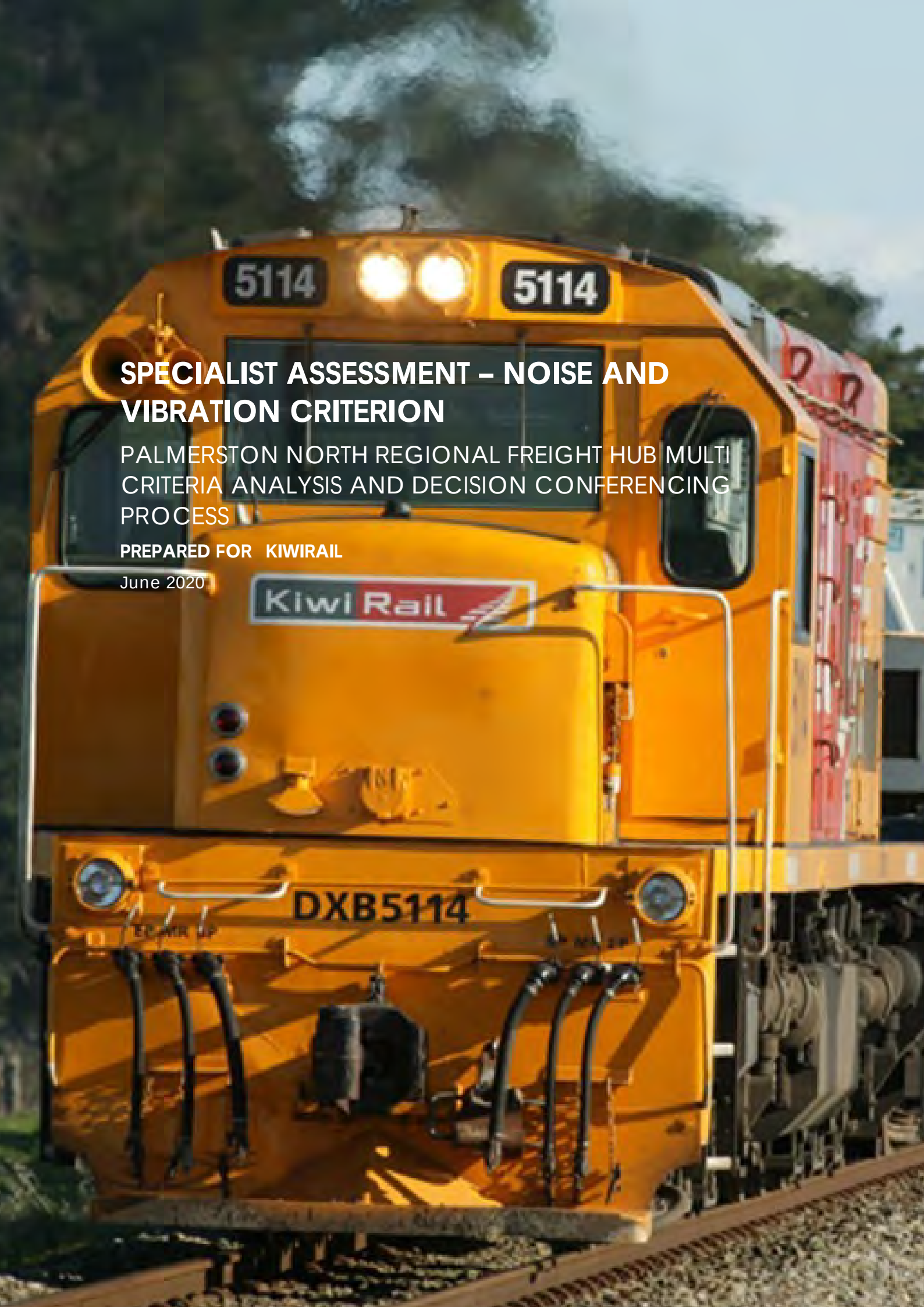


SPECIALIST ASSESSMENT – NOISE AND VIBRATION CRITERION

PALMERSTON NORTH REGIONAL FREIGHT HUB MULTI CRITERIA ANALYSIS AND DECISION CONFERENCING PROCESS

PREPARED FOR KIWIRAIL

June 2020

Noise and vibration assessment

1. Introduction

Date: 19 September 2019

Authors	*Credentials*
Stephen Chiles (Chiles Ltd)	BEng, PhD, CPEng, FIOA
Michael Smith (Altissimo Consulting)	BE, MEngNZ, MASNZ

