



High-level risk categorisation assurance review [In-Confidence]

Hawke's Bay

Prepared for
Cyclone Gabrielle Recovery Taskforce Secretariat

Prepared by
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Date
June 2023

Job Number
1091367 v2



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Document control

Title: High-level risk categorisation assurance review [In-Confidence]					
Date	Version	Description	Prepared by:	Reviewed by:	Authorised by:
14/06/23	1 (Draft)	Client issue	J. Rix M. Jacka	R. Reinen-Hamill M. Russ	R. Reinen-Hamill
21/06/23	2	Final	J. Rix M. Jacka	R. Reinen-Hamill M. Russ	R. Reinen-Hamill

Distribution:

Cyclone Gabrielle Recovery Taskforce Secretariat

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1 PDF copy

1 electronic copy

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Executive summary

The Cyclone Gabrielle Recovery Taskforce Secretariat engaged Tonkin & Taylor Ltd (T+T) to provide a high-level assurance review of the process followed by Hawke's Bay Regional Council (HBRC) and their consultant Pattle Delamore Partners (PDP) for their risk categorisation of flood-affected properties following Cyclone Gabrielle.

Our high-level assurance review has focused on the categorisation process, articulation of the risk thresholds and assumptions, and identification of the potential risks and consequences of any process concerns, including real-time risk mitigation. Our aim was to assess confidence in the validity of the risk categorisation process. Specifically, to provide assurance that the process is thorough, has integrity and is capable of withstanding challenge.

The key conclusions from our high-level assurance review are:

We consider that the preliminary risk categorisation process used by HBRC is technically valid, and appropriate given the constraints of the available information and the need for timely decision-making and community engagement.

The process used to identify Category 2 and 3 areas has relied heavily on expert judgement applied by HBRC and PDP informed by observations of the flood damage that occurred during ETC Gabrielle and with some input from district councils. We consider this is a suitable approach for the initial assessment, and for very high-risk situations where Category 3 is clearly appropriate. To ensure integrity as this initial assessment is refined, more detailed technical assessment will be required to confirm the feasibility and levels of service for community and property-level interventions, and to resolve cases on the borderline between Category 2 and 3.

The technical rigour and thoroughness of the process used to identify Category 1 areas could be improved by incorporating additional and more detailed information. However, in most situations these refinements would likely result in more properties being classed as Category 1 in this initial assessment, rather than fewer. This facilitates the precautionary approach described in the risk category framework where properties may be reassessed from Category 2 down to Category 1 in the future.

Flexibility in roles can help manage resourcing constraints and accelerated timelines in a post-disaster recovery context. However, to increase confidence regarding the ability to withstand challenge there are opportunities to clarify decision-making responsibilities and organisational roles whilst also engendering further community confidence.

A limitation of the reliance on observed flood damage when assigning risk categories is that there are various other matters which may be relevant as part of future repair and rebuild works including the associated Resource Consent and Building Consent processes and how applications will be assessed. There may also be other long term spatial planning and adaptation planning matters that are relevant (e.g., infrastructure requirements and emergency access). These matters could be explored as part of community engagement and more detailed technical assessment in future. In this future assessment, observations of the damage from ETC Gabrielle should be supplemented with additional modelled scenario-based approaches to better inform long term decisions on how resilience can be improved in the face of climate change effects.

A key next step will be communication of the initial findings of the risk categorisation assessment. We consider that the process used by HBRC is suitable to inform the initial communication and community engagement. However, it will be important to agree terminology and be clear about the technical limitations, and how these will be managed, and the assessment refined as part of the process going forward, to provide more confidence about the ability to withstand challenge.

1 Introduction

The Cyclone Gabrielle Recovery Taskforce Secretariat engaged Tonkin + Taylor (T+T) to provide a high-level assurance review of the process followed by Hawke's Bay Regional Council (HBRC) and their consultant Pattle Delamore Partners (PDP) for their risk categorisation of flood and landslide-affected properties following Ex-Tropical Cyclone (ETC) Gabrielle. Background briefing information provided by the Cyclone Gabrielle Recovery Taskforce Secretariat is included in Appendix A.

The Government, in conjunction with local councils, developed a principles-based framework to help inform decisions that need to be made to support communities and individual property owners to repair, rebuild or move. As this framework has been applied "on the ground", it has been refined following Council's risk categorisation assessment into the risk category definitions summarised in Table 1.1.

The majority of T+T's high-level assurance review was undertaken over the course of one week from 22 to 28 May 2023 for Category 1, and one week from 2 June to 9 June 2023 for Category 2 and 3. A register of information and documents provided to T+T for the purpose of this review is included in Appendix B.

Table 1.1: Category definitions for risk categorisation assessment (as at May 2023)

Category	Definitions	Examples
1	Repair to previous state is all that is required to manage future severe weather event risk.	Minor flood damage to repair but no need for significant redesign/retrofitting. Private insurance is sufficient but uninsured may face hardship.
2C	Community level interventions are effective in managing future severe weather event risk.	Local government repairs and enhances flood protection schemes to adequately manage the risk of future flooding events in the face of climate change effects.
2P	Property level interventions are needed to manage future severe weather event risk, including in tandem with community level interventions.	Property specific measures are necessary e.g., improved drainage, raising houses is necessary. Benefits accrue to property owners, but some may face affordability issues.
2A	Potential to fall within 2C/2P but significant further assessment required.	Interventions may be required / possible but insufficient information to provide initial categorisation (these may subsequently move between "2" categories or to categories 1 / 3).
3	Future severe weather event risk cannot be sufficiently mitigated. In some cases, current land uses may remain acceptable, while for many others there is an intolerable risk of injury or death.	In the face of enhanced climate risks, the property may face unacceptable risk of future flooding, this could be an intolerable risk of injury or death, or very significant and regular damage to the property. Other property could be subject to unstable land that poses an ongoing risk.

