[1] of this assessment.

Table 2: List of Elements and Sub Elements

Elements	Sub-elements
Electrical	Mains Supply
	Essential Services Supply (ESS)
	Local Reticulation (Essential & Non-Essential)
Water Supply (Potable water)	Mains Supply/Storage
	Onsite Treatment
	Cold Water Reticulation
	Hot Water Reticulation
	Hot Water Plant
Fuel Supplies and Reticulation	Supply – Diesel / Gas / Coal / Woodchip
	Reticulation
Medical Plant and Equipment	Pneumatic tube transport (PTT)
	Sterilisation plant / autoclaves
	Smoke / plume extract
Mechanical Plant and Equipment	Heating Plant
	Heating Reticulation
	Cooling Plant
	Chilled Water Reticulation
	Space Heating & Cooling (AHU, Ducting Radiators)
	Steam Generators
	Steam Reticulation
	Refrigeration Plant
Fire Protection	Suppression
	Detection
	Building Management System (BMS)

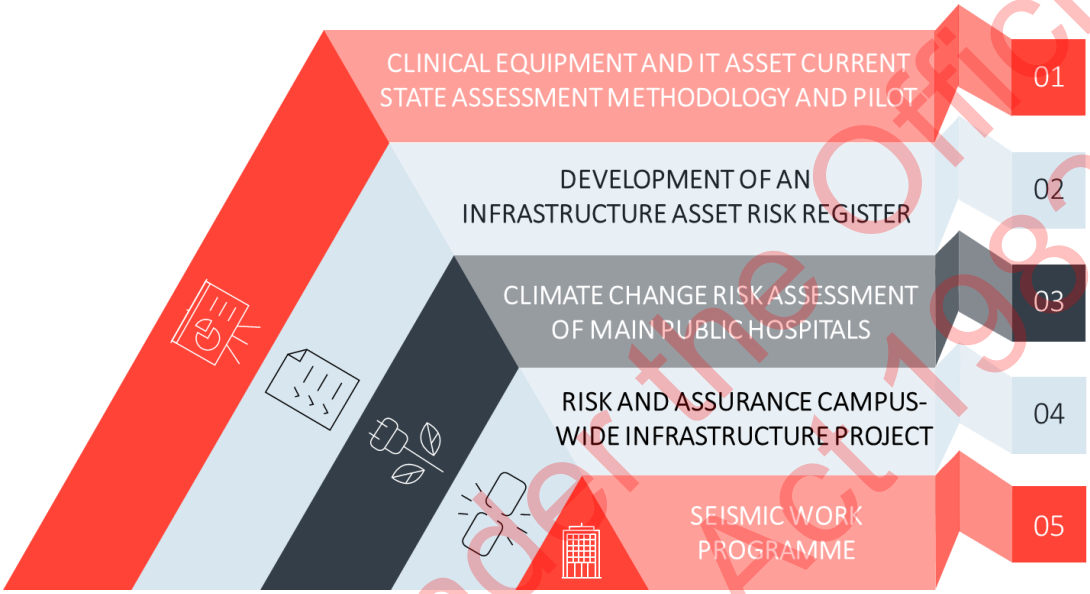
Elements	Sub-elements
Building Management, Monitoring and Control Systems	Programmable Logic Controllers (PLC)
	Supervisory Control and Data Acquisition (SCADA)
Wastewater	WW Reticulation
	WW Treatment / Discharge
Stormwater	SW Reticulation
	SW Onsite Treatment / Discharge
Centralised Security	Access System
	Doors
	Cameras
	Perimeter Fencing / Gates / Vehicle Access
Civil	Access Roads
	Internal Roading
	Ground Stability
Kitchen/Catering Equipment	Kitchen/Catering Equipment
Laundry Equipment	Laundry Equipment
Medical Gases	Medical Air (Low Pressure)
	Medical Air 7 (High Pressure)
	Medical Oxygen
	Carbon Dioxide
	Nitrous Oxide
	Nitrogen
	Entonox
	Vacuum Plant (Medical)
	Gas Scavenging

[1] Note: not all of which were present at each campus.

1.4 CAMPUS BUILDING & INFRASTRUCTURE RISK MANAGEMENT

Te Whatu Ora uses industry standard approaches to risk management, aligned with the AS/NZS 31000:2018 Risk Management Guidelines to manage campus Building & Infrastructure risks.

There are currently five strands Whatu Ora's strategy for managing building and infrastructure risk:



This report is the Risk and Assurance Campus-Wide Infrastructure Project and focuses on the failure impact of 'campus-wide infrastructure'.

The scale, programme and technical complexity of this risk assessment is not suitable for quantitative risk assessment and therefore necessitated the use of a Qualitative Risk Assessment approach using experienced subject matter experts in building and campus infrastructure. However, semi-quantitative assessment aspects were incorporated in the form of "Risk Gaps" and used to confirm the largest perceived risks were captured and assessed.

1.4.1 TE WHATU ORA RISK TOLERANCE MATRIX

Te Whatu Ora assessment of risk follows best practice risk management and classifies risks in relation to 'Consequence' of impact and 'Likelihood' of occurrence. Risks can then be plotted on the Te Whatu Ora Risk Tolerance Matrix to determine required actions. Table 3 illustrates how Te Whatu Ora has 'Consequence' of impact in relation to multiple criteria:

- Media and public interest.
- Absorption into normal operating practices.
- Disruption to campus and Ministry activities.
- Unbudgeted expenditure.
- Governance requirements.
- Ministerial interest.
- Legislative / Statutory compliance.
- Intervention by other government agencies.

Table 3: Te Whatu Ora Buildings & Infrastructure Risk Consequence Grades

Consequence				
Minimal	Minor	Moderate	Significant	Severe
Would only have low public interest and low media interest. Treated as routine issue. Managed by line management. Result in relatively minor disruption to particular business areas. Incur additional unbudgeted expenditure of less than $500,000.	Would have low public interest and medium media interest. No need to raise with Minister or other external stakeholders 3rd Tier management oversight of issue – 2nd Tier kept informed. Incur additional unbudgeted expenditure of $500,000 to $1M of budget. Result in disruption to particular business areas. No breach of statutory obligations.	Would have medium public interest and medium media interest. Minister advised of issue as part of general briefing – one off briefing. 2nd Tier management oversight of issue – CE/DCE kept informed. Incur additional unbudgeted expenditure of $1M to $10M of budget. Result in some disruption to Ministry operations. Minor/technical breach of statutory obligations.	Would have medium public interest and high media interest. Is likely that the event would result in the Minister asking for an explanation but would still have confidence in the Ministry. Chief Executive would have direct oversight. Incur additional unbudgeted expenditure. $10M to $100M budget. Result in significant disruption to Ministry operations. Significant breach of statutory obligations.	Would have high public interest and high media interest. Is likely that the event would result in the Minister expressing concern on the confidence in the performance of Ministry. Likely that other Central agencies (such as the SSC) or the Office of the Auditor General to undertake a review of Ministry operations. Chief Executive would have direct oversight on action taken. Incur additional unbudgeted expenditure - over $100M. Result in major (timeframe and spread) disruption to Ministry's overall operations. Major breach of statutory obligations.

Similarly, Likelihood is evaluated against a 5-grade Occurrence Frequency scale replicated in Table 4.

Table 4: Te Whatu Ora Buildings & Infrastructure Risk Likelihood Grades

		Occurrence Frequency	Probability	
Likelihood	Almost Certain	1 or more times a year	The event is expected to occur in most circumstances.	81-100%
	Likely	Once every 1 - 10 years	The event will probably occur in most circumstances.	51-80%
	Possible	Once every 10-50 years	The event may occur at some stage.	26-50%
	Unlikely	Once every 50-100 years	The event is less likely to occur.	6-25%
	Rare	Once every 100 years or more	It is very unlikely that the event will occur.	5%

The Te Whatu Ora Buildings & Infrastructure Risk Tolerance Matrix Table 5 has been created by combining the Consequence and Likelihood grading tables and overlaying the Te Whatu Ora risk management policy to organise risks into four categories.

Table 5: Te Whatu Ora Buildings & Infrastructure Risk Tolerance Matrix

				Consequence				
				Minimal	Minor	Moderate	Significant	Severe
		Occurrence Frequency		• Would only have low public interest and low media interest • Treated as routine issue • Managed by line management • Result in relatively minor disruption to particular business areas • Incur additional unbudgeted expenditure of less than $500,000	• Would have low public interest and medium media interest • No need to raise with Minister or other external stakeholders • 3rd Tier management oversight of issue – 2nd Tier kept informed • Incur additional unbudgeted expenditure of $500,000 to $1M of budget • Result in disruption to particular business areas • No breach of statutory obligations	• Would have medium public interest and medium media interest • Minister advised of issue as part of general briefing – one off briefing • 2nd Tier management oversight of issue – CE/DCE kept informed • Incur additional unbudgeted expenditure of $1M to $10M of budget • Result in some disruption to Ministry operations • Minor/technical breach of statutory obligations	• Would have medium public interest and high media interest • Is likely that the event would result in the Minister asking for a explanation but would still have confidence in the Ministry • Chief Executive would have direct oversight • Incur additional unbudgeted expenditure - $10M to $100M budget • Result in significant disruption to Ministry operations • Significant breach of statutory obligations	• Would have high public interest and high media interest • Is likely that the event would result in the Minister expressing concern on the confidence in the performance of Ministry • Likely that other Central agencies (such as the SSC) or the Office of the Auditor General to undertake a review of Ministry operations • Chief Executive would have direct oversight on action taken • Incur additional unbudgeted expenditure - over $100M • Result in major (timeframe and spread) disruption to Ministry's overall operations • Major breach of statutory obligations
		Te Whatu Ora	Probability	<$100k	>$100k & <$1M	>$1M & <$10M	>$10M & <$100M	>$100M
Likelihood	Almost Certain	Once or more times a year	81-100%					
	Likely	Once every 1 - 10 years	51-80%					
	Possible	Once every 10-50 years	26-50%					
	Unlikely	Once every 50-100 years	6-25%					
	Rare	Once every 100 years or more	5%					

KEY

- Te Whatu Ora Risk Matrix - Very High Risk
- Te Whatu Ora Risk Matrix - High Risk
- Te Whatu Ora Risk Matrix - Medium Risk
- Te Whatu Ora Risk Matrix - Low Risk

The Risk Categories have each been given a different colour signifying the acceptability of the risk, presented in Table 6.

Table 6: Te Whatu Ora Buildings & Infrastructure Risk Categories

Risk Category		Description
	Very High	Risks to the campus that are unacceptable and require immediate focussed attention to eliminate, mitigate or minimise, to return the campus to normal confidence levels.
	High	Risks that require urgent review and the implementation of temporary/short term risk treatment measures to manage risk until permanent actions can be completed that return the campus to normal confidence levels.
	Medium	Risks where plans should be in existence for treatment to return the campus to normal confidence levels.
	Low	Risk within acceptable confidence levels.

1.4.2 APPLICATION OF RISK TOLERANCE MATRIX FOR BUILDING & INFRASTRUCTURE RISK ASSURANCE

There are two important differences between the risk of 'Campus-wide Infrastructure failure' and risks included in the 'Te Whatu Ora overall Risk Tolerance Matrix':

- Campus-wide Infrastructure failure only indirectly impacts on the delivery of clinical health services. For example, infrastructure failures do not necessarily lead to impacts on the campus and the extent of infrastructure failure impact is not directly proportional to the impact on clinical services.
- Some campuses have inherent resilience against 'campus-wide infrastructure failures' born from several factors and embedded risk treatments. For example: the existence of infrastructure redundant capacity; contingency planning, standard operating procedures, emergency pre-plans partially decouple infrastructure failures from impacts on clinical health services.

Therefore, for the Risk & Assurance assessments:

- The decision was made to use a 5 x 5 risk tolerance matrix and intensify the assessment of 'Consequence' and 'Likelihood' to apply increased scrutiny on the failure of shorter life infrastructure assets.
- 'Consequence' impact was assessed in relation to the potential impact on 'Clinical Services'.
- 'Likelihood' of occurrence uses a highly condensed risk return period, whereby all 'campus-wide risk' likelihoods [*Almost certain to Rare*] fit within the [*Almost Certain to Possible*] likelihoods in the overall Te What Ora Risk Tolerance Matrix.

Table 7 illustrates:

- How risk scores have been used to determine the 'Risk Gaps' used as a cross check on the capture of the priority risks.
- The values introduced to improve the evaluation of critical assets.
- The red bordered area illustrates the scope of the focus at the outset of the assessment of risks.

Table 7: Backbone Infrastructure Risk and Assurance Matrix with Risks Scores and Groups Identified

		Probability	Occurrence Frequency	Consequence of Failure (Impact)				
				Minimal	Minor	Moderate	Significant	Severe
				Minimal Impact on clinical service delivery. Work arounds in place	Impact on corporate functions only with little direct impact on clinical service delivery. Work arounds in place.	Clinical service delivery will be affected, with loss of clinical support functions. Possible decant required.	Significant drop in level of clinical services. Potential injury to staff, patients and public. Partial decant required.	Vital to clinical service delivery. Loss of whole campus, impact on national level of clinical services. Potential death of staff, patients and public. Total Decant required.
Likelihood	Almost Certain	>90%	At least 1 each year	5	10	15	20	25
	Likely	61% - 90%	1 in 1-3years	4	8	12	16	20
	Possible	21% - 60%	1 in 3-10 years	3	6	9	12	15
	Unlikely	5% - 20%	1 in 10-25 years	2	5	6	8	10
	Rare	<5%	1 in 25 or more years	1	2	3	4	5

'Very High' Priority Risk Group

'High' Priority Risk Group

'Medium' Priority Risk Group

Risk scores

The risks gathered and categorised in this report are shaded and grouped into medium risks, high priority risks and very high priority risks. There are 599 risks across these three risk groups, within the red boundary.