The following is a comparative assessment of long list site options to inform the MCA workshop 2 for KiwiRail's future Palmerston North Rail and Freight Hub.

This assessment has relied on the following information:

- Site visit and workshop 1 (Dr Chiles), 20 August 2019
- Stantec, MCA workshop 2 briefing note, dated 2 September 2019, including "Concept F" site layout,
- Stantec, GIS dataset of buildings, district plan zoning, existing rail alignments, and long list location areas,
- Stantec, indicative location of Concept F within areas, received 18 September 2019
- KiwiRail, estimate of 20 fewer train movements through urban Palmerston North each day for locations 1 to 4 (North) compared to locations 5 to 8 (South), email dated 21 August 2019, and
- Sound level measurements at rail facilities at Lyttleton, Christchurch, Rolleston and Temuka.

The following information was not available for this assessment:

- Future forecast of train movements and differences between North and South locations,
- Heavy vehicle off-site routes and forecast volumes,
- Future configuration of the arterial road network,
- Information on building types/uses (i.e. dwelling, school, commercial or ancillary/utility), and
- Details of unexercised resource consents for future noise-sensitive development and details of where future dwellings could be built as permitted activities.

Heavy vehicles travelling to and from the hub on public roads may cause significant adverse noise effects. At this stage there is insufficient information available to make a reliable assessment of noise from off-site trucks and allow comparison between the location options. However, this factor might be a significant differentiator between options.

2. Constraints identified in each area

Area for Investigation	*Constraints - what they are and where they are in the area*
Option 1	This assessment is based on the site being constrained so the main part of the hub is at least 1 km from southern end of the area shown (Bunnythorpe) and at least 2km from residential areas in Feilding.
Option 2	This assessment is based on the site being constrained so the main part of the hub is at least 1 km from southern end of the area shown (Bunnythorpe) and at least 2km from residential areas in Feilding.
Option 3	This assessment is based on the main part of the hub being located west of the existing rail line. This is an assumed geometric constraint given the location around Bunnythorpe.
Option 4	This assessment is based on the site being constrained so that the main part of the hub is at least 1 km from southern end of the area shown (Kelvin Grove Road)
Option 5	The indicative layout is directly opposite a residential zone and future residential growth area. This is a fatal flaw in terms of noise impacts. It is unclear whether it is practicable for an alternative layout in this option area to be separated from residential zones.
Option 6	This main part of the hub has been assumed to be located centrally
Option 7	This main part of the hub has been assumed to be located centrally
Option 8	This assessment is based on the main part of the hub being located east of the existing rail line. This is an assumed geometric constraint given the location around Longburn.
Option 9	The assessment has been limited to the current site footprint rather than the Concept F footprint.

3. Criteria being assessed

Approach to the assessment

The noise and vibration impacts of each option have been scored using the following scale:

Score	1	2	3	4	5
Impact	Low	Medium low	Medium	Medium high	High

To score each option, the three factors detailed below have been considered in combination and a judgement has been made as to the absolute noise impact. The number of buildings near each option and the surrounding land-uses have carried the greatest weight in this evaluation, with the rail movements through Palmerston North considered as a lesser factor.

As set out in Section 1, insufficient information is available to reliably assess off-site heavy vehicle movements. Traffic forecasts and routes would be required to assess this factor. Comments have been made in Section 4 on connectivity of sites to the existing state highway network, but this is not a suitable basis for rating options and has not been considered in the scoring. Noise effects of off-site heavy vehicle movements could potentially change any of the assessments of options to having a high noise impact.