2 Scope of T+T's review

T+T has been requested to provide:

- 1 High-level assurance review of the process followed for risk categorisation by both regional council and PDP¹.
- 2 Clear articulation of the risk thresholds and assumptions used by both regional council and PDP.
- 3 If process concerns are identified what are the potential risks and consequences and can these be mitigated in real-time.

As agreed with Cyclone Gabrielle Recovery Taskforce Secretariat, our high-level assurance review has adopted an iterative approach, prioritised in line with planned announcements and the information available at the time. In line with this approach our review has only considered flood-affected properties following Ex-Tropical Cyclone (ETC) Gabrielle. There is no information supporting the risk categorisation of landslide-affected properties.

The aim of this independent assurance review is to provide confidence in the validity of the risk categorisation process. Specifically, to provide assurance that the process is thorough, has integrity and is capable of withstanding challenge. T+T has been asked to develop an assurance approach that is replicable so that it can be repeated in other affected regions, if required.

¹ PDP has been engaged by HBRC to provide technical support in relation to the risk categorisation process.

3 Validation approach

3.1 Review topics

The scope of works requested a “*validation approach that is replicable so that it can be repeated in other affected regions if required*”.

Our validation approach is presented below and relates to key topics for the risk categorisation process. Each of the topics is discussed in terms of importance to the scope of works outlined in Section 2.

Table 3.1: Validation approach topics

ID	Review topics	Why it's important
1	Hazard types assessed	The categorisation approach refers to “severe weather event” which could relate to different hazards. Clarity regarding the hazards which have (and have not) been considered is essential for credible community engagement. It also helps to ensure that similarities and/or differences with other regions can be identified.
2	Risk assessment methodology	This topic is intended to provide a high-level overview of the risk assessment methodology, so that key issues can be identified. This may relate to how judgement and the best available information has been utilised, which will be particularly important in consideration of regional inconsistencies and confidence.
3	Spatial extents of categorisation	The spatial extents of the assessed categories are needed to support community engagement. This helps to identify what areas have, and equally importantly, what areas have not been assessed.
4	Reporting deliverables and resolution	This topic relates to ensuring that the reporting deliverables are either suitable for the intended audience or, if the audience hasn't been defined, it may discuss the topic in terms of who it could be used by. It includes describing the level of granularity of the assessment to help identify who the information may be useful for. From an engagement perspective it is important to know whether the information is available at a property level resolution, which may be what a homeowner is interested in, or a community level (or other).
5	Stakeholders and partners – responsibility	This identifies which organisations have been involved and who has been responsible for different activities.
6	Category 1 Threshold	Identification of how the Category 1 threshold has been adopted including assumptions, judgement, best use of available information. This is important to ensure regional consistency or identification of any inconsistencies. For this category, an explanation of areas which haven't been assessed should also be included.
7	Category 2 Threshold	Identification of how the Category 2 threshold has been adopted including assumptions, judgement, best use of available information. This is important to ensure regional consistency or identification of any inconsistencies.
8	Category 3 Threshold	Identification of how the Category 3 threshold has been adopted including assumptions, judgement, best use of available information. This is important to ensure regional consistency or identification of any inconsistencies.

3.2 Applying the validation approach

For each of the review topics, the validation approach should:

- 1 Identify what the region has done in regards the topic.
- 2 Review what the region has done, including offering recommendations for any real-time risk mitigation opportunities.
- 3 Identify issues related to the topic that may affect (or need to be treated differently in) other regions.

It is important that these review topics are not considered in isolation of each other, nor in chronological order, because there are many inter-relationships that need to be considered in the overall assessment.

4 Findings

Based on the validation approach presented in Section 3 the main findings of our review are summarised under headings as per the scope items presented in Section 2.

Our validation assessment was based on:

- The information listed in Appendix B.
- Discussions with HBRC representative Craig Goodier and the Cyclone Gabrielle Recovery Taskforce Secretariat representative Amber Bill during the week of 29 May 2023.
- Observation of field investigations and risk categorisation processes being undertaken by HBRC and PDP during a site visit on 7 June 2023 throughout the Hastings District².

Our assessment is based on our interpretation from the processes and discussions observed and information provided. We recognise the potential for our misinterpretation of the process given the complexities and time constraints. This should be identified as a project risk, and if we have misinterpreted any details these should be brought to our attention so we can update our review as required.

4.1 Process followed for risk categorisation

4.1.1 Council approach

HBRC led the risk categorisation assessment with support from the district councils and PDP. The general process followed in the council assessment was to firstly identify Category 1 areas and Category 3 areas. By elimination, all remaining areas were then assumed to be Category 2.

The following information was considered as part of the council assessment:

- Post-cyclone aerial photography and satellite imagery, which was used to identify the extent of flooding.
- Photographs taken during and after the flood event (various sources).
- Stopbank breach information.
- Information from District Council rapid damage assessments:
 - Napier City, Central Hawke's Bay and Wairoa provided the placard output from the rapid damage assessment (i.e., red, yellow, white placard locations).
 - Hastings District Council initially provided additional information from the rapid damage assessment (such as site observation notes and photographs) alongside the placarding output and then later requested the additional information be returned (discussed in Section 4.2.2.2 below).
- Ground surface elevation contours derived from LiDAR survey undertaken in November 2020.
- Site walkovers and community discussions (particularly for assessing Category 2 and 3).

The following additional information was available to council, but not specifically relied upon as part of the categorisation assessment:

- Insurance damage assessment information, aggregated at Statistical Area 1 (SA1) scale.
- RiskScapeTM hazard model outputs.

² The sites were selected by HBRC, some to show effect of floods and some to demonstrate matters of categorisation judgement. Site visits included Esk Valley, Dartmoor, Rissington, Pakowhai, Puketapu, Tangoio.