The 'red-bounded area' has been superimposed over the Te Whatu Ora Risk tolerance Matrix (Table 8) to illustrate how the Risk & Assurance risks fall within the overall Te Whatu Ora Risk Tolerance Matrix. As the likelihood occurrences are much shorter, it is shown that this provides a conservative view of the risks. The impact of failure of campus-wide infrastructure is not as great as shown on this matrix.

Table 8: Te Whatu Ora Building and Infrastructure Risk Tolerance Matrix

		Occurrence Frequency	Consequence				
			Minimal	Minor	Moderate	Significant	Severe
Likelihood	Almost Certain	One or more times a year					
	Likely	Once every 1 - 3 years					
		Once every 3-10 years					
	Possible	Once every 10-30 years					
		Once every 30-50 years					
	Unlikely	Once every 50-100 years					
	Rare	Once every 100 years or more					

1.4.3 *RISK REGISTER & RISK MANAGEMENT*

Table 9 illustrates the use of a 3-stage Risk Register to manage the risks through the evaluation of 'Raw Risks', the review of existing 'Risk Mitigation and Reduction' measures and identification of required additional risk reduction treatments. The full sample risk register for the 82 Very High priority risks is provided in Appendix. 5.

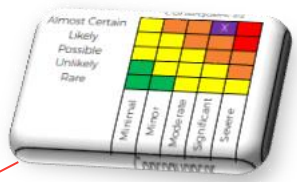


Table 9: Risk Register Management

Risk Ref	Site	Element	Sub-Element	Risk Description	Likelihood		Consequence		Evaluation	Description of Existing Risk Mitigation / Treatment in Place	Likelihood	Consequence		Identified Solution	Work Programme	Likelihood	Consequence	
MNK- 9- 38	Manukau Super Clinic	Waste Water	WW Reticulation	Wastewater Reticulation - end of life and regular blockages	Almost Certain	More than once per year	Significant	pretty bad	Very High	Nil	Almost Certain	Significant	Very High	Wastewater reticulation - end of life renewal	Wastewater reticulation renewal programme	Almost Certain	Significant	High
GIS- 10- 25	Gisborne Hospital	Electrical	Electrical - Local Reticulation (Essential & Non-Essential)	Electrical Local Distribution - end of life and capacity issues	Almost Certain	More than once per year	Significant	pretty bad	Very High	Nil	Almost Certain	Significant	Very High	Electrical - Local Reticulation - Distribution capacity and safety standard renewal	Gisborne Hospital Capital Investment Programme	Almost Certain	Significant	Medium
GIS- 6- 42	Gisborne Hospital	Mechanical	Mech - Steam Reticulation	Steam Reticulation - end of life, compliance and resilience	Almost Certain	More than once per year	Significant	pretty bad	Very High	Nil	Almost Certain	Significant	Very High	Steam Reticulation - end of life renewal	Gisborne Hospital Capital Investment Programme	Almost Certain	Significant	High
WRP- 3- 35	Wairarapa Hospital	Building Management Systems	BMS - Programmable Logic Controllers (PLC)	PLC - controllers for essential infrastructure end of life	Almost Certain	More than once per year	Significant	pretty bad	Very High	Nil	Almost Certain	Significant	Very High	PLC controllers - end of life upgrade programme	PLC controller renewal programme	Almost Certain	Significant	Very High
KNP- 7- 22	Kenepuru Hospital	Potable Water	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life and has capacity issues due to incremental historical additions	Almost Certain	More than once per year	Significant	pretty bad	Very High	Nil	Almost Certain	Significant	Very High	Domestic Hot Water Reticulation - end of life and resiliency upgrade	Kenepuru Hospital Capital Investment Programme	Almost Certain	Significant	Medium
KNP- 11- 37	Kenepuru Hospital	Fuel Supplies	Fuel - Reticulation	Fuel Supply - single point of failure Resiliency	Almost Certain	More than once per year	Significant	pretty bad	Very High	Nil	Almost Certain	Significant	Very High	Gas Supply - Upgrade and diversity supply	Kenepuru Hospital Capital Investment Programme	Almost Certain	Significant	Medium

Risk details, 'Consequence', and 'Likelihood' of each identified campus-wide infrastructure sub-element risk are plotted in the "Raw Risk" section of a risk record. Purple signifies where the risk resides on the Consequence and Likelihood matrix. The Matrix categorises risks into the necessary action to be taken:

- Red signifies risks that are 'unacceptable' and have to be immediately addressed.
- Green signifies risks that fit within Business As Usual (BAU) and are acceptable.
- Risks that fit in between red 'Unacceptable Risks' and green 'Business As Usual' are split into two groups:
  - Amber signifies risks that can be managed by short term measures but need to be addressed in the near term.
  - Yellow signifies risks where increased awareness is required, and plans need to be developed to manage or treat the risk.

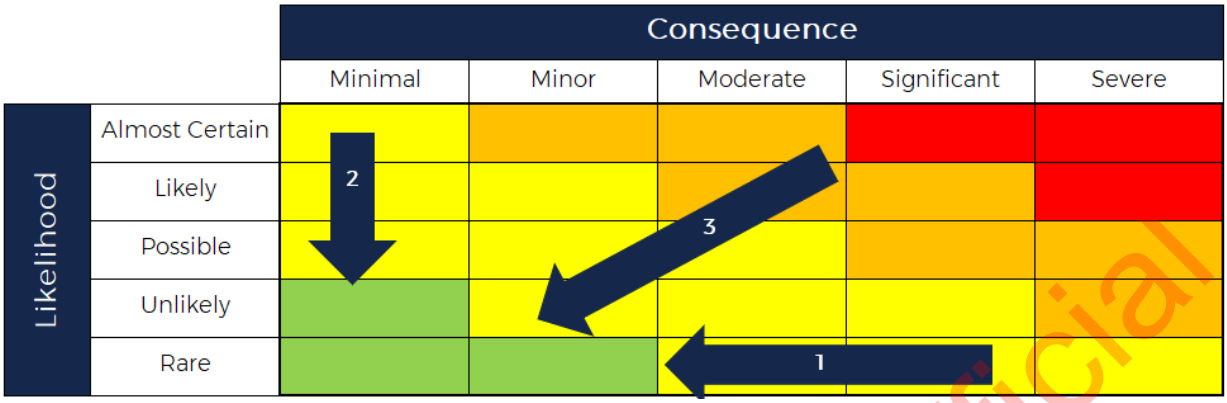
The second section of the risk register (referring to the blue headings) illustrates the evaluated status of the 'Risk' considering existing risk mitigation and management controls in place.

The third section of the register (referring to the green headings) is available to identify further risk treatments required to reduce risk level to 'Business As Usual'.

Table 10 illustrates the three types of risk treatments available to '*move the risk to BAU*':

- Reduction in impact consequence (refer '1' on Table 10).
- Reduction in likelihood of occurrence (refer '2' on Table 10).
- Reduction in both consequence and likelihood of occurrence (refer '3' on Table 10).

Table 10: Risk Treatments to Move Risks to Business As Usual on the Consequences and Likelihood Matrix



2 RISK SUMMARY

This section summarises observations collected and risk assessments of the sub-elements on the 34 campuses. It also provides detail of the risk prioritisation exercise that WSP has carried out using the data gathered.

The consequence and likelihood of failure of each sub-element (48) was assessed sequentially focussing on the five criteria of Design, Condition, Maintenance, Compliance and Resilience/Capacity. The consequence and likelihood grades were determined and applied to the risk matrix to produce an assessed risk rating for each sub-element.

Target risk ratings (based on consequence and likelihood) were also developed in conjunction with facility managers/engineers, clinical engineering, clinical and emergency management team recommendations for their specific areas of expertise.

The target risk rating was then compared against the assessed risk rating and where a 'difference was determined (termed the 'gap') risks were prioritised in relation to the size of the gap.

Additionally, each sub-element was assessed against the five criteria using a secondary Criteria Assessment Grading Table [2] to determine and assign 'status grades' [1 (Very Good) – 5 (Very Poor)] for each criteria. These 'status grades' have been used as proxy for Level of Service (LoS), enabling further analysis/drill down into the risk assessments.

There were a total of 1632 risk assessments carried out but 355 were not applicable as the sub-element was not present on the campus (leaving a total of 1277).

2.1 RISK ANALYSIS

1277 risks assessments formed the analysis carried out. The 599 risks within the area bound by the red line in table 11 were further analysed and form part of the risk prioritisation exercise undertaken which was based primarily on the scores from the risk assessment process:

Very High Priority Risks	Those risks with the highest consequence and greatest likelihood of occurrence
High Priority Risks	Those risks with either a high likelihood and low consequence or low likelihood and high consequence.
Medium Priority Risks	Those risks with a high likelihood, but with consequence that is low

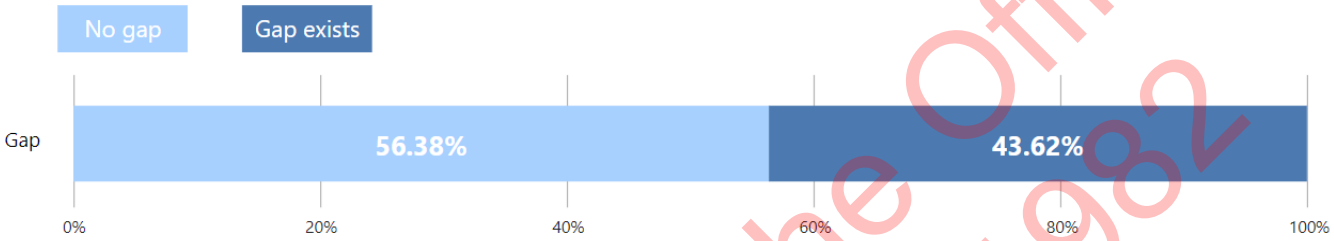
The remaining 678 risks were not analysed as these were considered either of a probability or consequence that does not warrant the highest priority. These risks should be assessed further as part of a future exercise.

[2] Developed in alignment with International Infrastructure Management Manual (IIMM), the World Health Organisation (WHO) hospital safety index and industry experts.

2.2 RISK GAPS - TARGET TO ACTUAL

Over forty per cent of the campus-wide infrastructure sub-elements over the 34 campuses were assessed as having higher levels of risk than desired (**above the 'target' risk** levels identified by Te Whatu Ora) and hence a 'gap' exists as outlined in Figure 1. This group have all been incorporated into the priority group as set out in section 2.2. Further to this, Figure 2 shows that Electrical and Potable Water systems have higher risk levels than desired on more campuses than those that fall within the 'target' risk levels. Approximately half of the Medical Gases, Civil and Mechanical sub-elements do not fall within the 'target' risk levels set by Te Whatu Ora therefore a 'gap' exists for around 50% of these. Although assessed, Kitchen and Laundry Equipment is generally owned and operated by third parties, so does not contribute to campus-wide infrastructure risk.

Figure 1: Gap Across All Sub-elements



Note: The 'no gap' category includes sub-elements with:

- assessed risk rating equal to the target rating, therefore the gap is zero.
- assessed risk rating below the target rating, therefore a positive gap exists.