As set out above, the following three factors have been considered in this assessment as they correlate to the potential noise exposure of sensitive activities arising from the proposed activity:

a) Number of buildings around the hub that may be affected by on-site noise,
b) Additional off-site rail movements through the Palmerston North urban area, and
c) Compatibly with surrounding land-uses.

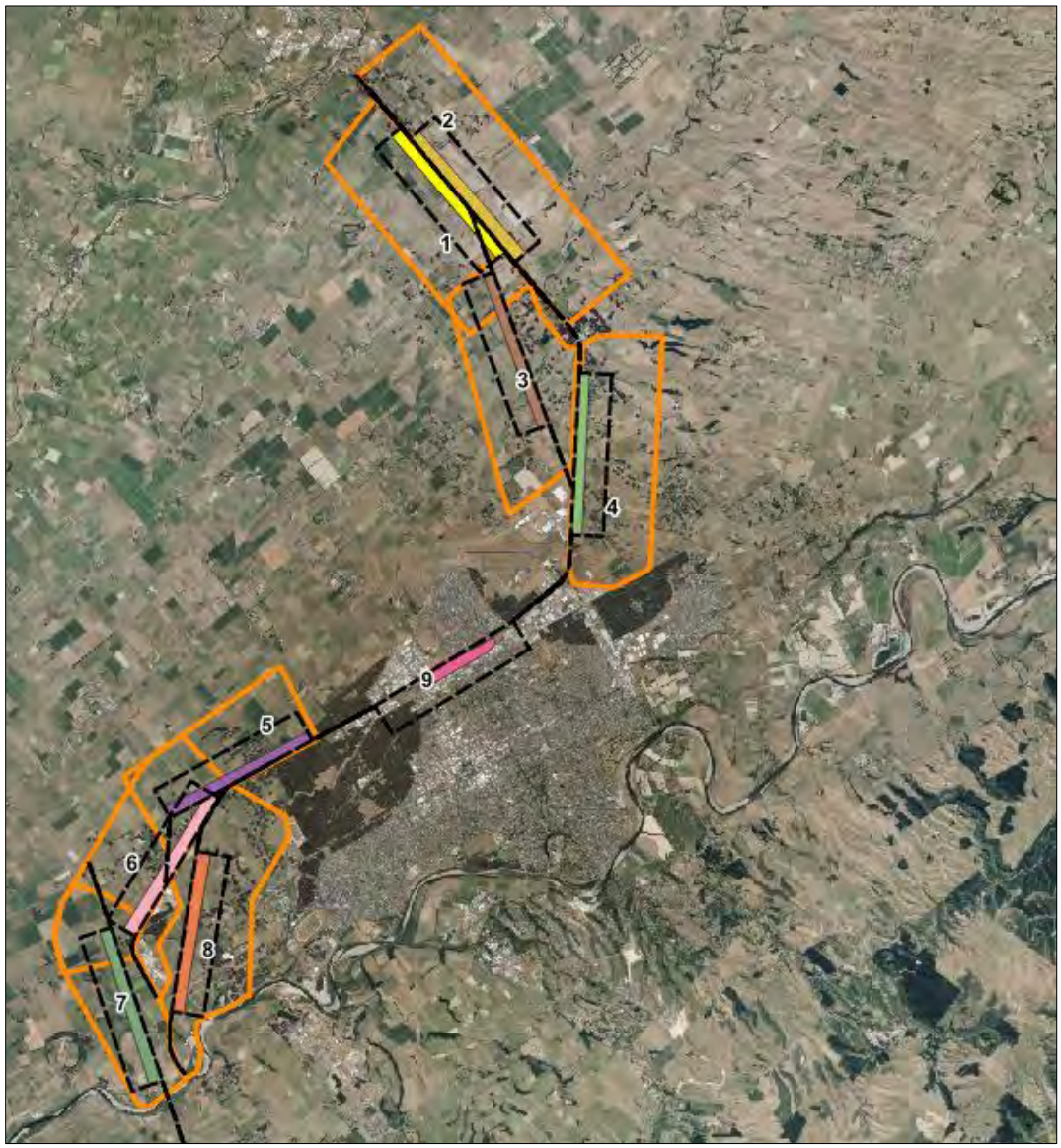
The prime consideration addressed by the three factors listed is operational noise from on-site and off-site activity. However, insofar as there might be effects, the factors considered are also relevant in terms of operational vibration and construction noise and vibration.

a) Buildings affected

The extent of noise sensitive activities around each option area has been approximated by counting the number of buildings within 2 kilometres.