The council assessment is subject to the following assumptions and limitations:

- Based on flood hazard only, other hazards (e.g., landslides) were not considered.
- The stopbanks are repaired in-situ (i.e., not replaced elsewhere).
- Council prioritised the assessment of residential properties over other property types.
- Categorisation is reported as generalised areas in workbooks and maps. Property level assessments have not generally been carried out.

The council risk categorisation assessment was based on expert judgement, primarily informed by observations of flood inundation and damage resulting from ETC Gabrielle. Council considered it appropriate to base the assessment on the observed flooding (rather than using models to predict the potential extent of flooding in future events) for the following reasons:

- Council considered that an event of the scale and nature of ETC Gabrielle significantly exceeded the design standards typically adopted for land development in New Zealand.
- Revised flood frequency analysis is not yet available and is unlikely to be for some time.
- Revised flood modelling is not yet available and is unlikely to be for some time.
- Even when it is available, there will be a high degree of residual uncertainty with the flood frequency analysis outputs and revised flood modelling.

Council experts applied judgement in their provisional risk categorisation assessment. Specific details of their process and judgement basis for each location were not recorded at the time, however general comments for some areas are noted in the rapid assessment workbook and in the PDP memorandum "*Ex-Tropical Cyclone Gabrielle Flood Hazard Zoning*" (dated 1 June 2023).

The provisional nature of the land categorisation maps is explained on the Hastings District Council website³ (which also cover Napier, Hastings Wairoa and Central Hawke's Bay) "*The maps on this website are provisional and have not been reviewed. This data may be reviewed and altered at any time, without notice. Severely affected localities will be advised when the maps are independently verified and peer reviewed and the website will be updated*". An iterative approach is also implied by the risk category definitions in Table 1.1, with Category 2A noting that significant further assessment could be required and that properties may move between categories in future.

As the risk categorisation process progressed, HBRC adjusted their practical interpretation of category definitions to suit the immediate needs across the region. Table 4.1 summarises our interpretation of the current HBRC practice.

³ <https://www.hastingsdc.govt.nz/land-categorisation-hb/#landcategorisationmaps>, accessed 13 June 2023.

Table 4.1: HBRC practice regarding categorisation (June 2023)

Category	Definitions (May 2023)	T+T interpretation of HBRC practice (June 2023)
1	Repair to previous state is all that is required to manage future severe weather event risk.	As per definition.
2C	Community level interventions are effective in managing future severe weather event risk.	Existing community level interventions, repaired as necessary to existing levels of service, are effective in managing future severe weather event risk.
2P	Property level interventions are needed to manage future severe weather event risk, including in tandem with community level interventions.	Property level interventions or new community level interventions are required to manage future severe weather event risk.
2A	Potential to fall within 2C/2P but significant further assessment required.	Potential to fall within 2C/2P/3 but significant further assessment required.
3	Future severe weather event risk cannot be sufficiently mitigated. In some cases, current land uses may remain acceptable, while for many others there is an intolerable risk of injury or death.	Future severe weather event risk cannot be sufficiently mitigated to a tolerable level.

4.1.2 T+T assessment

4.1.2.1 Roles and responsibilities

As the risk categorisation process has progressed, there appears to have been a degree of fluidity and potential for misalignment between the roles and responsibilities of various parties, such as:

- HBRC initially worked alongside the district councils to assist them with flood damage assessment. Over time this evolved into HBRC taking more leadership and overall ownership of the risk categorisation process.
- PDP's role:
 - In PDP's engagement by HBRC, their work was identified as a "sense-check" review of the HBRC assessment.
 - In the briefing document provided to T+T for this assurance review, the Cyclone Recovery Taskforce have referred to PDP's work as a peer review.
 - Our observations identified that as the categorisation work has progressed PDP's role has evolved into detailed technical assistance working alongside the HBRC team to undertake the assessment.

Fluidity in roles is to be expected in a post-disaster recovery context, and this flexibility can help manage resourcing constraints and accelerated timelines. However, if roles become unclear (particularly where independence is needed) then there may be more opportunity for responsibility gaps to develop and for the process to be challenged. Community confidence in the process could also be impacted if there is confusion regarding who has the final decision-making responsibility and who is leading the community engagement (e.g., Regional Council or District Council).

This risk assurance process review has been made on the basis that HBRC are the lead categorisation agency.

Irrespective of organisational accountability, our observations identified the key role of HBRC's Principal Engineer, who is perceived to be leading the expert judgement on categorisation, working alongside PDP. We have no concerns regarding his qualifications and experience to be carrying out

this role given his 25+ years working in flood management across the region. We also have no concerns regarding the qualifications and experience being provided by PDP's lead personnel to HBRC.

4.1.2.2 Information used to assess risk

We consider that the observations of flood inundation and damage resulting from ETC Gabrielle are a reasonable basis for the HBRC risk categorisation assessment, to support the recovery effort in damaged areas at this time. We concur with the rationale provided by HBRC and PDP as justification for the approach. In the future these observations should be supplemented with additional modelled scenario-based approaches to better inform long term decisions on how resilience can be improved in the face of climate change effects.

Reliance on the observations of flood damage from ETC Gabrielle introduces two key uncertainties:

- Uncertainty regarding the observations themselves. For example, whether all affected properties have been identified, and differences in the detail and interpretation of those observations across the region.
- Uncertainty regarding how well the damage that occurred in this one event represents the damage that might occur in various possible future events, and how transferable this is to other areas. For example, the damage that occurred is uniquely related to the specific rainfall conditions of this event, and the chain of events that followed (such as locations of stopbank breakouts and bridge/culvert blockages).

These limitations may also pose challenges with consistency when applying the same approach across other regions.