Figure 2: Breakdown of Gaps Across 14 Elements

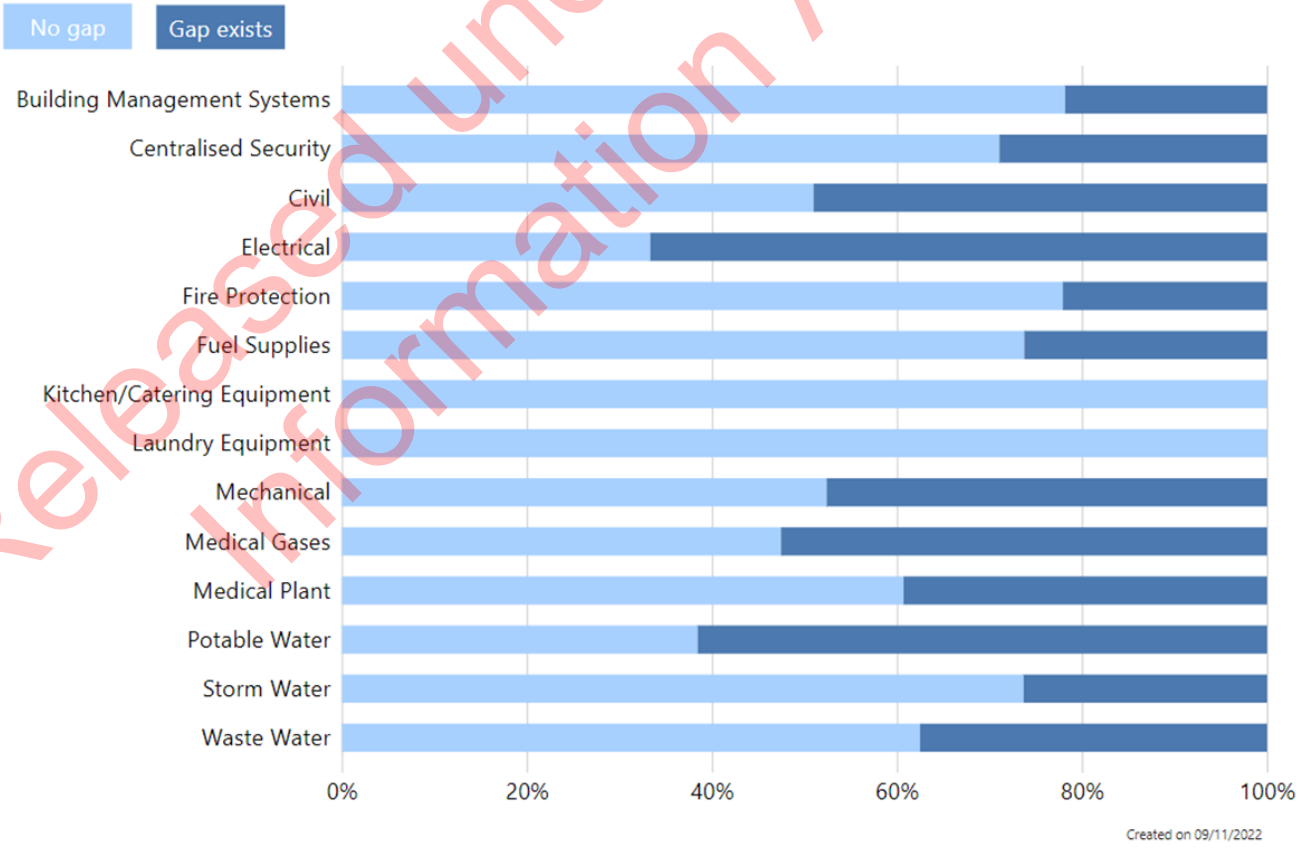
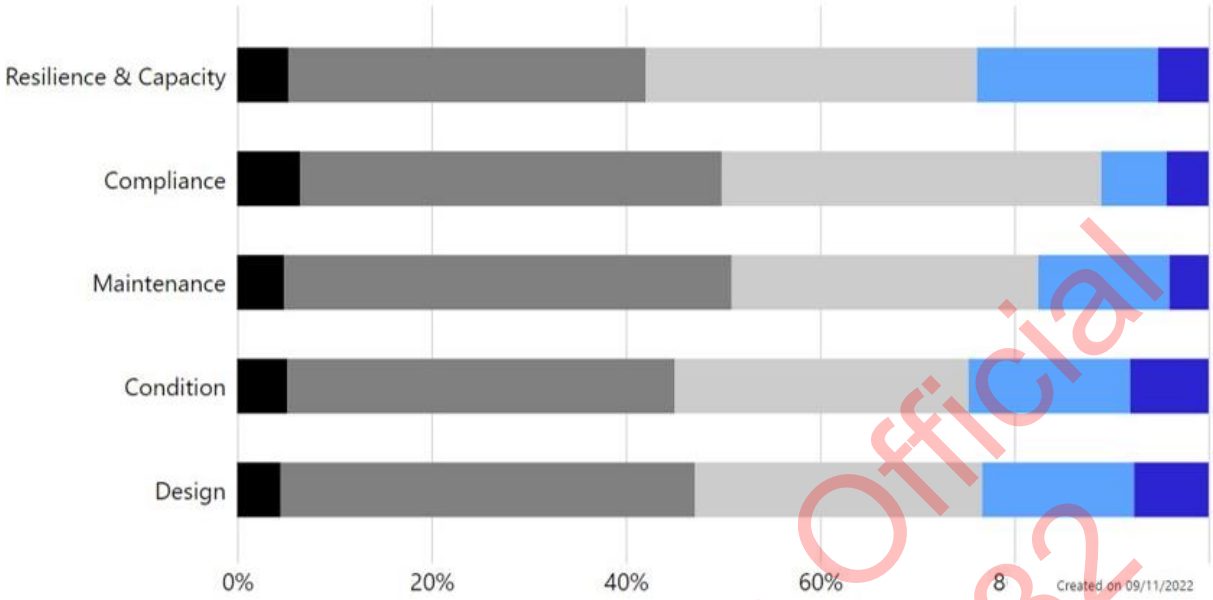


Figure 3 illustrates approximately 50% of Sub-Element Criteria assessments were negative, 30% neutral and 20% positive as depicted in Figure 3. Maintenance and Compliance had the most negative assessments.

Figure 3: Criteria Assessments Across 34 Campuses



KEY FOR CRITERIA ASSESSMENT

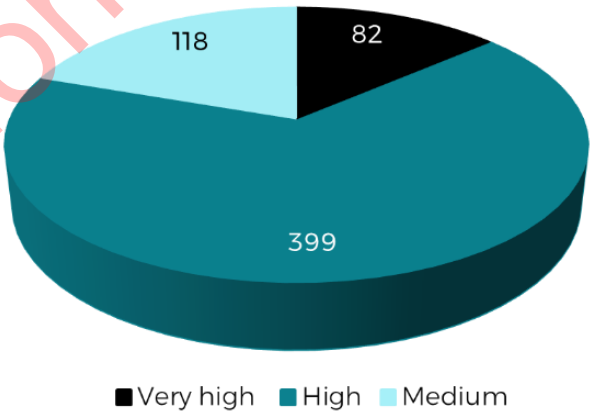
VERY GOOD	GOOD	MODERATE	POOR	VERY POOR
1	2	3	4	5

2.3 RISK PRIORITISATION

599 'Priority Risks' were identified and categorised into three priorities – Very High, High and Medium, based on the severity of the consequence of failure. This group includes all risks which were assessed to have a gap between actual and target score. There are a further 678 risks which fall outside of this prioritised group which should still be assessed, managed and monitored on a regular basis. The remaining sub-elements (355) were not applicable at the various campuses.

As illustrated in Figure 4, 82 of these risks were determined to be Very High priority.

Figure 4: Prioritised Risks (599 in total)



The 599 'Priority Risks' are shown within the red line boundary in Table 11.

Table 11: Prioritised Risks Identified Within Bordered Section of Risk Tolerance Matrix

				Consequence of Failure (Impact)				
				Minimal	Minor	Moderate	Significant	Severe
		Probability	Occurrence Frequency	Minimal Impact on clinical service delivery. Work arounds in place.	Impact on corporate functions only with little direct impact on clinical service delviery. Work arounds in place.	Clinical service delivery will be affected, with loss of clinical support functions. Possible decant required.	Significant drop in level of clinical services. Potential injury to staff, patients and public. Partial decant required.	Vital to clinical service delivery. Loss of whole campus, impact on national level of clinical services. Potential death of staff, patients and public. Total Decant required.
Likelihood	Almost Certain	>90%	At least 1 each year					
	Likely	61% - 90%	1 in 1-3years					
	Possible	21% - 60%	1 in 3-10 years					
	Unlikely	5% - 20%	1 in 10-25 years					
	Rare	<5%	1 in 25 or more years					

KEY

'Very High' Priority Risk Group

'High' Priority Risk Group

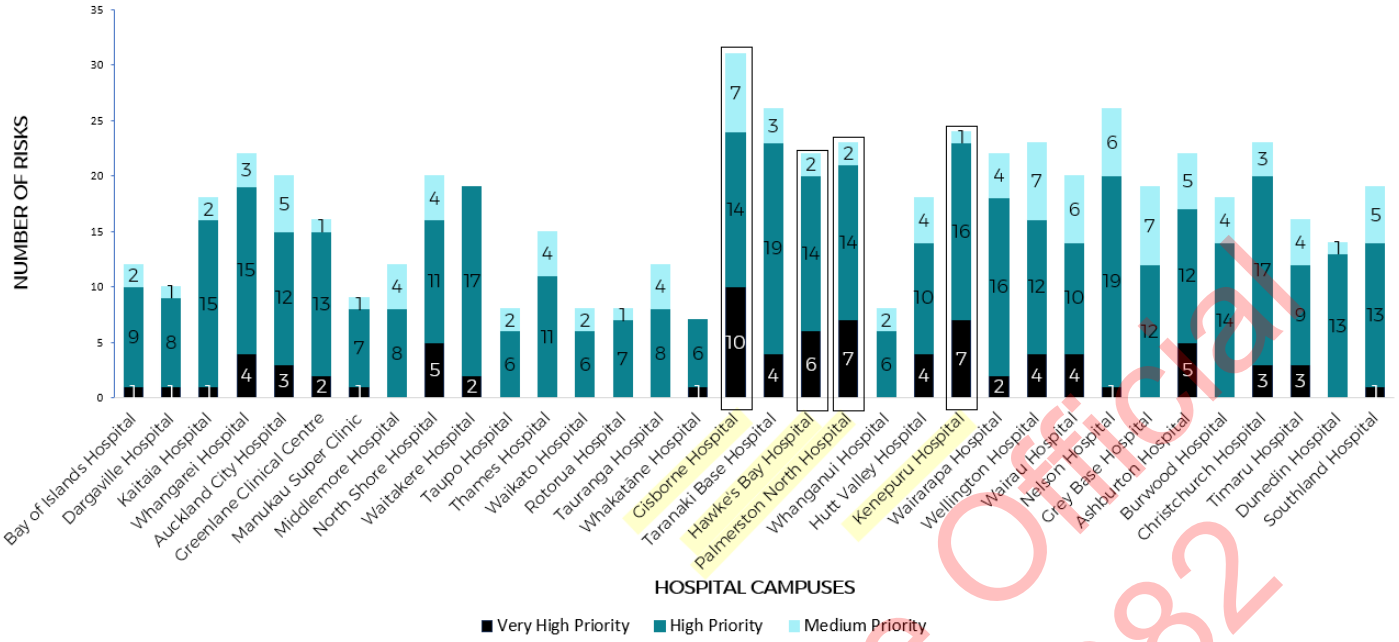
'Medium' Priority Risk Group

Figure 5 shows an approximate even split of the 599 risks across the regions: Northern has 160 risks, Te Manawa Taki has 117 risks, Central has 144 risks and Te Waipounamu has 178 risks. The larger outer ring segment areas illustrate the elevated number of risks at some hospital campuses which are shown in more detail in Figure 6.

Figure 5: Split of the 599 Risks Across Regions

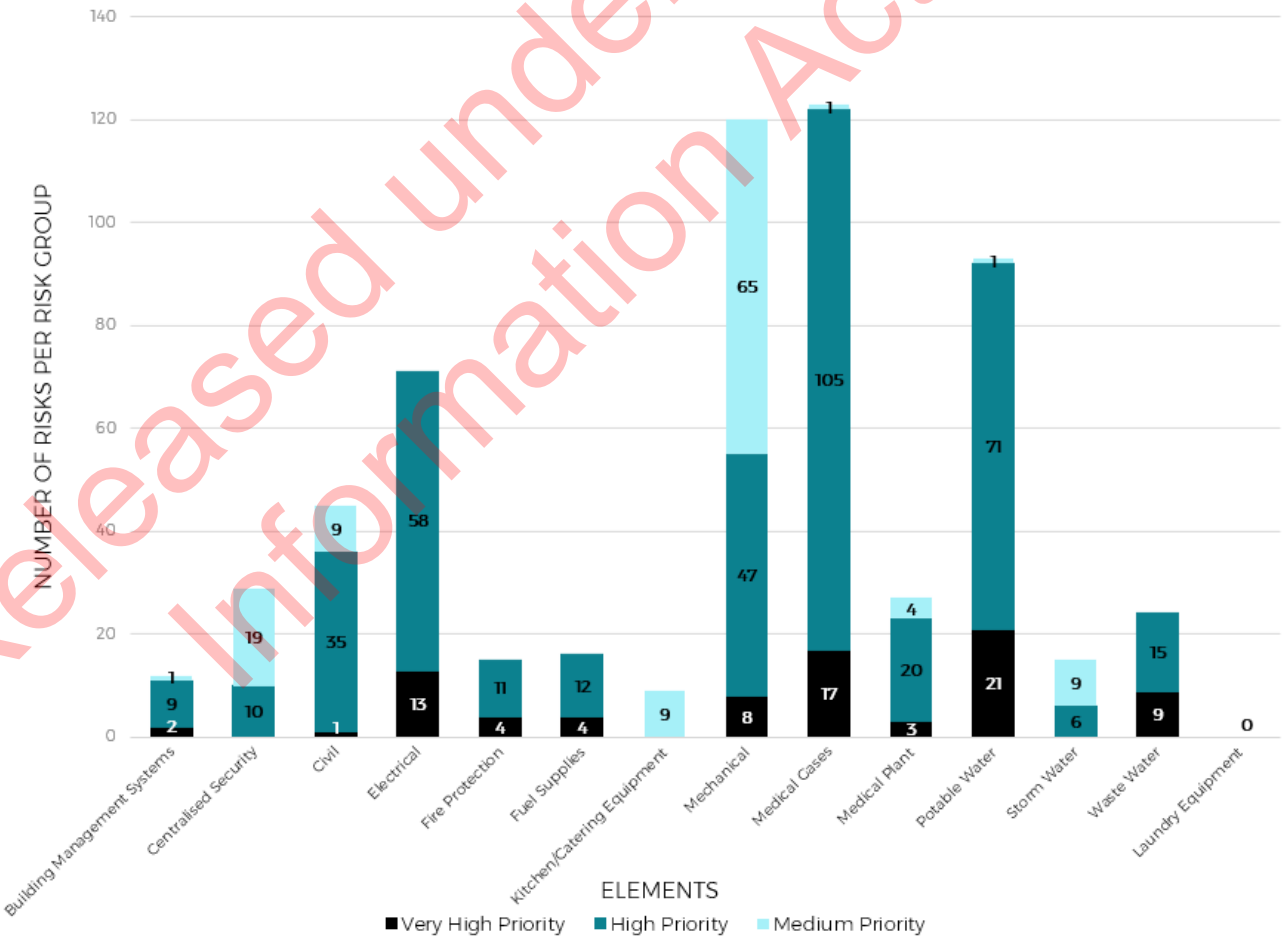
Drilling down further into each location as shown in Figure 6, Gisborne Hospital has the most risks identified at 31. Hawkes' Bay, Palmerston North and Kenepuru also have a large number of Very High and High priority risks.