For this assessment, an indicative 'core site' has been assumed to be at the locations identified by Stantec, which are approximately 3 km long. The extent of the core site has been assumed to be 200 m wide from the main line. This is the footprint that will contain most of the main noise sources (accepting there are other noise sources in the wider site). The locations of each of these indicative core sites are shown in the following figure.

Figure 1 – Indicative core site locations for the purposes of the noise and vibration MCA assessment



A GIS query has been used to count the number of buildings within certain distances of each indicative core site (Figure 2). The buildings counted are those provided by Stantec excluding buildings:

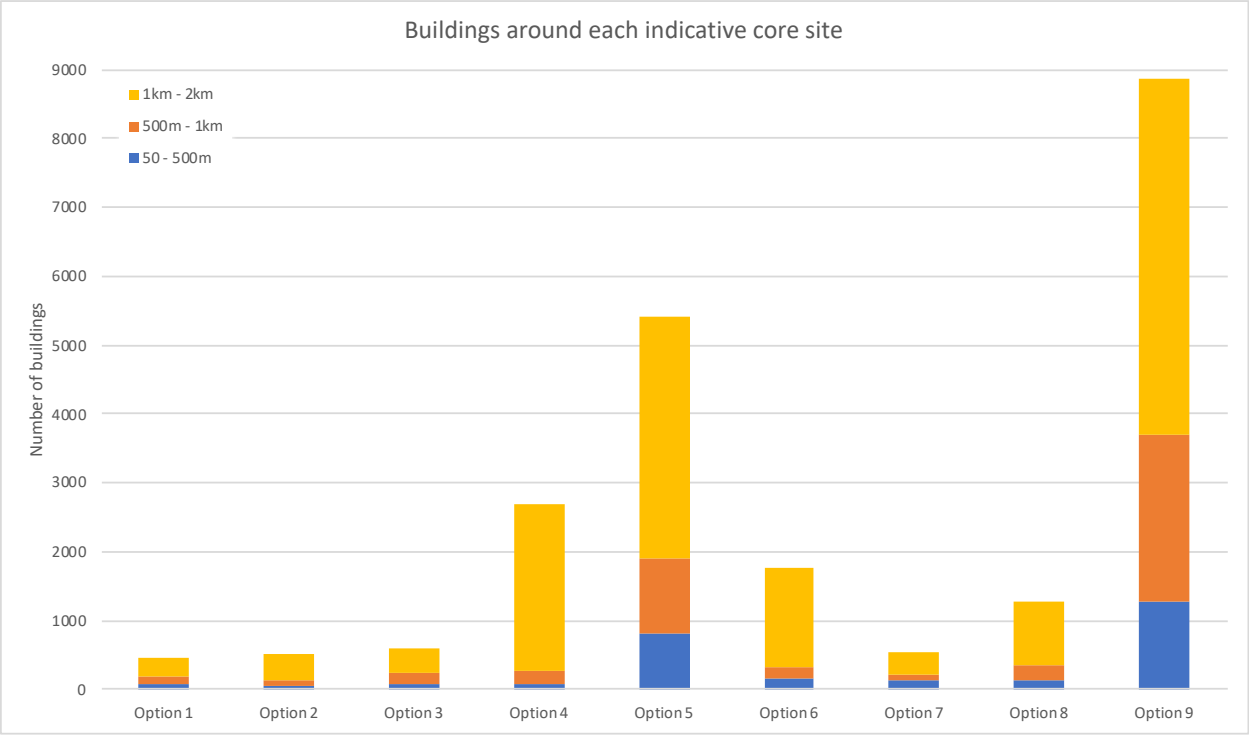
- with an attribute of "outbuilding" in the GIS dataset,
- less than 100 m^2,
- not in district plan zones: residential, rural, rural 1, rural 2, or
- not within the wider site footprint (assumed to be 600m wide).