4.1.2.3 Categorisation chronology

We support the council assessment approach of firstly identifying the Category 1 and Category 3 areas, which then by default identifies the Category 2 areas through elimination (i.e., not being in either Category 1 or 3). We observed a viewpoint that that all Category 2 areas will become Category 1 or Category 3 over time. This is true to an extent although we caution against rapidly changing a Category 2C or 2P to Category 1 after risk mitigation work is carried out. The rationale for this is discussed in Section 4.2.

We also support the approach of sharing preliminary maps with communities to help inform the process. This enables HBRC and the district council to engage in a meaningful way to consider more detailed information and adjust the categorisation if appropriate. It is currently unclear how differences of opinion between technical experts and community would be resolved. For example, property owners may tolerate higher levels of risk than HBRC is prepared to accept, and vice versa. As the duration of category designation becomes clearer (e.g., how long does an area stay Category 3), this could have important ramifications for property owners and the time available for them to consider their options and make decisions.

4.1.2.4 Prioritisation of assessments for residential properties

It is understandable that priority has been given to the assessment of residential properties, however we note that this could introduce process concerns if there is inconsistency in the interpretation of what is residential. Terminology covering residents, residential land, residential buildings and residential property is frequently used, often interchangeably. Clarifying the terms further would help with prioritisation of effort and setting community expectations. It remains unclear whether the risk category is intended to apply only to the building or to some/all of the land within the property boundary as well as the building, or the land irrespective of property boundary.

Although non-residential properties are clearly not an immediate priority, it is currently unclear whether the categorisation process is intended to capture non-residential properties in the future. The categorisation process applied to residential properties may be inappropriate for non-residential properties due to different use behaviours (e.g., daytime only use for some areas).

4.1.2.5 Documenting the outcome and basis of judgement

We consider it is appropriate for the risk categorisation to be based on expert judgement, drawing on the best available information at the time and incorporating community input to provide a quick assessment. However, the current lack of detailed notes documenting the assessment of each specific area presents risks to the process. These risks include:

- Key person risk, with the detailed technical basis for categorisation of individual areas known by only a small group of experts.
- Potential for inconsistencies between areas assessed at different times or by different experts.
- Difficulty demonstrating what community input was considered, and how it was incorporated into the assessment.
- During our review we identified some inconsistencies between risk categories recorded in the rapid assessment workbook compared to those shown on the GIS maps (likely due to transcription errors, or the assessment being updated in one but not the other).

4.2 Risk thresholds and assumptions

4.2.1 Council approach

4.2.1.1 Category 1

The council assessment for preliminary Category 1 areas was underpinned by the assumption that an event of the scale and nature of ETC Gabrielle exceeded the land use design standards, so if an area was not significantly affected in this event, then repair/rebuild could proceed without the need for further flood risk mitigation.

For Napier City, Central Hawke's Bay and Wairoa, the extent of flood inundation caused by ETC Gabrielle was identified from the aerial photography, satellite imagery and placard colour outputs from the rapid damage assessment. Areas where there was no visible evidence of flooding having occurred were assigned Category 1.

For Hastings District, additional information from the rapid damage assessment was initially made available and used for the assessment, but was later withdrawn. This meant that in addition to the information used in other districts (listed above), observations such as flood depth, silt presence and structural damage were also taken into account to assess the degree to which an area was affected by ETC Gabrielle. For example, there was a small area in Hastings District where flood inundation occurred, but the effects were only considered minor, so the area was included within Category 1. However, because the additional information was withdrawn, some of the supporting evidence for the decision is no longer available to HBRC. This may complicate matters if the categorisation is challenged in future.

4.2.1.2 Category 3

The preliminary Category 3 areas were assigned where there was risk to life during ETC Gabrielle and where there is likely to be risk to life in the future. Council experts applied judgement in their assessment, considering the following:

- The hazard posed by the flood water, which has been semi-quantitatively assessed based on:
 - Observed water depth and associated damage.
 - High-level assessment of whether the area sits in a high energy or low energy environment. For example, there may be evidence of scour or damage to structures and trees in a high energy environment.
- Ease of egress, including how quickly floodwaters could rise and available evacuation routes.
- Likelihood of similar patterns of damage being repeated in future events, particularly for areas where the damage was in-part due to stopbank breaches and/or debris blockage. For example, some areas would likely experience similar impacts as they did in ETC Gabrielle if another event of the same magnitude occurred. Conversely there are some areas where the damage that occurred was the result of a particular cascading chain of events, and different patterns of damage might result in future events with different details (e.g., if the stopbank were to breach in a different location).
- In some cases, community preferences have been considered, particularly for borderline Category 2 and Category 3 areas (where Category 2A has been assigned to provide an opportunity to consider additional information and undertake more detailed assessment).

Category 3 areas to date have been identified at a community scale largely irrespective of land use or property boundaries. However, the mapped boundaries between Category 3 and Category 2A were also commonly adjusted based on the location of residential buildings to allow time to engage with the community and consider the categorisation in more detail.

4.2.1.3 Category 2

By elimination, areas not assessed as Categories 1 or 3 were assigned Category 2. Council experts applied judgement to assess which of the three sub-categories applied (2C, 2P or 2A), however in some cases there was considerable uncertainty as to which sub-category was most appropriate, and this was noted in the rapid assessment workbook. Council considered future land use as part of the risk assessment, although uncertainty regarding both longer-term policy direction and financial support packages were acknowledged as complicating factors.

All category 2 areas experienced flooding during ETC Gabrielle. The key factors considered by council to distinguish between the three sub-categories were:

Category 2C: HBRC used this category for areas where there is an existing flood protection scheme in place – in most cases stopbanks, plus a flood detention scheme in Havelock North. These areas flooded during ETC Gabrielle because the capacity of the scheme was exceeded or stopbanks breached. As stopbank rebuilds are completed in these areas it is generally envisaged that they will move to Category 1.