Figure 6: Breakdown of Very High, High and Medium Priority Risks across Campuses



Evaluation of the risks per element (Figure 7) shows that the largest number of risks reside in Medical Gases followed by Mechanical, Potable Water and Electrical.

Figure 7: Risk Priorities per Element



2.3.1 'VERY HIGH PRIORITY' RISK EVALUATION

Further analysis of Very High priority risks finds Central Region has the most with 30. Gisborne Hospital has the greatest number of priority risks (31, refer Figure 6) **and** Very High priority risks with 10. This is highlighted in Table 12 and Figure 8.

Table 12: Very High Prioritised Risks Across Regions and Campuses

NORTHERN (20)		TE MANAWA TAKI (15)		CENTRAL (30)		TE WAIPOUNAMU (17)	
Bay of Islands	1	Whakatāne	1	Hawkes Bay	6	Nelson	1
Dargaville	1	Gisborne	10	Palmerston North	7	Wairau	4
Kaitaia	1	Taranaki Base	4	Hutt Valley	4	Christchurch	3
Whangarei	4			Kenepuru	7	Ashburton	5
Auckland City	3			Wairarapa	2	Timaru	3
Greenlane Clinical	2			Wellington	4	Southland	1
Manukau Super Clinic	1						
North Shore	5						
Waitakere	2						

Figure 8: Very High Priority Risks across Regions and Campuses

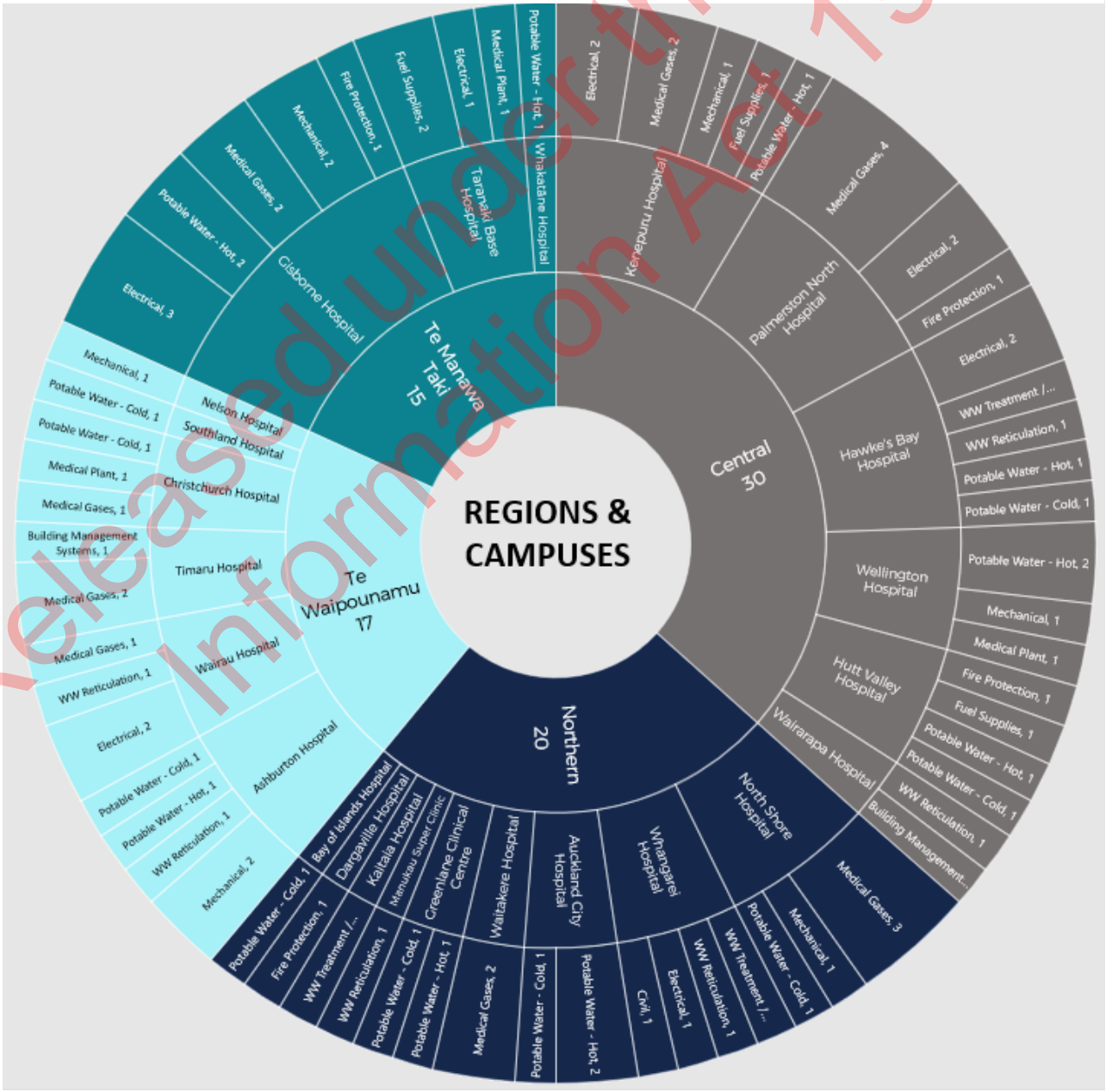


Figure 9 shows Medical Gases, Potable Water and Electrical make up 51 of the 82 Very High priority risks.

Figure 9: Very High Priority Risks Across Elements and Sub-elements

2.3.2 'HIGH PRIORITY' RISK EVALUATION

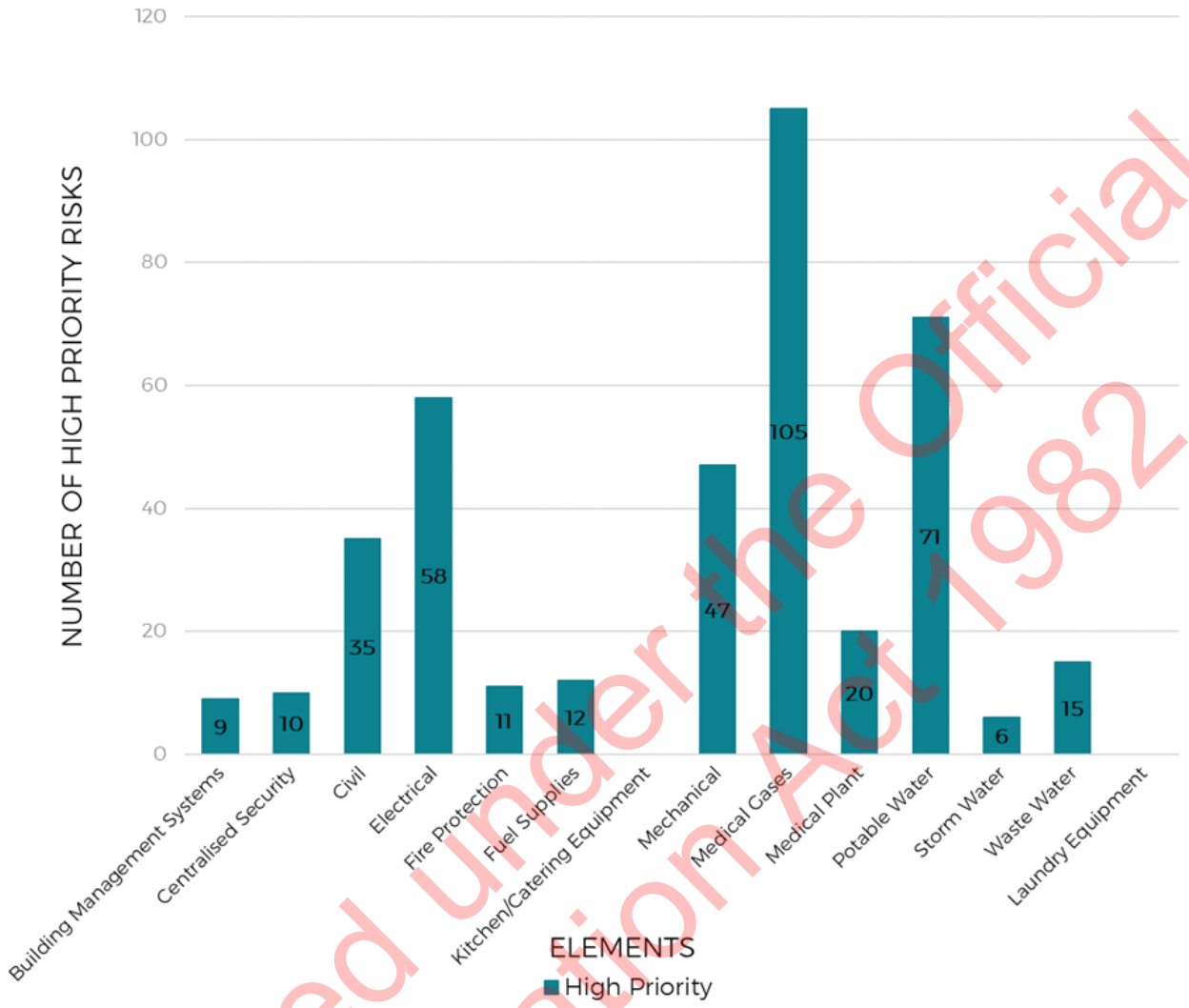
'High Priority Risks' are the largest group of priority risks with 399 identified.

60% of High priority risks are within Te Waipounamu and Northern Regions. High priority risks are spread relatively evenly across campuses and illustrated in Figure 10.

Figure 10: High Priority Risks Breakdown by Region and Campus

Figure 11 illustrates how High priority risks are split across elements, emphasising Medical Gases, Potable Water, Electrical and Mechanical make up 70%, or 281 of the risks.

Figure 11: High Priority Risks Breakdown by Element



Note: Kitchen/Catering Equipment and Laundry Equipment elements have no High priority risks.

Figure 12: High Priority Risks Breakdown by Sub-elements

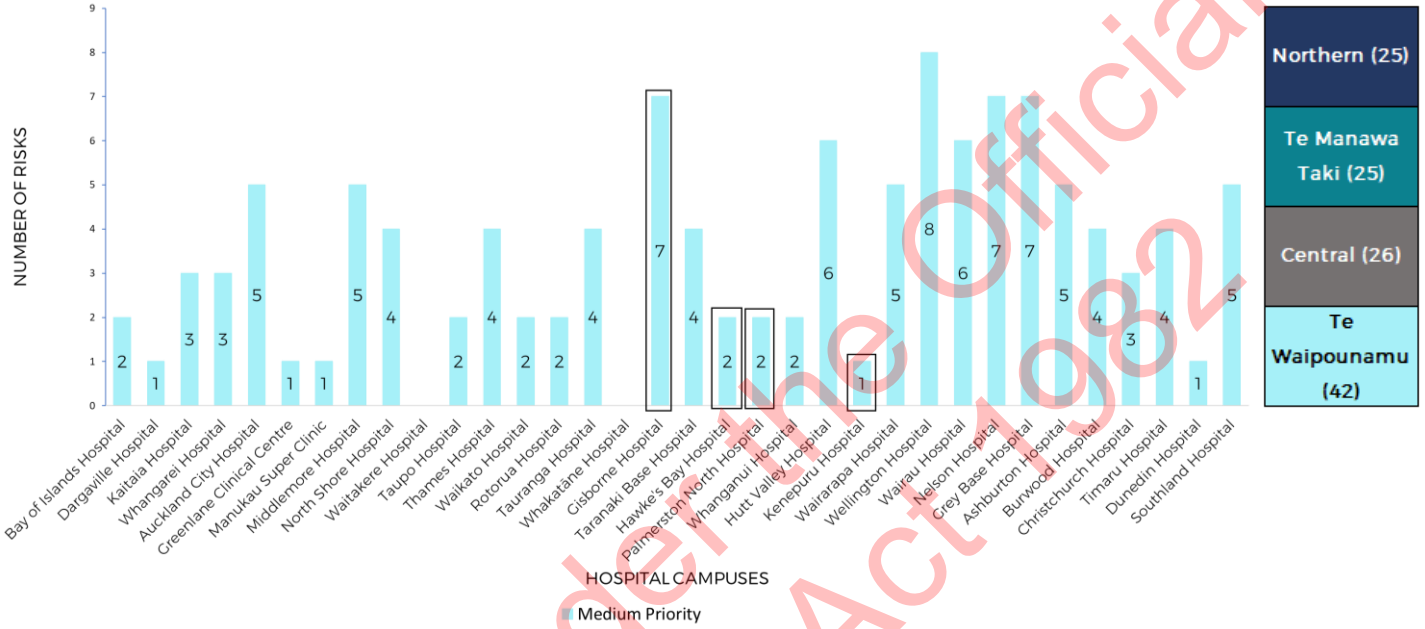
Figure 12 highlights six sub-elements make up nearly half (46%) of the High priority risks:

- Electrical - Electrical Essential Services Supplies (31)
- Potable Water – Mains Supply Storage (32)
- Civil – Access Roads (32)
- Medical Gases – Medical Air Low Pressure (28)
- Medical Gases – Medical Oxygen (32)
- Medical Gases – Vacuum Plant (30)