This process counts buildings containing noise sensitive activities such as dwellings and also other buildings such as large sheds. With the data and time available this process has not been refined to count only buildings containing noise sensitive activities, which is the variable of interest. While buildings not containing noise sensitive activities are an unwanted confounding variable, from examination of aerial photographs the results appear to reasonably reflect the relative residential density around each option area.

The distances used have been split up to allow consideration of different issues such as:

- For unrestricted 24/7 operation, at least minor noise effects are likely to extend for in the order of 2 km.
- Mitigation may be required for houses near to the facility, over a distance potentially up to 500 metres.

Figure 2 – Number of buildings around each indicative core site



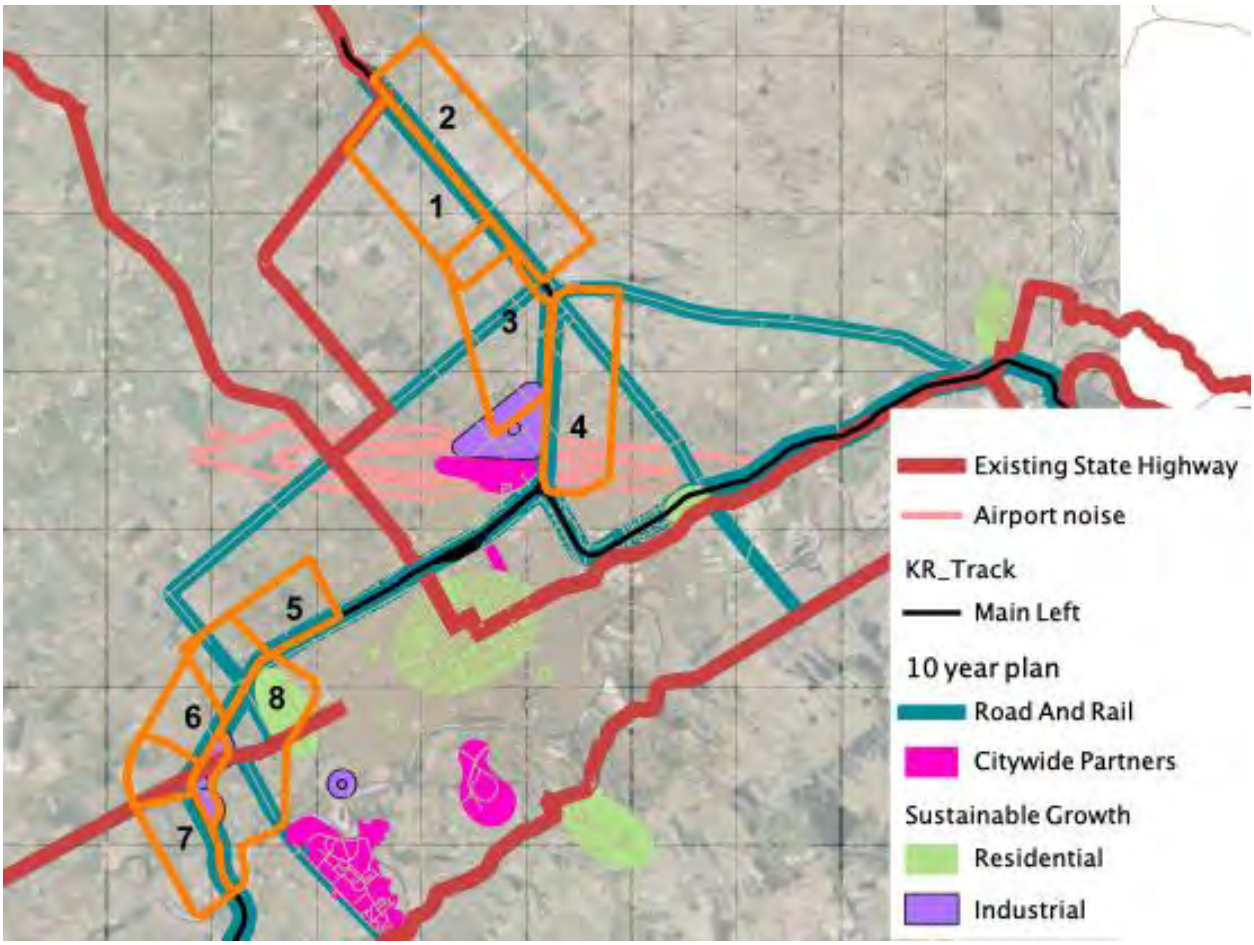
b) Off-site rail movements

For options 5 to 8 it is assumed there would be additional train movements through the Palmerston North urban area, compared to options 1 to 4. This factor has been assessed as increasing the noise impact of options 5 to 8. Less weight has been placed on this factor in the overall evaluation given that affected houses are already exposed to noise from existing rail movements.

c) Surrounding land-uses

A qualitative assessment has been made considering the current district plan zoning, the existing environment (any industry, road, rail, and airport noise), and the Palmerston North 10 year plan. Key features are shown on Figure 3. Option areas near to future residential areas have been considered as having higher noise impact and those near industrial areas or infrastructure have been considered as having lesser noise impact.

Figure 3 – Key land-uses around each option area



Assumptions

- The main noise sources will be on the indicative core sites shown on Figure 1 (each 3km by 200m other than the existing site/option 9),
- Inclusion of buildings not containing noise sensitive activities does not change overall findings, and
- There will be more train movements through urban Palmerston North with options 5 to 8.

4. Comparative assessment

Area	*Affected buildings*	*Additional rail movements and road connections*	*Surrounding land-uses*	*Score*