Category 2P: HBRC used this category for areas where there is no existing flood protection scheme in place.

Category 2A: HBRC used this category for areas which are likely to move to Category 2C, 2P or 3 after further assessment (i.e., not likely to be reassessed as Category 1 directly).

4.2.2 T+T assessment

4.2.2.1 Practical interpretation of risk category definitions

As summarised in Table 4.1, HBRC adjusted their practical interpretation of category definitions as the risk categorisation process progressed, to suit the immediate needs across the region. These changes in HBRC's practical interpretation are unlikely to have significantly affected the assessment in Category 1 and Category 3 areas, however they do impact the distribution of properties across the various Category 2 sub-categories. Whilst the definition for Category 2A acknowledges the uncertainty, situations could arise where properties located in Category 2P may implement property-level interventions, to only later find that a community-wide scheme is being supported. The wider impact of sub-categorisation will only become clearer once the policy, financial support and community support for the different categories is clearer.

Due to the overlap between categories and some sub-categories there are some seemingly arbitrary decisions regarding preliminary categorisation, which are acknowledged by HBRC. For example, the mapped boundary between Category 3 and 2A in Pakowhai has been drawn along the 3m contour, which happens to also align with a road and therefore distinguishes properties on one side of the road from the other. We consider that HBRC's approach to categorisation, using Category 2A in situations where there is considerable uncertainty, is appropriate in that it provides the opportunity to consider more detailed information and community input.

The category 3 definitions allow consideration of tolerable risk, although the method for establishing tolerable risk is likely to be highly variable. To some this will include consultation with the community and to others it may entail an independent technical assessment.

Differences in the interpretation of the category definitions in practice could result in inconsistency in the results of the categorisation process in different regions. For example, in other regions Category 2C may be interpreted to include consideration of new community (or catchment) level interventions.

We consider that the intended process to re-categorise Category 2C areas to Category 1 following repair of flood schemes should be clarified, including identification of factors to be considered. Due to ETC Gabrielle there are a variety of reasons why the level of service of a stopbank (or other flood scheme) may no longer be met, or why the level of service is no longer suitable to manage "future severe weather events". HBRC should satisfy themselves that the nature and level of consideration and documentation is appropriate to the location being evaluated for re-categorisation. Consideration could include such factors as revised flood frequency analysis, failure mode analysis from ETC Gabrielle to determine likelihood of repeat failure, residual risk and changing risk tolerance within the community.

4.2.2.2 Access to additional information from rapid damage assessments

Our review identified that while district councils held additional information from the rapid damage assessment process (such as site observation notes and photographs), the information wasn't shared with HBRC, or in the case of Hastings District Council it was shared and then later recalled. The rationale for not sharing this information is unclear although privacy concerns were speculated.

Having access to all the relevant information collected during the rapid damage assessments would help to build a stronger evidence base for the technical experts to determine the appropriate risk category, both for the initial assessments and more detailed assessments undertaken in future. It is likely that if decisions are challenged, the basis by which information has, or hasn't, been shared will be tested. We therefore recommend that the rationale for not sharing more detailed information from the rapid damage assessments is documented for future reference, and steps taken to allow relevant information to be shared for future risk categorisation assessments.

As a result, we expect that some areas assigned Category 2 in the preliminary assessment may later be reassessed to Category 1 once more detailed information is incorporated into the risk assessment. Within Napier City, Central Hawke's Bay and Wairoa, there is greater potential for areas to be reassessed downwards to Category 1 in the future, because in these districts all areas within the observed flood inundation extents were excluded from Category 1. Within the Hastings District area, while the additional rapid damage assessment information that was initially shared was considered during the risk categorisation assessment, now that the information has been recalled HBRC no longer have access to this evidence to support their initial assessment or future refinements.

4.2.2.3 Accumulation of flows in the event of stopbank failure

Areas located on the landward side of a stopbank (i.e., normally protected) present a complex challenge for categorisation.

It is clear that many areas across the region are at significant risk if there is a failure at a particular location in a stopbank. However, for most of these areas there would need to be a particular set of cascading circumstances to cause that specific failure. Conversely there are some areas where there is a high flooding consequence due to a stopbank failure in any location along a large length of stopbank. These areas therefore have a much higher risk and we consider that HBRC's use of Category 3 in these situations is appropriate. Whilst some areas clearly fall into this higher risk category (e.g., Pakowhai) there are other locations which exhibit similar potential risk to life although to a lesser spatial scale.

We support a carefully considered approach to re-categorising areas from Category 2C to Category 1 area following repair of flood schemes, as further assessment may be required. The approach taken at Dartmoor (where some land remains as Category 2A) is a good example of where we have observed this considered approach whilst further assessment is carried out.

HBRC should satisfy themselves that the level of consideration and documentation is appropriate to the location being evaluated for re-categorisation.

Refer also to Section 4.2.2.1 for further comments regarding land protected by stopbanks.

4.2.2.4 Incorporating community input into the risk categorisation assessment

As a locally led recovery effort, community input will be critical to help guide decision-making. The community will be able to provide detailed observations about the flooding and damage that occurred on individual properties, which will help to inform technical assessment of the hazard. Members of the community may also provide feedback about their tolerance for these risks, and their preferences for how they are managed, which will help guide decisions that need to be made about the future of affected areas.

To maintain integrity and be able to withstand challenge, the risk categorisation assessment should produce technical information about the hazard which is essentially factual in nature. Where there is uncertainty in the technical assessment then this should be acknowledged and clearly communicated. While there may be a temptation when assigning risk categories to err on the "safe side" to align with perceived community preferences, this may be counterproductive, especially where these preferences are based on incomplete information and there is uncertainty regarding hazard levels, future planning/consenting approaches, and recovery policy direction. These uncertainties are better managed with involvement from the relevant stakeholders as part of the subsequent engagement, risk evaluation and decision-making process.