2.3.3 'MEDIUM PRIORITY' RISK EVALUATION

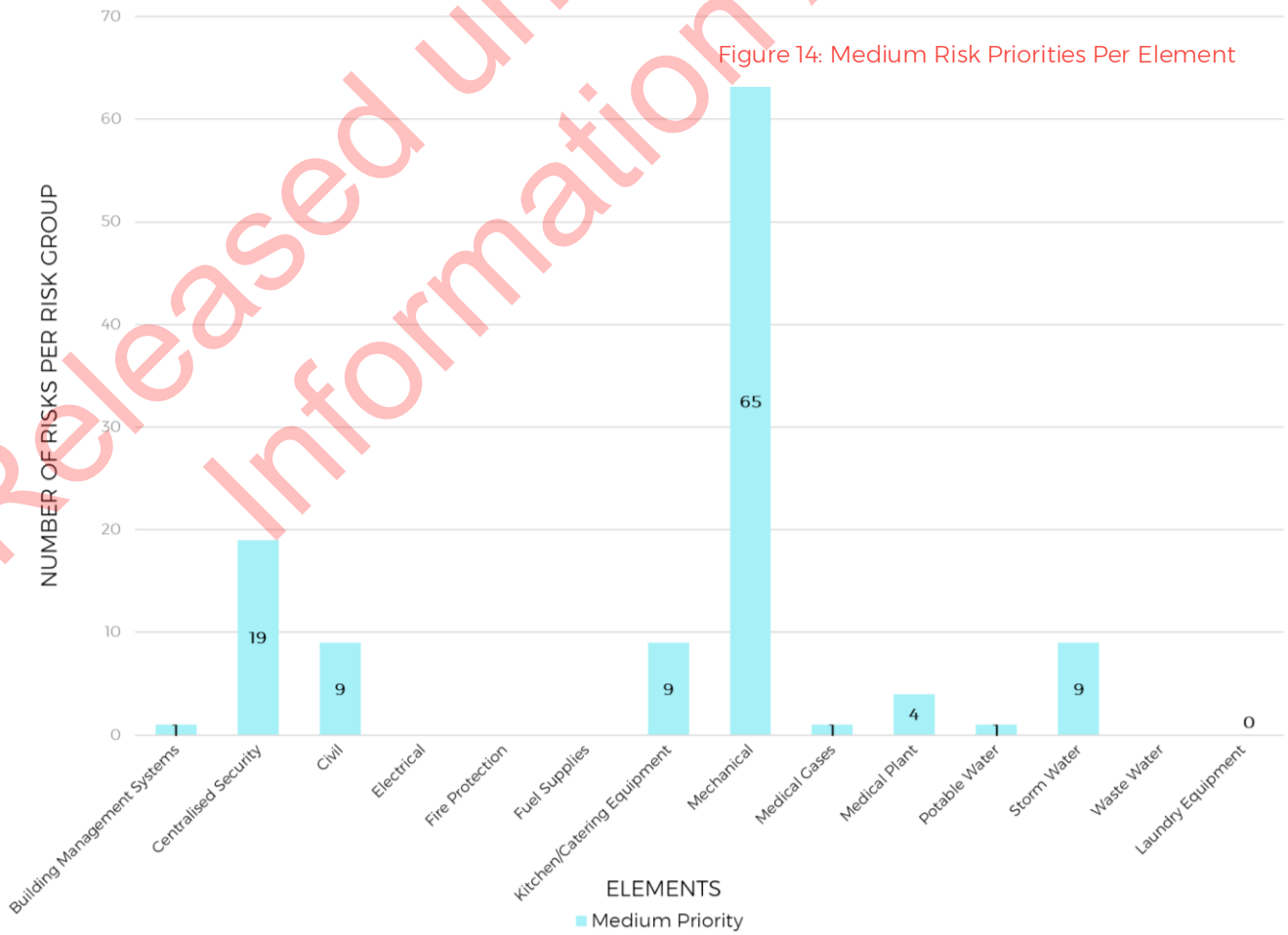
Figure 13 shows how the 118 Medium priority risks are spread across campuses. Te Waipounamu has the most with 42 risks and the remaining regions with 25 or 26 each. Risks for the campuses with the highest numbers of Very High priority risks are highlighted. Gisborne has close to the most medium priority risks which is consistent with other priorities.

Figure 13: Medium Risk Priorities Per Campus



Most Medium Priority Risks relate to the Mechanical sub-elements as shown in Figure 14.

Figure 14: Medium Risk Priorities Per Element



2.4 GAPS AND RISK PRIORITISATION – OBSERVATIONS

Overall observations from the analysis are as follows:

- 43% of the sub-element risks that were rated contain a gap from the desired/target level risk.
- 50% of the criteria assessment scores across 34 campuses and 48 sub-elements were negative (rated poor or very poor).
- The elements with the largest gaps are Electrical, and Potable Water followed by Civil, Mechanical and Medical Gases.

Using the scores from the risk assessments and focussing on those with the highest likelihood and consequence of failure, 599 risks were grouped into the highest priority.

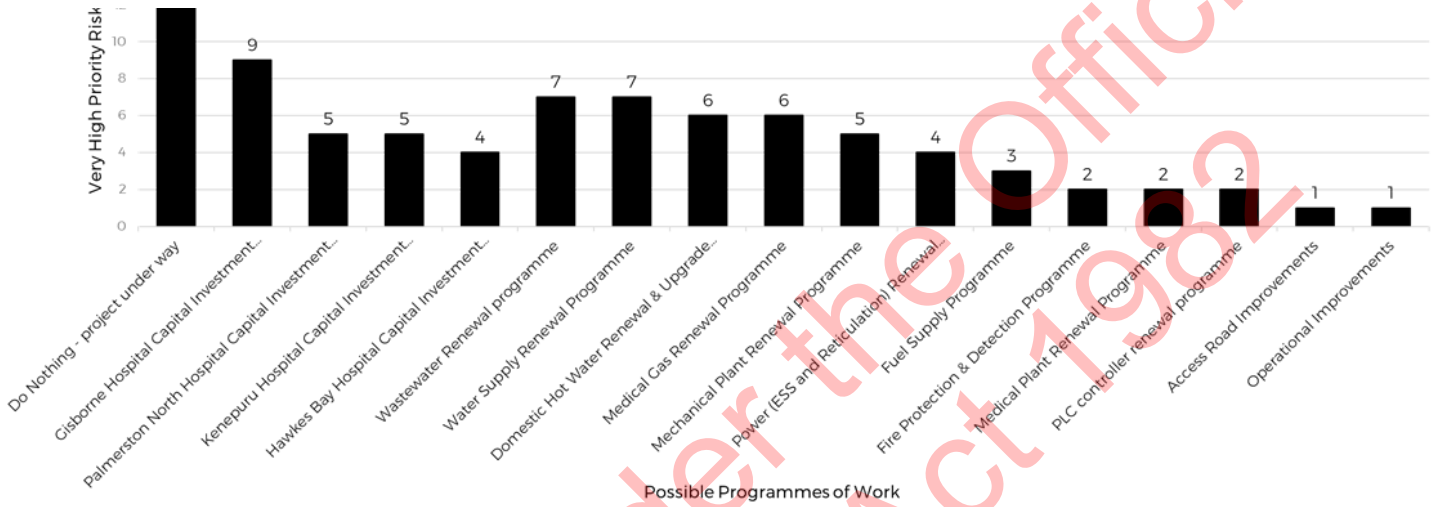
- These risks have been categorised as follows: 82 are Very High priority, 399 are High priority and 118 are Medium priority.
- The risks are generally evenly spread across the Country, although Central Region has the highest number of Very High priority risks.
- Gisborne, Palmerston North, Hawkes Bay and Kenepuru have the highest number of Very High and High priority risks.
- The elements which feature the most in the highest priority group of 599 are: Electrical, Mechanical, Medical Gases and Potable Water.

3 POSSIBLE MITIGATION SOLUTIONS

For the purposes of proposing possible mitigation solutions only the Very High Priority Risks have been assessed as these represent the highest consequence with the greatest likelihood of failure.

We have used the risk assessment data and developed 17 programmes (Figure 15) of work to reduce the likelihood and/or consequence of the 82 Very High priority risks.

Figure 15: Possible Programmes of Work to Mitigate 82 Very High Priority Risk Group



The programmes of work are further described below:

'Do Nothing – project underway' (13 Very High Risks)'

The assessments were produced by rating the condition of the campus-wide infrastructure on the day of the assessment. However, some of the sub-elements have a mitigation planned or already underway so this was noted at the time of the assessment. We have grouped these together here, as no further work is required.

Change operational procuedures (1 Very High Risk)

The *supply logistics of medical oxygen at Wairau Hospital* is leading to an elevated risk which can be mitigated by modifcation.

Liaise with other infrastructure agencies (1 Very High Risk)

The *access roads that surround Whangarei Hospital* are a single point of failure and need upgrading to avoid the potential for flooding

Four location based programmes of work (23 Very High Risks)

As described in section 2.2, four campuses have the highest numbers of Very High and High Priority Risks. By focussing on these four locations, 23 of the Very High priority risks will be mitigated:

Gisborne Hospital Capital Investment: 9 of the highest priority risks (plus 1 which is a project already underway) make this site with the largest amount of mitigation required. The individual work programmes are detailed in Table 14, but include Electrical, Medical Gases, Mechanical Plant, Potable Water and Fire Detection.

Palmerston North Capital Investment: 5 of the highest priority risks (plus 2 which are projects underway) with individual work programmes that comprise Electrical, Medical Gases and Fire Detection.

Kenepuru Capital Investment: 5 of the highest priority risks (plus 2 which are projects underway) with individual work programmes that comprise Electrical, Fire Detection, Potable Water and Mechanical Plant.

Hawkes Bay Capital Investment: 4 of the highest priority risks (plus 2 which are projects underway) with individual work programmes that comprise Electrical, Wastewater and Fuel reticulation.

10 Capital Works Programmes (44 Very High Priority Risks)

The remaining mitigations are made up of 10 capital works programmes which were chosen from analysis described in section 2.2, Figure 9. The programmes align with element categories and comprise:

Wastewater Renewal Programme	*7 packages*
Water Supply Renewal Programme	*7 packages*
Domestic Hot Water Renewal Programme	*6 packages*
Medical Gas Renewal Programme	*6 packages*
Mechanical Plant Renewal Programme	*5 packages*
Power Renewal Programme	*4 packages*
Fuel Supply Programme	*3 packages*
Fire Protection and Detection Programme	*2 packages*
Medical Plant Renewal Programme	*2 packages*
PLC Renewal Programme	*2 packages*

3.1 VERY ROUGH ORDER OF COSTS

The information gathered is based on a qualitative assessment at each campus, so Very Rough Order of costs have been developed for the mitigation programmes using a bespoke methodology developed for this stage of the project. The methodology adopted was to split the programmes into three categories:

- Type A – works comprising site wide reticulation programmes where the infrastructure is buried
- Type B – works comprising of reticulation and other programmes where the infrastructure is not buried
- Type C – works comprising of large pieces of plant and equipment such as generators, power supply and the like.

Within each category, the works were split into minor, moderate and major works packages and then split by campus size (small being a campus of 0-150 beds, medium 151-400 beds and large 400+ beds). Please refer to Appendix 4 for a list of all the 34 campuses bed numbers and their categorisation.

Construction values for each category were then assigned from information obtained from Te Whatu Ora and using WSP project experience. This is summarised in the tables below:

Table 13: Very Rough Order Cost Table

Type A	Small site	Medium	Large
Minor works	Up to $500k	Up to $1M	Up to $1M
Moderate	$500k-$2M	$1M-$5M	$1M-$10M
Major	>$2M	>$5M	>$10M

Type B	Small site	Medium	Large
Minor works	UP to $250k	Up to $500k	Up to $1M
Moderate	$250k-$1M	$500k-$2M	$1M-$5M
Major	>$1M	>$2M	>$5M

Type C	Small site	Medium	Large
Minor works	Up to $500k	Up to $1M	Up to $2M
Moderate	$500k-5M	$1M-10M	$2M-15M
Major	>$5M	>$10M	>$15M

Using this methodology, very rough order cost ranges for each of the Mitigation Programmes has been produced and outlined in Table 14. It must be noted that these costs have been developed from qualitative information derived from the site assessments and the intent with the broad ranges shown is to illustrate the lack of detail that was available when producing the costings.

A detailed breakdown of all 82 Very High priority risks has been provided in Table 15 with project types (A, B or C) and individual very rough order cost ranges. Additional details on the 82 Very High priority risks have been included in Appendix 3.