1	0m to 500m - 84 buildings 500m to 1km - 90 buildings 1km to 2km - 291 buildings Low density of rural dwellings. Fielding to north, but only near pullback tracks.	Reduced urban train movements SH54 north (Arterial)	Rural with no significant noise sources Airfield to east (general aviation)	3
2	0m to 500m - 86 buildings 500m to 1km - 51 buildings 1km to 2km - 91 buildings Low density of rural dwellings. Fielding to north, but only near pullback tracks.	Reduced urban train movements SH54 north (Arterial)	Rural with no significant noise sources	3
3	0m to 500m - 83 buildings 500m to 1km - 166 buildings 1km to 2km - 351 buildings Generally low density and good offsets, other than Bunnythorpe.	Reduced urban train movements No direct state highway access	Adjacent to industrial area and airport Rural to east	4
4	0m to 500m - 72 buildings 500m to 1km - 202 buildings 1km to 2km - 2426 buildings Relatively small number of affected buildings nearby but then dense residential area.	Reduced urban train movements No direct state highway access	All rural on east of rail Residential to south	5
5	0m to 500m - 812 buildings 500m to 1km – 1101 buildings 1km to 2km - 3491 buildings If the core site is away from residential zone, moderate number affected.	Increased urban train movements SH56 south (Arterial)	Currently rural Residential growth planned south of railway	5
6	0m to 500m - 164 buildings 500m to 1km - 161 buildings 1km to 2km - 1442 buildings Good setbacks from dwellings other than Longburn	Increased urban train movements SH56 south (Arterial)	Industry in Longburn to east of railway Industrial growth indicated in plan	4
7	0m to 500m - 136 buildings 500m to 1km - 161 buildings 1km to 2km - 84 buildings Good setbacks from dwellings other than Longburn	Increased urban train movements SH56 south (Arterial)	Industry on opposite side of railway Industrial growth planned River to south	3
8	0m to 500m - 131 buildings 500m to 1km - 213 buildings 1km to 2km - 918 buildings Distant residential to east	Increased urban train movements SH56 south (Arterial)	Residential growth planned in north of this area Distant residential to the east	5
9	0m to 500m - 1284 buildings 500m to 1km - 2424 buildings 1km to 2km - 5170 buildings	SH3 north (Regional)	Existing rail and freight facilities Planned growth in residential land to south	5