Our review of the process used by HBRC to date for the initial risk categorisation has not identified concerns regarding the influence of community input on the technical assessment. However, with broader community engagement now underway there is increasing potential for this to become an

issue in future as more detailed risk assessment is undertaken. We therefore recommend that community input is incorporated as part of a structured engagement process, with a clear understanding and documentation of how this input is incorporated into the technical assessment.

4.2.2.5 Impact of non-engineering solutions on categorisation

Currently there has not been any consideration of the impact that non-engineering solutions could have on risk categorisation and overall risk mitigation. These can include, for example:

- Flood warning systems and flood forecasting systems to alert people to flood hazard.
- Education and awareness programmes to help people understand what to do if they are at risk.
- Altered catchment management practices to reduce the potential of debris blockages during flood events.

Whilst we do not consider that these alternative approaches would have an impact on the current preliminary categorisation for residential areas, they have the potential to impact the risk categorisation assessment for other land use types such as horticulture and other mixed-use areas.

4.2.2.6 Potential for unassessed damage within Category 1

It appears that all land outside Category 2 and Category 3 areas has been mapped as Category 1 on the published category maps³. However, the HBRCrisk categorisation assessment only looked at areas where significant flood damage was thought to have occurred, so much of the land mapped as Category 1 was not specifically examined as part of the risk categorisation, it was simply mapped as Category 1 by default.

The HBRC risk categorisation assessment to date has focussed on areas where flood inundation was mapped from post-cyclone aerial photography and satellite imagery, and where there were clusters of properties with yellow and red placards from the rapid damage assessment. However there does not appear to be a specific minimum threshold used by HBRC to decide which areas were specifically examined in the risk categorisation assessment. For example, there are various buildings with yellow and red placards located in areas that were mapped as Category 1 by default without being specifically examined in the HBRC risk assessment.

Furthermore, the approach adopted by HBRC means that a specific risk categorisation assessment is more likely to be carried out for areas where rapid building damage assessments were undertaken. We have not reviewed the process for rapid building damage assessment and therefore any limitations regarding the ability to identify damaged properties have not been fully considered in our assurance review. It is also possible that some locations were affected by flooding that HBRC are not aware of (e.g. by localised surface runoff from heavy rainfall, rather than flooding from rivers overflowing). The adopted approach also does not take into account the possibility that a different event may result in different patterns and extents of flood damage than observed in ETC Gabrielle.

Risks resulting from the mapping of areas as Category 1 by default could be managed through community engagement, acknowledging that there could be some areas unknown damage and providing a way for these to be brought to council's attention for further assessment. This should clearly identify areas that have not been specifically examined as part of the risk categorisation (e.g. using a new category or subcategory), and whether assessment of these areas in any greater detail is proposed in future.

4.3 Real-time risk mitigations

Following our findings in the previous sections, the following information identifies opportunities to mitigate categorisation process risks in real-time. In providing our assessment, we have considered a Hawke's Bay lens, and wider repeatability issues:

- 1 Within the Hawke's Bay region, we agree that the actual damage from ETC Gabrielle provides a reasonable basis for deciding future Category 1 land use. However, in other areas, or following other extreme weather events, this experience-based approach may be insufficient, particularly as we look to manage the impacts of future climate change. Further consideration of risk thresholds is required to promote consistency of outcomes across New Zealand. Basing the risk categorisation on observed damage could link the categorisation to the actual combination of hazards, storm magnitude and observed consequences in that one event (which may be affected by particular infrastructure failures, e.g., blocked bridges), which is likely to result in inconsistent categorisation across regions. One option for central government to consider would be the development of guidance for use in the aftermath of severe weather events regarding whether information from "actual scenario" or "predicted hazard scenarios" should be used. This should be developed alongside guidance relating to national risk thresholds.
- 2 Due to the likelihood of the categorisation results being challenged at some stage, and to help provide confidence to the community, the roles and responsibilities of those involved in the technical assessment, decision making and engagement processes should be clearly communicated. This should include the roles of the Cyclone Gabrielle Recovery Taskforce, regional council, district council and all external suppliers.
- 3 We consider that the intended process to re-categorise Category 2C areas to Category 1 area following repair of flood schemes should be carefully reviewed. The purpose of the review would be to confirm that the flood scheme is providing the appropriate level of protection, including its ability to manage "future severe weather events".
- 4 We have identified communication risks associated with inconsistent terminology and its interpretation. We recommend further clarity regarding the following topics to help mitigate this process risk:
 - Terminology covering residents, residential land, residential buildings and residential property is frequently used, often interchangeably for categorisation discussions. Consequently, or perhaps irrespectively, it is unclear whether the risk category is intended to apply only to the building or to some/all of the land within the property boundary as well as the building, or the land irrespectively of property boundary.
 - Where HBRC or other councils need to redefine or clarify interpretations of category definitions then there should be a process to do this. Currently HBRC's practice does not align with all the category definitions and therefore there is increased potential for misunderstanding and inconsistency across different regions.
- 5 Having access to all the relevant information collected during the rapid damage assessments would help to build a stronger evidence base for the technical experts to determine the appropriate risk category, both for the initial assessments and more detailed assessments undertaken in future. It is likely that if decisions are challenged, the basis by which information has, or hasn't, been shared will be tested. We therefore recommend that the rationale for not sharing more detailed information from the rapid damage assessments is documented for future reference, and steps taken to allow relevant information to be shared for future risk categorisation assessments.
- 6 The current lack of detailed notes documenting the assessment of each specific area presents risks to the process. We understand that there are efforts underway, through PDP, to resolve this gap.