Table 14: Very Rough Order Cost Ranges for Mitigation Programmes

Reference	Programme	Very Rough Order Cost Range
1	Access Road Improvements	N/A
2	Do Nothing - project under way	N/A
3	Domestic Hot Water Renewal & Upgrade Programme	$10.75M-$34M
4	Fire Protection & Detection Programme	$1.250M-$6M
5	Fuel Supply Programme	$2.1M-$11M
6	Gisborne Hospital Capital Investment Programme	$14.5M-$38M
7	Hawkes Bay Hospital Capital Investment Programme	$4.5M-$21M
8	Kenepuru Hospital Capital Investment Programme	$6.35M-$18.5M
9	Mechanical Plant Renewal Programme	$15.45M-$34M
10	Medical Gas Renewal Programme	$4.85M-$18M
11	Medical Plant Renewal Programme	$600K-$3M
12	Operational Improvements	N/A
13	Palmerston North Hospital Capital Investment Programme	$22.6M-$46.5M
14	PLC controller renewal programme	$350K-$1.5M
15	Power (ESS and Reticulation) Renewal Programme	$31M-$70M
16	Wastewater Renewal programme	$13.6M-$31M
17	Water Supply Renewal Programme	$12.5M-$40M
	TOTAL	$140.4M-$372.5M

Table 15: Very High Priority Risks - Details

Risk Reference Number	Campus	Sub Element	Risk Description	Potential Risk Mitigation	Project Type	Very Rough Order Cost Range	Possible Programmes of Work
WRE- 1- 1	Whangarei Hospital	Civil - Access Roads	Access Roads - single point of failure	Access Road improvements, flooding and diversity. TLA and Waka Kotahi	Type A		Access Road improvements
GIS- 10- 14	Gisborne Hospital	Electrical - Essential Services Supplies (ESS)	Electrical Essential Services Supplies - end of life and not supplying some essential infrastructure	Project Planned: Major End of Life and Capacity Upgrade to essential power system			Do Nothing - project under way
HKB- 10- 14	Hawke's Bay Hospital	Electrical - Essential Services Supplies (ESS)	Electrical Essential Services Supplies - Generator and Fuel Storage capacity undersized	Project Underway: Major Project Essential Power Generator Capacity and Increased Fuel storage			Do Nothing - project under way
HKB- 7- 27	Hawke's Bay Hospital	Water - Mains Supply / Storage	Potable Water Mains supply - end of life and single point of failure	Project Underway: Potable Water supply resilience and capacity upgrade			Do Nothing - project under way
PMR- 12- 46	Palmerston North Hospital	Med Gas - Vacuum Plant (Medical)	Vacuum Plant - end of life	Project Underway: Vacuum pump system renewal and upgrade			Do Nothing - project under way
KNP- 4- 29	Kenepuru Hospital	Med Gas - Medical Air (Low Pressure)	Medical Air - System - end of life, compliance, and resilience	Project Underway: Renewal of medical air compressors and reticulation upgrade			Do Nothing - project under way
TIU- 12- 46	Timaru Hospital	Med Gas - Vacuum Plant (Medical)	Vacuum Plant - end of life and compliance	Project Underway: Vacuum Plant renewal and upgrade - end of life, compliance, and capacity			Do Nothing - project under way
AKL- 7- 8	Auckland City Hospital	Water - Cold Water Reticulation	Potable Water Reticulation - end of life	Project Underway: Potable Water Reticulation - end of life, upgrade and resiliency improvement			Do Nothing - project under way
AKL- 7- 21	Auckland City Hospital	Water - Hot Water Plant	Hot Water Plant - end of life and poor resilience	Project Underway: Domestic Hot Water Reticulation - end of life and resiliency upgrade			Do Nothing - project under way
PMR- 4- 28	Palmerston North Hospital	Med Gas - Medical Air (High Pressure)	Medical Air - System - end of life, compliance, and capacity issues	Project Underway: Medical Air compressor end of life renewal project			Do Nothing - project under way
WLG- 12- 43	Wellington Hospital	Medical - Sterilisation plant / autoclaves	Autoclaves - end of life and failing regularly	Project Underway. Autoclaves end of life renewal			Do Nothing - project under way
KNP- 4- 28	Kenepuru Hospital	Med Gas - Medical Air (High Pressure)	Medical Air - System - end of life and resiliency	Project Underway. Medical Gas compressor end of life renewals			Do Nothing - project under way
ASG- 7- 22	Ashburton Hospital	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life and resilience	Project Underway. Hot Water reticulation end of life and resiliency upgrade			Do Nothing - project under way
NSC- 4- 5	North Shore Hospital	Med Gas - Carbon Dioxide	Carbon Dioxide - Reticulation system design, compliance, and resiliency	Project Underway. Carbon Dioxide reticulation upgrade			Do Nothing - project under way
AKL- 7- 22	Auckland City Hospital	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life and poor historical maintenance	Domestic Hot Water Distribution renewal and upgrade due to condition and poor historic maintenance	Type B	$2M-$4M	Domestic Hot Water Renewal & Upgrade Programme
GCC- 7- 22	Greenlane Clinical Centre	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life and poor historical maintenance	Domestic Hot Water Reticulation - end of life and resiliency upgrade	Type B	$1M-$2M	Domestic Hot Water Renewal & Upgrade Programme
WHK- 7- 22	Whakatāne Hospital	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life and resilience	Domestic Hot Water Reticulation - upgrade	Type B	$250K-$1M	Domestic Hot Water Renewal & Upgrade Programme
WLG- 7- 22	Wellington Hospital	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life and resilience	Domestic Hot Water Reticulation - end of life renewal and upgrade	Type B	$5M-$10M	Domestic Hot Water Renewal & Upgrade Programme
WLG- 7- 21	Wellington Hospital	Water - Hot Water Plant	Hot Water Plant - end of life	Domestic Hot Water Plant - end of life renewal	Type C	$2M-$15M	Domestic Hot Water Renewal & Upgrade Programme
HVL- 7- 22	Hutt Valley Hospital	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life	Domestic Hot Water Reticulation - partial end of life renewal	Type B	$500K-$2M	Domestic Hot Water Renewal & Upgrade Programme
DGR- 8- 10	Dargaville Hospital	Fire - Detection	Fire Detection - end of life and incomplete coverage	Fire Detection System - end of life, inadequate coverage, poor compliance, and resilience requires renewal	Type B	$250K-$1M	Fire Protection & Detection Programme
HVL- 8- 44	Hutt Valley Hospital	Fire - Suppression	Potable Water Reticulation - end of life	Fire Protection - reticulation end of life renewal project	Type A	$1M-$5M	Fire Protection & Detection Programme

Risk Reference Number	Campus	Sub Element	Risk Description	Potential Risk Mitigation	Project Type	Very Rough Order Cost Range	Possible Programmes of Work
HVL- 11- 37	Hutt Valley Hospital	Fuel - Reticulation	Fuel Reticulation - system design and resiliency	Fuel Reticulation - resiliency upgrade	Type A	$100K-$1M	Fuel Supply Programme
TKI- 11- 15	Taranaki Base Hospital	Fuel - Supply - Diesel / Gas / Coal / Woodchip	Fuel Supply - end of life and resiliency	Fuel Supply - end of life renewal and capacity / resiliency upgrade	Type A	$1M-$5M	Fuel Supply Programme
TKI- 11- 37	Taranaki Base Hospital	Fuel - Reticulation	Fuel Reticulation - end of life	Fuel Reticulation - and Fuel Storage end of life renewal and compliance upgrade	Type A	$1M-$5M	Fuel Supply Programme
GIS- 10- 25	Gisborne Hospital	Electrical - Local Reticulation (Essential & Non-Essential)	Electrical Local Distribution - end of life and capacity issues	Electrical - Local Reticulation - Distribution capacity and safety standards renewal	Type C	$500K-$5M	Gisborne Hospital Capital Investment Programme
GIS- 6- 42	Gisborne Hospital	Mech - Steam Reticulation	Steam Reticulation - end of life, compliance, and resilience	Steam Reticulation - end of life renewal	Type B	$1M-$2M	Gisborne Hospital Capital Investment Programme
GIS- 4- 30	Gisborne Hospital	Med Gas - Medical Oxygen	Medical Oxygen - Reticulation and outlets at end of life	Medical Oxygen - reticulation end of life renewal , security, and reliability	Type B	$1M-$2M	Gisborne Hospital Capital Investment Programme
GIS- 10- 26	Gisborne Hospital	Electrical - Mains Supply	Electrical Mains Supply - end of life and compliance	Electrical Essential Services - Main Switchboard end of life and compliance renewal	Type C	$5M-$10M	Gisborne Hospital Capital Investment Programme
GIS- 7- 22	Gisborne Hospital	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life	Domestic Hot Water Reticulation - end of life and resiliency upgrade	Type B	$250K-$1M	Gisborne Hospital Capital Investment Programme
GIS- 7- 21	Gisborne Hospital	Water - Hot Water Plant	Hot Water Plant - end of life, capacity issues and poor resilience	Domestic Hot Water - Calorifier end of life renewal	Type C	$500K-$5M	Gisborne Hospital Capital Investment Programme
GIS- 6- 41	Gisborne Hospital	Mech - Steam Generators	Steam Generators - end of life and compliance	Steam Generator - end of life renewal and compliance upgrade	Type C	$5M-$10M	Gisborne Hospital Capital Investment Programme
GIS- 8- 10	Gisborne Hospital	Fire - Detection	Fire Detection - end of life and incomplete coverage	Fire Detection System - end of life renewal and coverage upgrade	Type B	$250K-$1M	Gisborne Hospital Capital Investment Programme
GIS- 4- 28	Gisborne Hospital	Med Gas - Medical Air (High Pressure)	Medical Air - System - end of life	Medical Air system - end of life renewal	Type B	$1M-$2M	Gisborne Hospital Capital Investment Programme
HKB- 10- 25	Hawke's Bay Hospital	Electrical - Local Reticulation (Essential & Non-Essential)	Electrical Local Distribution - end of life, compliance, and capacity issues	Electrical Distribution end of life renewal	Type C	$1M-$10M	Hawkes Bay Hospital Capital Investment Programme
HKB- 7- 22	Hawke's Bay Hospital	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life	Domestic Hot Water Reticulation - end of life renewal and upgrade	Type B	$500K-$2M	Hawkes Bay Hospital Capital Investment Programme
HKB- 9- 38	Hawke's Bay Hospital	WW Reticulation	Wastewater Reticulation - end of life and poor resilience	Wastewater Reticulation - end of life renewal and capacity, resiliency upgrade	Type B	$2M-$4M	Hawkes Bay Hospital Capital Investment Programme
HKB- 9- 11	Hawke's Bay Hospital	WW Treatment / Discharge	Wastewater Reticulation - end of life and regular blockages	Wastewater grease trap end of life renewal project	Type A	$1M-$5M	Hawkes Bay Hospital Capital Investment Programme
KNP- 7- 22	Kenepuru Hospital	Water - Hot Water Reticulation	Domestic Hot Water Reticulation - end of life and has capacity issues due to incremental historical additions	Domestic Hot Water Reticulation - end of life and resiliency upgrade	Type B	$250K-$1M	Kenepuru Hospital Capital Investment Programme
KNP- 11- 37	Kenepuru Hospital	Fuel - Reticulation	Fuel Supply - single point of failure, resiliency	Gas Supply - Upgrade and diversity supply	Type A	$500K-$2M	Kenepuru Hospital Capital Investment Programme
KNP- 10- 26	Kenepuru Hospital	Electrical - Mains Supply	Electrical Mains supply - resiliency	Electrical Mains Supply - upgrade resilience and standards	Type C	$5M-$10M	Kenepuru Hospital Capital Investment Programme
KNP- 10- 25	Kenepuru Hospital	Electrical - Local Reticulation (Essential & Non-Essential)	Electrical Local Distribution - end of life, compliance, and capacity issues	Electrical - Local Reticulation - end of life renewals	Type C	$500K-$5M	Kenepuru Hospital Capital Investment Programme
KNP- 6- 41	Kenepuru Hospital	Mech - Steam Generators	Steam Generators - system design, over capacity, reliability, and efficiency	Steam Generator - replace for energy efficiency	Type C	$100K-$500K	Kenepuru Hospital Capital Investment Programme
WLG- 6- 41	Wellington Hospital	Mech - Steam Generators	Steam Generators - system design, over capacity, reliability, and efficiency	Steam Generator - replace for operational efficiency	Type C	$100K-$2M	Mechanical Plant Renewal Programme
NSN- 6- 41	Nelson Hospital	Mech - Steam Generators	Steam Generator - end of life, capacity, and compliance	Steam Generator and Reticulation - end of life renewal	Type C	$10M-$20M	Mechanical Plant Renewal Programme
ASG- 6- 41	Ashburton Hospital	Mech - Steam Generators	Steam Generators - end of life and resiliency	Steam Generator - end of life renewal and resiliency upgrade	Type C	$5M-$10M	Mechanical Plant Renewal Programme
ASG- 6- 42	Ashburton Hospital	Mech - Steam Reticulation	Steam Reticulation - end of life	Steam Reticulation - end of life renewal	Type B	$250K-$1M	Mechanical Plant Renewal Programme