Addendum to the Workshop 2 Noise and Vibration Assessment

Date: 21 April 2020

Author: Stephen Chiles

Reasons for the addendum

The reason for this addendum is to provide a:

- record of the reasons why area option 5 was found to have a fatal flaw in terms of noise effects at Workshop 2; and
- document the further assessment of the Workshop 2 area options with the indicative site layouts applied, as previously summarised by email dated 9 October 2019.

Fatal flaw of area option 5

I was unable to attend Workshop 2, and Michael Smith deputised for me. Michael and I briefed and debriefed before and after the workshop.

At Workshop 2 as part of the discussions on the noise and vibration assessment I understand the workshop participants proposed that area option 5 had a fatal flaw. I agreed with this position for the following reasons:

- In my assessment prepared prior to Workshop 2 I had scored option 5 as having a high noise impact (score of 5) and had recorded that if the marshalling yard and container terminal could not be located away from residential areas this would represent a fatal flaw.
- I understand that it was confirmed at the workshop that it would not be practical to significantly distance the key elements of the rail facility from the residential areas, due to the alignment of the existing railway.
- The option 5 area is in the vicinity of thousands of existing residential properties and adjacent to areas specifically identified for future residential growth. In my opinion, a noise generating rail facility is fundamentally incompatible with such residential areas, and hence I agreed this option has a fatal flaw in terms of noise effects.

Further assessment

During Workshop 2, some participants acknowledged that having a specific site to assess within the areas identified could potentially result in changes to the scores presented at Workshop 2. This was less of an issue for my noise and vibration assessment as I had already based the assessment on an assumed "core site" where the key noise generating elements would be within the wider option area.

As a result, after Workshop 2, an indicative site layout was located within the wider area options assessed. These indicative site layouts generally correlated with the "core sites" I had previously assumed. The rail connection was included on the site layouts.

Two indicative site layout options were provided for areas 1 and 2 (Options 1a, 1b, 2a, 2b). Three layouts were originally developed for area 3, however I understand that only one layout (Option 3c) was taken forward because the others did not meet the project objectives. Area 4 could only accommodate one layout option (Option 4). I understand there were significant constraints at the ends of areas 5 and 6 (including the fatal flaw discussed above), and therefore the parts of these two areas without the constraints were combined to create site 5 (revised Option 5). The revised Option 5 aligns with the core site I had previously assumed for Option 6 for Workshop 2, so the revised Option 5 was scored the same as Option 6 in my original assessment.

I understand that indicative site layouts were not developed for areas 7, 8 and 9 as these areas were determined to have fatal flaws at Workshop 2.

Assessment

The following table sets out the noise and vibration assessment and scoring for each of the refined site options as previously advised by email dated 9 October 2019.

Site Option	Score	Assessment
Option 1a	3	This site is located approximately in the position of the core site previously assumed for the Workshop 2 assessment of Option 1. Therefore, the same factors/considerations apply as set out in the Workshop 2 noise and vibration assessment and the same score has been maintained.
Option 1b	4	This site is located closer to residential areas of Bunnythorpe than the core site previously assumed in the Workshop 2 assessment of Option 1. As there are more houses potentially affected by noise the score has been downgraded to have a higher impact in terms of noise.
Option 2a	3	This site is located approximately in the position of the core site previously assumed in the Workshop 2 assessment of Option 2. Therefore, the same factors/considerations apply as set out in the Workshop 2 noise and vibration assessment and the same score has been maintained.
Option 2b	4	This site is located closer to residential areas of Bunnythorpe than the core site previously assumed in the Workshop 2 assessment of Option 2. As there are more houses potentially affected the score has been downgraded to have a higher impact in terms of noise.
Option 3c	5	This site is located closer to residential areas of Bunnythorpe and other residential properties than the core site previously assumed in the Workshop 2 assessment of Option 3. As there are more key noise sources in the indicative site layout near houses there is likely to be a high noise impact and the score has been downgraded accordingly from that set out in the Workshop 2 noise and vibration assessment to have a higher impact in terms of noise.
Option 4	5	This site is located closer to the residential areas to the south than the previously assumed core site for Option 4 assessed for Workshop 2. Regardless, for the reasons set out in the Workshop 2 noise and vibration assessment the score was previously 5 so this has been maintained.
Option 5 (revised)	4	This site is located in the position previously assumed for the core site in the Workshop 2 assessment of Option 6. Therefore, the same factors/considerations apply as set out in the Workshop 2 noise and vibration assessment for Option 6 and that score has been applied.