- 7 It is unclear whether the impact of landslides could affect land categorisation, particularly in some of the steeper terrain areas located outside the urban centres. The categorisation process should either identify whether there was no impact to land categorisation as a result of landslides, or identify the alternative process by which categorisation of areas due to landslide risk will be assessed to “manage future severe weather event risk”.
- 8 Risks resulting from the mapping of areas as Category 1 by default could be managed through community engagement, acknowledging that there could be some areas unknown damage and providing a way for these to be brought to council’s attention for further assessment. This should clearly identify areas that have not been specifically examined as part of the risk categorisation (e.g. using a new category or subcategory), and whether assessment of these areas in any greater detail is proposed in future.
- 9 Where areas are assessed solely on the extents of the hazard impact (in this case flooding), long-term factors relating to spatial planning may be overlooked (e.g., infrastructure requirements to support development in particular areas). In some locations, there is potential to identify areas for rebuild and/or redevelopment which may not align with best outcomes for long-term adaptation planning. This is a difficult risk to mitigate in real-time however the risks and opportunities for HBRC to consider this (or not) within a recovery phase is an important decision.
- 10 During our review we identified some inconsistencies between risk categories recorded in the rapid assessment workbook compared to those shown on the GIS maps. We identified the inconsistencies to HBRC, and recommended the data was checked for consistency and a single source of truth adopted for ongoing assessment and engagement.
- 11 Hazards associated with “severe weather” and the mechanisms by which they cause damage can be highly variable and therefore the validation approach has been developed with a strong influence from the flood response effort in Hawke’s Bay because of one event, ETC Gabrielle. Before implementing more widely, the validation approach should be tested across a range of geographies and severe weather hazard types and event scenarios so that the approach can evolve in accordance with a continual improvement philosophy.

5 Assurance review opinion

We consider that the preliminary risk categorisation process used by HBRC is technically valid, and appropriate given the constraints of the available information and the need for timely decision-making and community engagement.

The process used to identify Category 2 and 3 areas has relied heavily on expert judgement applied by HBRC and PDP in partial collaboration with district councils, informed by observations of the flood damage that occurred during ETC Gabrielle. We consider this is a suitable approach for the initial assessment to support the recovery effort in damaged areas at this time, and for very high-risk situations where Category 3 is clearly appropriate. To ensure integrity as this initial assessment is refined, more detailed technical assessment will be required to confirm the feasibility and levels of service for community and property-level interventions, and to resolve cases on the borderline between Category 2 and 3.

The technical rigour and thoroughness of the process used to identify Category 1 areas could be improved by incorporating additional and more detailed information. However, in most situations these refinements would likely result in more properties being classed as Category 1 in this initial assessment, rather than fewer. This facilitates the precautionary approach described in the risk category framework where properties may be reassessed from Category 2 down to Category 1 in the future.

Flexibility in roles can help manage resourcing constraints and accelerated timelines in a post-disaster recovery context. However, to increase confidence regarding the ability to withstand challenge there are opportunities to clarify decision-making responsibilities and organisational roles whilst also engendering further community confidence.

A limitation of the reliance on observed flood damage when assigning risk categories is that there are various other matters which may be relevant as part of future repair and rebuild works including the associated Resource Consent and Building Consent processes and how applications will be assessed. There may also be other long term spatial planning and adaptation planning matters that are relevant (e.g., infrastructure requirements and emergency access). These matters could be explored as part of community engagement and more detailed technical assessment in future. In this future assessment, observations of the damage from ETC Gabrielle should be supplemented with additional modelled scenario-based approaches to better inform long term decisions on how resilience can be improved in the face of climate change effects.

A key next step will be communication of the initial findings of the risk categorisation assessment. We consider that the process used by HBRC is suitable to inform the initial communication and community engagement. However, it will be important to agree terminology and be clear about the technical limitations, and how these will be managed, and the assessment refined as part of the process going forward, to provide some confidence about the ability to withstand challenge.

6 Applicability

This report has been prepared for the exclusive use of our client Cyclone Gabrielle Recovery Taskforce Secretariat, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

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Appendix A Information for briefing Hawke's Bay
governing bodies

Process to develop the initial risk assessments

Information gathering by the Cyclone Recovery Taskforce

- 1 On 7 March, the Extreme Weather Recovery Committee asked the Cyclone Recovery Taskforce (the Taskforce) to facilitate the rapid risk assessment of high-risk locations as a result of the 2023 Auckland flood events and Cyclone Gabrielle, and to work with regions and the insurance sector to help build this picture.
- 2 The Taskforce has facilitated the overlay of insurance data (an aggregated view across the largest insurance companies of areas identified as having had both high claims and high risk) and the risk assessments that local councils are carrying out to present a combined view of risk assessment.
- 3 This data is intended to provide an evidence base to help inform decisions on community engagement. It is not intended to be the absolute answer, but a credible base from which to move forward. Judgement and community engagement remain as critical inputs.
- 4 Workshops were conducted by the Taskforce with local government representatives and insurance representatives from Auckland, Gisborne and Hawke's Bay. Hawke's Bay workshops were held with Hastings and Wairoa. These areas were prioritised because they are the areas with the most extensive impact.

How the initial risk assessments were undertaken

- 1 A three-category framework was developed by central government agencies to guide central government policy considerations, and to support consistent decision-making across local and central government around "repair, rebuild or move". These three categories were applied and expanded on as the risk areas were worked through by council officials. The risk categories are described in Table 1.