Risk Reference Number	Campus	Sub Element	Risk Description	Potential Risk Mitigation	Project Type	Very Rough Order Cost Range	Possible Programmes of Work
NSC- 6- 42	North Shore Hospital	Mech - Steam Reticulation	Steam Reticulation - capacity	Steam Reticulation - partial capacity upgrade	Type B	$100K-$1M	Mechanical Plant Renewal Programme
TIU- 4- 29	Timaru Hospital	Med Gas - Medical Air (Low Pressure)	Medical Air - Reticulation end of life and compliance	Medical Air system - upgrade and end of life renewal	Type B	$250K-$1M	Medical Gas Renewal Programme
NSC- 12- 46	North Shore Hospital	Med Gas - Vacuum Plant (Medical)	Vacuum Plant - end of life	Vacuum Plant - end of life renewal and compliance and capacity upgrade	Type B	$1M-$5M	Medical Gas Renewal Programme
WTK- 12- 46	Waitakere Hospital	Med Gas - Vacuum Plant (Medical)	Vacuum Plant - end of life and compliance	Vacuum Plant - end of life renewal and compliance and capacity upgrade	Type B	$2M-$4M	Medical Gas Renewal Programme
CHC- 12- 16	Christchurch Hospital	Med Gas - Gas Scavenging	Gas Scavenging - plant resiliency	Gas Scavenging - resiliency upgrade	Type B	$100K-$1M	Medical Gas Renewal Programme
NSC- 12- 16	North Shore Hospital	Med Gas - Gas Scavenging	Gas scavenging - end of life	Gas Scavenging - end of life renewal	Type B	$1M-$5M	Medical Gas Renewal Programme
WTK- 12- 16	Waitakere Hospital	Med Gas - Gas Scavenging	Gas Scavenging - end of life and compliance	Gas Scavenging - end of life renewal	Type B	$500K-$2M	Medical Gas Renewal Programme
TKI- 12- 43	Taranaki Base Hospital	Medical - Sterilisation plant / autoclaves	Autoclaves - end of life and failing regularly	Autoclaves end of life renewal	Type B	$500K-$2M	Medical Plant Renewal Programme
CHC- 12- 47	Christchurch Hospital	Medical - Smoke / plume extract	Smoke Plume Extract - system design and resiliency	Smoke plume extract compliance and safety upgrade project	Type B	$100K-$1M	Medical Plant Renewal Programme
WAR- 4- 30	Wairau Hospital	Med Gas - Medical Oxygen	Medical Oxygen - Supply logistics	Operational Improvement / Increased storage	Type B		Operational Improvements
PMR- 4- 29	Palmerston North Hospital	Med Gas - Medical Air (Low Pressure)	Medical Air - System - end of life, compliance, and resilience	Replacement Planned 2 years. Upgrade and renewal of complete Medical Air system	Type B	$2M-$4M	Palmerston North Hospital Capital Investment Programme
PMR- 10- 26	Palmerston North Hospital	Electrical - Mains Supply	Electrical Mains Supply - end of life and capacity issues	Electrical Essential Services - Transformer and Incomer upgrade end of life and capacity	Type C	$10M-$20M	Palmerston North Hospital Capital Investment Programme
PMR- 10- 25	Palmerston North Hospital	Electrical - Local Reticulation (Essential & Non-Essential)	Electrical Essential Services Supplies - end of life, compliance, and capacity issues	Electrical Essential Services - Main Switchboard end of life and compliance renewal	Type C	$10M-$20M	Palmerston North Hospital Capital Investment Programme
PMR- 8- 10	Palmerston North Hospital	Fire - Detection	Fire Detection - end of life and incomplete coverage	Fire Detection System - end of life renewal and coverage upgrade	Type B	$500K-$2M	Palmerston North Hospital Capital Investment Programme
PMR- 12- 16	Palmerston North Hospital	Med Gas - Gas Scavenging	Gas Scavenging - incomplete coverage	Gas Scavenging - coverage upgrade project	Type B	$100K-$500K	Palmerston North Hospital Capital Investment Programme
WRP- 3- 35	Wairarapa Hospital	BMS - Programmable Logic Controllers (PLC)	PLC - controllers for essential infrastructure end of life	PLC controllers - end of life upgrade programme	Type B	$100K-$500K	PLC controller renewal programme
TIU- 3- 35	Timaru Hospital	BMS - Programmable Logic Controllers (PLC)	PLC - controllers Single point of failure for some essential infrastructure	PLC controllers - end of life upgrade programme	Type B	$250K-$1M	PLC controller renewal programme
WAR- 10- 14	Wairau Hospital	Electrical - Essential Services Supplies (ESS)	Electrical Essential Services Supplies - Generator capacity undersized and poor configuration	Electrical Essential Services - End of Life Generator Renewal and system reliability improvements	Type C	$10M-$20M	Power (ESS and Reticulation) Renewal Programme
WRE- 10- 25	Whangarei Hospital	Electrical - Local Reticulation (Essential & Non-Essential)	Electrical Local Distribution - Main Switchboards end of life and compliance	Electrical Local Reticulation - Main Switchboards - end of life, standards, and resiliency	Type C	$10M-$20M	Power (ESS and Reticulation) Renewal Programme
WAR- 10- 26	Wairau Hospital	Electrical - Mains Supply	Electrical Mains Supply - end of life, compliance, and resilience	Electrical Mains Supply - and Essential Power renewal and resiliency upgrade	Type C	$1M-$10M	Power (ESS and Reticulation) Renewal Programme
TKI- 10- 25	Taranaki Base Hospital	Electrical - Local Reticulation (Essential & Non-Essential)	Electrical Local Distribution - end of life, compliance, and capacity issues	Electrical Local Reticulation - end of life renewals	Type C	$10M-$20M	Power (ESS and Reticulation) Renewal Programme
MNK- 9- 38	Manukau Super Clinic	WW Reticulation	Wastewater Reticulation - end of life and regular blockages	Wastewater Reticulation - end of life renewal	Type A	$2M-$4M	Wastewater Renewal programme
KAI- 9- 11	Kaitaia Hospital	WW Treatment / Discharge	Wastewater Discharge - end of life and single point of failure Resiliency	Wastewater discharge renewal and upgrade due to capacity, condition, and resilience	Type A	$500K-$2M	Wastewater Renewal programme

Risk Reference Number	Campus	Sub Element	Risk Description	Potential Risk Mitigation	Project Type	Very Rough Order Cost Range	Possible Programmes of Work
WRE- 9- 38	Whangarei Hospital	WW Reticulation	Wastewater Reticulation - end of life and regular blockages	Wastewater Reticulation - end of life renewal and capacity, resiliency upgrade	Type A	$5M-$10M	Wastewater Renewal programme
WRE- 9- 11	Whangarei Hospital	WW Treatment / Discharge	Wastewater Discharge - capacity and blockages	Wastewater discharge renewal and upgrade due to capacity, condition, and resilience	Type A	$5M-$10M	Wastewater Renewal programme
WRP- 9- 38	Wairarapa Hospital	WW Reticulation	Wastewater Reticulation capacity and regular blockages	Wastewater Reticulation - end of life renewal	Type A	$500K-$2M	Wastewater Renewal programme
WAR- 9- 38	Wairau Hospital	WW Reticulation	Wastewater Reticulation - end of life and regular blockages	Wastewater Reticulation - end of life renewal	Type A	$100K-$1M	Wastewater Renewal programme
ASG- 9- 38	Ashburton Hospital	WW Reticulation	Wastewater Reticulation - end of life and regular blockages	Wastewater Reticulation - end of life renewal and capacity, resiliency upgrade	Type A	$500K-$2M	Wastewater Renewal programme
CHC- 7- 8	Christchurch Hospital	Water - Cold Water Reticulation	Potable Water Reticulation - end of life and capacity	Potable Water Reticulation - end of life, upgrade, and resiliency improvement	Type B	$5M-$10M	Water Supply Renewal Programme
BOI- 7- 27	Bay of Islands Hospital	Water - Mains Supply / Storage	Potable Water Mains Supply - Reticulation and emergency storage at end of life	Potable Water supply - and emergency storage end of life renewal	Type A	$2M-$4M	Water Supply Renewal Programme
GCC- 7- 8	Greenlane Clinical Centre	Water - Cold Water Reticulation	Potable Water Reticulation - end of life and poor resilience	Potable Water Reticulation - end of life, upgrade, and resiliency improvement	Type A	$2M-$4M	Water Supply Renewal Programme
HVL- 7- 8	Hutt Valley Hospital	Water - Cold Water Reticulation	Potable Water Reticulation - end of life, capacity, and resiliency	Potable Water Reticulation - end of life renewal	Type A	$1M-$5M	Water Supply Renewal Programme
ASG- 7- 8	Ashburton Hospital	Water - Cold Water Reticulation	Potable Water Reticulation - end of life and resiliency	Potable Water Reticulation - end of life renewal	Type A	$500K-$2M	Water Supply Renewal Programme
STL- 7- 8	Southland Hospital	Water - Cold Water Reticulation	Potable Water Reticulation - end of life and resiliency	Potable Water Reticulation - end of life renewal	Type A	$1M-$5M	Water Supply Renewal Programme
NSC- 7- 8	North Shore Hospital	Water - Cold Water Reticulation	Potable Water Reticulation - end of life	Potable Water Reticulation - end of life renewal	Type A	$1M-$10M	Water Supply Renewal Programme

4 RECOMMENDATIONS

Based on the information gathered from the Risk and Assurance Assessments, we recommend the following actions are carried out to reduce priority risks to the Te Whatu Ora campus-wide infrastructure portfolio at the 34 campuses assessed:

1 **Extend Assessments to the remaining campuses**

This exercise was carried out on 34 campuses that are responsible for surgical procedures. These assessments and subsequent analysis should now be carried out on the remaining campuses across the portfolio

2 **Mitigate Very High Priority Risks**

Using the themes and solutions identified in this report, we recommend that quantitative assessment is carried out on the 82 Very High priority risks to confirm the urgent programme of works required. This should take the form of further investigations of each of the risks with more detailed risk mitigation strategy and costings while taking account of existing risk mitigations and treatments in place that may not have been captured thus far,

3 **Analyse High Priority Risks**

The group of high priority risks is large at 399, so we recommend that these risks are analysed to derive themes and to develop interim solutions which can be implemented across the campus portfolio. It is likely that there are existing mitigations and treatments in place and that the themes developed will be like the Very High priority risks so inclusion of some of these into the urgent programme of works may be more cost-effective. Once the analysis is completed, quantitative assessment should be carried out. With such a large number of risks, we recommend that this is carried out by risk theme,

4 **Assess Medium Priority Risks**

The Medium priority risks should be further assessed, followed by analysis and assessment to ensure that these risks are being managed and a medium-term mitigation plan is developed for the Te Whatu Ora portfolio.

5 **General**

- As part of the site assessment phase, several Very High priority risks were identified which are being mitigated. We recommend that this group: '**Do Nothing - Project Underway**' is checked and validated as part of the mitigation of Very High priority risks.
- Several of the campuses are subject to other programmes of work – the Regional Hospital Upgrade Programme for example. We recommend engagement with these programme teams to ensure risks are mitigated in the most effective manner.
- All risks should be managed in both a Regional and National Risk Register. Individual or aggregated Campus level risks that fall within a regular risk management and review process should be captured.
- The purpose of this analysis is to identify and recommend mitigations for the Very High priority risks. We recommend that a regime where regular monitoring of all site-wide infrastructure assets is carried out and treatments are applied as required to manage risks across the portfolio to an acceptable level (including the non-prioritised risks included in this Risk and Assurance process).

5 OBSERVATIONS AND OPPPORTUNITIES

The Campus Infrastructure Risk & Assurance programme has been a successful first step to the implementation of Asset Management across the Health Estate, effectively engaging the facility teams in 20 Districts and leveraging their knowledge to identify, categorise and prioritise risks.

WSP have enjoyed working with Te Whatu Ora Infrastructure Unit and the facilities teams across New Zealand and we have identified some observations that may assist in the asset management journey.

The fundamental goal for asset management is to deliver the optimum balance of level of service, cost of service and risk.

5.1 UNDERSTANDING THE DESTINATION OF THE ASSET MANAGEMENT JOURNEY.

As with any journey it is essential to define the destination so that it can be used to focus attention and as part of a measure to determine how far there is still to go.

Te Pae Tata - Interim NZ Health Plan provides a good view on the health objectives of Te Whatu Ora and can be used to inform the asset management journey, however it needs to be broken down in order to identify the requirements on the infrastructure and people of the health estate.

We believe Te Whatu Ora requires a minimum of 3 components of the 'Destination' as outlined in table 16 below.

Table 16: Component of Te Whatu Ora's Asset Management Destination

1	The linkage between health estate infrastructure and network of campuses with the health outcomes from Te Pae Tata. The health outcomes need to be interpreted into the outcomes to be delivered by health estate infrastructure.	This will enable improved decision making. The ability to prioritise where investment and effort is expended, the required urgency and potential consequences if it does not happen. It will be important to break this down into enough detail to understand different types of infrastructure, for different clinical purposes and how the campus fits within Te Whatu Ora's delivery of health services regionally and nationally. Effectively defining how Te Pae Tata - Interim NZ Health Plan influences a National Campus Network Plan, how this National Plan influences District Network Plans, how District Plans influence Campus Master Plans and how the Campus Master Plans drive Asset Management Plans for Buildings and Infrastructure.
2	The Performance required from assets to deliver the health infrastructure outcomes.	This will enable Te Whatu Ora to use the fundamental asset management technique of "What gets measured gets managed". To this end, the Draft National Asset Performance Measure framework developed by the Ministry of Health and District Health Boards in consultation with Treasury in 2017, provides a good starting point. The framework was designed to be able to be applied for the 'significant asset portfolios' of Buildings & Infrastructure; Clinical Equipment and ICT Infrastructure and is replicated in the figure below.

		The framework makes it possible to design asset-type-specific 'performance measures', set 'target values' against these performance measures based on criticality/function and also set 'intervention levels' which identify minimum performance level values and act as a trigger for some form of intervention.
3	The level of asset management maturity for Te Whatu Ora's people and processes to develop, implement and maintain the asset management system required by component 1 & 2.	This will identify the skills, competency, consistency and systems required to embed asset management into Te Whatu Ora's "Business As Usual" so Asset Management becomes part of normal operations and management, not a peripheral activity.