Table 1: Categorisation definitions

Category	Definitions	Examples
1	Repair to previous state is all that is required to manage future severe weather event risk.	Minor flood damage to repair but no need for significant redesign/retrofitting. Private insurance is sufficient but uninsured may face hardship.
2	Areas with complex issues that may require significant choices on community level solutions (for example a flood management scheme) and / or property level interventions to manage risk to property. As areas were assessed, Category "2" was expanded into three specific sub-categories, described below.	
2C	Community level interventions are effective in managing future severe weather event risk.	Local government repairs and enhances flood protection schemes to adequately manage the risk of future flooding events in the face of climate change effects.
2P	Property level interventions are needed to manage future severe weather event risk, including in tandem with community level interventions.	Property specific measures are necessary e.g., improved drainage, raising houses is necessary. Benefits accrue to property owners but some may face affordability issues.
2A	Potential to fall within 2C/2P but significant further assessment required.	Interventions may be required / possible but insufficient information to provide initial categorisation (these may subsequently move between "2" categories or to categories 1 / 3).
3	Future severe weather event risk cannot be sufficiently mitigated. In some cases, current land uses may remain acceptable, while for many others there is an intolerable risk of injury or death	In the face of enhanced climate risks the property may face unacceptable risk of future flooding, this could be an intolerable risk of injury or death, or very significant and regular damage to the property. Other property could be subject to unstable land that poses an ongoing risk.

- 2 The Taskforce secretariat used information gathered from the workshops to establish a workbook combining data sourced from councils, insurance and census information to facilitate council completion of the risk categorisation. The purpose of the workbook was to provide a consistent frame across multiple regions.

- 3 The workbook comprises the following key information to provide a consistent understanding of assessment status and to support assurances, decision making, and engagement planning processes:
 - a Part 1: Risk categorisation by councils
 - i Areas identified by councils within each region (and smaller zones within those areas) considered to be high risk.
 - ii For each zone, information provided by councils regarding assessments undertaken (yellow and red placards) and the outcome of rapid risk assessment processes completed to date.
 - iii Initial risk categorisation for each zone and confidence ratings of assessment
 - b Part 2: Insurance, census and Māori land data
 - i Aggregated insurance risk ratings (based on hazard data for any 1:50 or 1:100 hazard areas overlaid with claims density from the floods and cyclone), shown at an SA1 level. The insurance data is intended to provide a reference point for both council and assurance processes.
 - ii For reference purposes, where available, 2018 census data in respect of the number of dwellings for each SA1, noting that a number of SA1s have been added in the intervening years.

Appendix B List of information reviewed

Name/filename	Description	Received from	Received date
Stopbank repairs	Flood infrastructure repairs; 6km of stopbank repairs; drain cleaning		
Assets	Public GIS - Regional Assets Information	n/a	n/a
Hazard portal	Public GIS - Hawke's Bay Hazard Portal (inc Coastal, detention dams, Flood risk areas)	n/a	n/a
Hawke's Bay open data portal		n/a	n/a
Hawke's Bay rapid assessment workbook 190523 (Excel spreadsheet)	Aggregated insurance data.	Amber Bill (Cyclone Gabrielle Recovery Taskforce Secretariat)	19/05/2023
Confidential Draft - Hawke's Bay rapid assessment workbook 200523 (pdf)	Maps accompanying "Hawke's Bay rapid assessment workbook 200523.xls"		23/05/2023
Hawke's Bay rapid assessment workbook 200523 (Excel spreadsheet)		Craig Goodier (HBRC)	
Hawke's Bay proposed hazard categories		Craig Goodier (HBRC)	19/05/2023
HBRC Cyclone Gabrielle - Hazard Zones Portal	AGOL Portal with published data. Includes placarding information.	HBRC	n/a
20230331_HBRC_Flood_Hazard_Info.pdf		Craig Goodier (HBRC)	21/05/2023
20230412_HBRC_Flood_Hazard)Info_Wairoa.pdf		Craig Goodier (HBRC)	21/05/2023
Hawke's Bay rapid assessment workbook 240523_HDC.xlsx	Hawke's Bay Rapid Assessment Workbook HDC	Craig Goodier (HBRC)	24/05/2023
Version03.zip	Version 3 of the Proposed Hazard Categories	Craig Goodier (HBRC)	24/05/2023
Maps with SA1 Boundaries	Maps with Hand-drawn SA1 Boundaries for High Risk Areas - Hastings District Council	Craig Goodier (HBRC)	24/05/2023
Hawke's Bay Rapid Assessment Workbook CHBDC	Hawke's Bay Rapid Assessment Workbook CHBDC (Central Hawke's Bay District Council)	Craig Goodier (HBRC)	24/05/2023

Name/filename	Description	Received from	Received date
Hawke's Bay Rapid Assessment Workbook Maps CHBDC	Accompanying maps for the Hawke's Bay Rapid Assessment Workbook CHBDC	Craig Goodier (HBRC)	24/05/2023
Hawke's Bay Rapid Assessment Workbook HDC	Hawke's Bay Rapid Assessment Workbook HCD (Hastings District Council_	Craig Goodier (HBRC)	24/05/2023
Hawke's Bay Rapid Assessment Workbook Maps HDC	Accompanying maps for the Hawke's Bay Rapid Assessment Workbook HDC	Craig Goodier (HBRC)	24/05/2023
Hawke's Bay Rapid Assessment Workbook NCC	Hawke's Bay Rapid Assessment Workbook NCC (Napier City Council)	Craig Goodier (HBRC)	24/05/2023
Hawke's Bay Rapid Assessment Workbook Maps NCC	Accompanying maps for the Hawke's Bay Rapid Assessment Workbook NCC	Craig Goodier (HBRC)	24/05/2023
Hawke's Bay Rapid Assessment Workbook WDC	Hawke's Bay Rapid Assessment Workbook NCC (Wairoa District Council)	Craig Goodier (HBRC)	25/05/2023
Hawke's Bay Rapid Assessment Workbook Maps WDC	Accompanying maps for the Hawke's Bay Rapid Assessment Workbook (Wairoa District Council)	Craig Goodier (HBRC)	26/05/2023
Ex-Tropical Cyclone Gabrielle Flood Hazard Zoning	Memorandum prepared by PDP for HBRC, dated 1 June 2023.	Craig Goodier (HBRC)	9/06/2023

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