Table 17: Asset Management Objectives

ICR Asset Performance Indicators	Description	Level of Service 'Drivers'	Level of Service Statements	Asset Performance Measures Categories	
Broad categories of asset service attributes		Types of asset service attributes that are important from the customer perspective	Describes the customer experience relative to the Level of Service 'Driver'	Technical criteria that demonstrate organisational performance	Measure Notes
Condition	Confidence the asset is capable of performing	Condition	Assets are in working order, not damaged or in need of repair	Condition Grade	The asset condition relative to industry accepted grading eg. IIMM 1-5 Condition Grades
				Supportable	The capability of the asset to be supported with Spare Parts, Consumables and specialised skills.
				Maintenance & Operation Requirement	The asset condition relative to its needs of regulatory compliance, calibration and reactive, preventative, service and replenishment maintenance.
Utilisation	How well the asset is used	Utilisation	Assets are well utilised and not overloaded	Time Consumption	How intensively the asset is used in relation to the time available
				Loading	How intensively the asset is loaded in relation to its maximum capacity
Functionality	Making sure the asset does what it should	Accessibility	Assets are where they are needed and accessible	Location	The position of the asset in relation to where it would be best located
				Usability	Asset is able to be used when located by the user
		Resilience	Assets are tough, reliable and safe to use	Availability	The reliability/confidence the asset can operate when needed
				Vulnerability – Severe Events	Ability of the Asset to withstand the impacts of severe weather and natural events
				Vulnerability – Security	The ability to prevent loss.
				Durability	The ability of the asset to withstand operational 'wear and tear' and other predictable demands
				Risk to People	Ability of the asset to keep patients, visitors and healthcare workers safe, healthy and away from harm
		Performance	Assets work efficiently and effectively	Service Performance	Asset performance in relation to what is needed in terms of Healthcare Objectives
				Design Performance	Asset performance relative to certification standards
				Cost of Operating	Asset performance in relation to operating costs and value generation (Whole of Life Costs)

Te Whatu Ora can use the above components in Table 17 to define the "Asset Management Objectives" which are an essential element of IIMM and ISO 55000 Asset Management Systems.

5.2 MAXIMISE THE VALUE OBTAINED FROM THE INVESTMENT AND EXPENDITURE ON INFRASTRUCTURE

After the 'Destination' is determined, the next most important step is to define the 'benefits' being sought from asset management. These 'benefits' provide the justification and business case for the asset management journey. The importance of defining the benefits early can't be overestimated, as the asset management journey won't be easy and it is possible that there will be distractions and reviews along the route, when questions are asked about what is the point and outcome that will be delivered. Understanding what benefits available and which ones are being

targeted will help build resolve to face up to the inevitable challenges and help in prioritising effort.

The defined 'benefits' should be simple to understand and measurable. We have identified the following possible 'benefits' from the conversations and discussions we had during the Risk & Assurance project:

- **Improving access and equity to good health services** by making sure investment is made where it provides the best benefit through alignment on Infrastructure investment with desired health outcomes to.
- **Maximising the proportion of the 'health dollar' spent on direct health services** by minimising Whole of Life costs of infrastructure.
- **Providing 'fit for purpose' infrastructure** to support health services by implementing optimised B&I campus asset renewal plans.
- **Improve the reliability** delivered from infrastructure and confidence that the infrastructure will perform.
- **Maximising operational efficiency**, making infrastructure affordable and sustainable for the future.

5.3 ENABLING ASSET MANAGEMENT SYSTEM SUCCESS

During the Campus Risk & Assurance project we identified a number of opportunities for Te Whatu Ora to make improvements to the management of buildings and infrastructure, summarised in the following paragraphs.

5.3.1 RISK MANAGEMENT

Operational risk is well developed within the facilities departments across the majority of the districts, although the use of common consistent approaches, language and tools could improve consistency and portfolio level risk management.

Te Whatu Ora has done substantial work on a number of 'Threats' across the portfolio such as 'Earthquake shaking' and 'Fire' that has largely been driven by regulatory compliance and the high awareness of these 'Threats'. Strategies for managing other 'Threats' (e.g. 'Infrastructure Failure', 'Supply and Logistics Chain', 'Resource Availability', 'Security' etc.) are less developed and have a wider variance between the different campuses. Developing a measured and balanced approach to 'Infrastructure Threats' will be important to maximise return from risk mitigation investment. For example, there is a mindset change from initiating seismic strengthening and fire protection to comply with legislation to doing the same work because it reduces these threats to fit within Te Whatu Ora risk tolerance / appetite.

There are opportunities for improving the risk management strategy, including the development and communication of a common and consistent Risk Policy and Framework that is used by all districts and campuses. Once these are developed / finalised a risk management development programme should be implemented for Te Whatu Ora facilities groups.

Risk is the most successful investment prioritisation. In order to do this, it is important that Te Whatu Ora implements a common approach to categorising assets in relation to Criticality. The impact of failure approach outlined in the National Asset Performance Measure project and further developed in the Condition Assessment and Deterioration Modelling Procedures project provides a useful starting point for Te Whatu Ora to develop from.

Finally, Te Whatu Ora should look at the operational level. Developing common contingency approaches to be used across all Districts to tune contingency plans and make them more consistent. In addition, the Risk & Assurance has identified some infrastructure failure mechanisms that recur across the health estate, ideally Te Whatu Ora will develop 'Emergency Pre-Plans' defining the response and using this across the country to improve consistency whilst increasing the opportunity for knowledge and resource sharing.

5.3.2 COLLABORATION, SHARING & IMPROVEMENT

Te Whatu Ora is a new organisation, but with a huge legacy of knowledge, experience, and information. Harvesting and leveraging this capability whilst filtering out the differences and optionality between different Districts doing the same thing differently is a key success factor.

One element of the solution will be to adopt similar language, terminology, and approaches. The work on developing Te Whatu Ora Asset Data Standards earlier this year is a very useful first step and needs to be accelerated in 2023.

Further opportunities lie with developing and embedding consistency in operations through tools such as National Design standards and Product Standards which will drive down the cost of new infrastructure and modifications to existing infrastructure, whilst improving build quality and reliability.

The use of Standardisation and Harmonisation to enable knowledge sharing, efficiency capture, resource sharing and continual improvement is one of the key benefits from forming Te Whatu Ora from the former DHBs. There will be resistance from some to change to something new, but it is critically important that this is completed in as short a timeframe as practical, before DHB IP (Intellectual Property) is lost.

5.3.3 ASSET PLANNING

Journeys are always less stressful and easier to negotiate with the use of maps showing the route, speed restrictions and potential risks. Effective infrastructure investment requires plans that show the context and scope of the purpose and importance of the infrastructure.

Te Whatu Ora delivers health outcomes to New Zealanders by delivering campus-based services at different levels from services to the local community, services for the region through to campuses which have to deliver nationally.

This provision of health services drives the requirement and criticality of campus infrastructure. Infrastructure plans need to include:

- Campus Master Plans to define the future development of the campus, through adds, moves, changes and demolitions. The plans provide the certainty of future direction, so that infrastructure life can be optimised to future loading and timescales.
- Asset Management Plans which can be developed in different dimensions that best suit the future direction. For example, Asset Management Plans for Buildings; Asset Management Plans for Types of Infrastructure; Asset Management Plans for Health Planning Units or a hybrid, combining all of these.

From our wide experience, whilst plans can be very important, they only have value if they accurately reflect implementation intentions. Therefore, Te Whatu Ora should ensure that performance measures around plans relate to practicality rather than fall into the trap of others and measure the number of plans in place or the mere existence of plans.

5.3.4 HIGHLY PERFORMING TEAMS

Through the project we come across many high performing facilities teams, very competent and proficient in operational infrastructure. However, we witnessed varying levels of strategic asset management maturity and practice; and we found that there is generally a strong correlation between the size of the district and the level of asset management capability.
The overall enhancement of Asset Management (AM) maturity relies on raising the asset management capability and knowledge of Te Whatu Ora's Facilities teams, including:

- Definition of AM Roles and Responsibilities with competency requirements.
- Training and Development Plans tailored to AM strategy and activities.

As with many other organisations, intellectual infrastructure knowledge in Te Whatu Ora facility teams is concentrated in a number of individuals rather being formally recorded. There is an urgent need to fist share this knowledge with others to reduce risk and then record information which has real future value (noting not all information held by these individuals has future value).

Therefore, there is an opportunity for using the asset management maturity enhancement programme to retain institutional knowledge. However, as a counter side to the opportunity there is a significant and growing risk that campus knowledge will be lost if a programme for AM knowledge transfer is not urgently implemented, due to aging demographics and the danger of flight-risk.

5.3.5 IMPROVING DECISION MAKING

The need to make better infrastructure decisions is usually used as one of the most important drivers for improving asset management practices. We all agree decisions need to be optimal, based on evidence, repeatable and able to be defendable when subject to future scrutiny. However, many historical decisions don't meet all these criteria.

The process of making better decisions can be broken down into the following elements.

- Improving the quality, completeness, accuracy, and relevance of asset data.
- Analysing data, structuring it and preparing it for decision making.
- Implementing decision 'Analytics' and logic
- Reviewing, monitoring, and measuring the success of historical decisions.
- Using history to refine the way we make similar decisions in the future.

Although this makes sense in theory, it is apparent that all campuses make Infrastructure decisions in different ways, influenced by different factors, priorities, and biases.

Whilst there is common agreement across the campuses about the need to improve asset data, there is less consensus about the need to change the way decisions are made. We predict that this need to change the way decisions are made will be received differently by the different districts, with probably more resistance in the larger metropolitan districts who have more developed processes and fixed ideas. However, the need to improve decisions will mean the need to harmonise the way similar infrastructure decisions are made across all campuses.

We recommend the first stage in improving decisions across Te Whatu Ora will be to get the campuses to realise when they are making decisions, get them to define the problem/s they are trying to solve and get them to identify a minimum of 3 realistic options (not options developed to drive binary decision making). The Risk & Assurance project has seen instances across the estate where there may have been a jump to solution rather than consideration and selection from available options.

6 GLOSSARY

1. **Asset management**: The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost-effective manner.
2. '**Campus-wide Infrastructure'** is the term used to describe the common building and infrastructure campus assets that support buildings, clinical services and activities carried out on the hospital campuses. This includes roads, reticulated services, buried services, tunnels and common support systems
3. **Compliance**: Alignment with regulatory and statutory requirements
4. **Condition**: Physical state of a system or asset
5. **Consequence**: The impact on people, property and the normal operation of a facility (See table B)
6. **Criteria assessment**: Quantifiable assessment of level of service or descriptor based on a 1 – 5 scale to support the risk assessment process of sub-elements against design, condition, maintenance, compliance and resilience.
7. **Critical system or asset**: A system or asset which failure will impact the normal provision of services or operation of a facility.
8. **Design**: Configuration of systems or assets to perform a specific function.
9. **Element:** Amalgamation of built infrastructure systems and assets (Sub-elements) grouped under a common discipline or function.
10. **Engineered Life**: Period of time in which a system or asset is predicted to function correctly considering manufactures recommendations, environment, intended use and operating hours.
11. **Facilities management**: A profession that encompasses multiple disciplines to ensure the functionality of the built environment by integrating people, place, process and technology.
12. **Gap**: The difference between the Assessed Rating and the Target Rating. The higher this figure the higher level of variance exists. This report then prioritises the gap from highest to lowest highlighting the key elements that contributed to the variance.
13. **Health Asset Management Improvement (HAMI)**: A forum designed to encourage improvement and share knowledge of asset management in the health sector.
14. **Importance Level**: Buildings and infrastructure under the New Zealand Building Code are given an Importance Level (IL) of 1–5 determined by risk to human life, the environment, economic cost and other risk factors in relation to its use. In the health sector we currently have no IL5 building or infrastructure, so we consider IL 1 – 4 only.
15. **Likelihood:** The number of times an event happens, or asset fails within a set period (see table A).
16. **Maintenance**: All actions (Planned and Reactive) undertaken to ensure an asset achieves its engineered life or repairs to ensure normal operation.
17. **Planned Preventative Maintenance**: Scheduled inspections, component replacement or activities undertaken to ensure a system or asset, achieves its engineered life, performs to expectations, complies with manufacturers recommendations, and remains compliant.
18. **Reactive Maintenance**: Unscheduled activities or repairs required enable a system or asset to function normally.

19. **Resilience**: The ability of a system or asset to perform to predetermined expectation or levels of service.
20. **Risk management**: The application of a formal process to determine the resultant ranges of risk centric outcomes based on the consequence and likelihood of occurrence.
21. **Sub-element**: Individual built infrastructure systems and assets assessed as part of this report.
22. **System**: A complete self-supporting group of assets, subsystems, components, elements or sub-elements.
23. **Target rating**: Based on likelihood and consequence that the owner or responsible stakeholder of the asset believes is appropriate.

7 REFERENCES

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2. World Health Organization, Pan American Health Organization. 2015. *Hospital safety index: guide for evaluators*. URL: https://www.who.int/publications/i/item/hospital-safety-index-guide-for-evaluators
3. New Zealand Building Regulations 1992
4. ISO 31000 Risk Management – Principals and Guidelines

APPENDICES

Please refer to the separate Appendix Document for the following Appendices:

- Appendix 1 – Te What Ora Risk and Assurance Risk Tables and Matrix
- Appendix 2 – Methodology Details
- Appendix 3 – Very High Priority Risks (82) Detailed
- Appendix 4 – Campus sizes using bed numbers
- Appendix 5 – Very High Priority Risk Register
- Appendix 6 – Detailed Sub-element reports for each of the 29 Campuses assessed by WSP and CSV Data of the 5 Campuses assessed by Te Whatu Ora

***Creating** what*
matters** for **future
generations

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