Concluding statement

In general, the further assessment of options with specific site layouts set out above has resulted in the same scores for noise and vibration as previously set out in the Workshop 2 noise and vibration assessment. This is due to the previous assessment being based on 'core sites' that largely align with the new site layouts. However, there are three new site layouts (1b, 2b & 3c) which have been found to have higher noise impacts because they are closer to residential areas of Bunnythorpe than previously assumed. Conversely, the two options which score the best are 1a and 2a as they are furthest from residential areas.

Option 5 is now in the position previously assumed for Option 6 and the score has changed accordingly. The score is the same previously given for Option 6.

KiwiRail: Palmerston North - Workshop 3 Noise and vibration assessment

1. Introduction

Date: 17 November 2019

Authors	*Credentials*
Stephen Chiles (Chiles Ltd)	BEng, PhD, CPEng, FIOA
Michael Smith (Altissimo Consulting)	BE, MEngNZ, MASNZ

The following is a comparative assessment of short list site options to inform the MCA workshop 3 for KiwiRail's future Palmerston North Rail and Freight Hub.

This assessment has relied on the following information:

- Site visit and workshop 1 (Dr Chiles), 20 August 2019
- Workshop 2, Noise and vibration assessment, 19 September 2019,
- Workshop 2 (Mr Smith), 25 September 2019,
- Supplementary noise and vibration assessment of sub-options, 4 October 2019
- Stantec, MCA workshop 3 briefing note, dated 8 November 2019,
- Stantec, 2031 traffic estimates, 12 November 2019. This is interim data only and does not include new road linkages.
- Stantec, GIS dataset of buildings, district plan zoning, existing rail alignments, and short list site layouts,
- Palmerston North City Council, 2017 aerial photographs, and
- Sound level measurements at rail facilities at Lyttleton, Christchurch, Rolleston and Temuka.

The following information was not available for this assessment

- Refined traffic estimates reflecting new road connections,
- Future configuration of the arterial road network,
- Information on building types/uses (i.e. dwelling, school, commercial or ancillary/utility), and
- Details of unexercised resource consents for future noise-sensitive development and details of where future dwellings could be built as permitted activities.

2. Constraints identified in each site

Site	*Constraints - what they are, where they are in the site and the significance of the constraint*
Option 2	• Noise screening might not be effective for houses to the west of Waughs Road opposite the marshalling yard and workshops, unless the location of at least one row of warehouses can be switched with the marshalling yard. If the site layout cannot be adjusted, for unconstrained operation of the site these houses might need to be designated and removed. • The north road connection uses an existing low volume section of Campbell Road adjacent to houses. Mitigation might be required treating buildings and upgrading the road. • Transfer of existing traffic at Bunnythorpe from Campbell Road to Waughs Road (including the unformed section), brings it close to houses causing adverse effects. Mitigation including treating buildings and upgrading the road are likely to be required. • Mitigation including treating buildings might be required by both pull back tracks.
Option 3	• There is an existing rural lifestyle area east of the railway opposite the workshop and the end of the main marshalling yard, which is unlikely to be practicable to effectively screened unless at least one row of warehouses can be switched with the marshalling yard and workshop. There are also other rural properties opposite the balance of the marshalling yard. An extensive buffer area to the east of the railway would need to be designated and a large number of houses removed to avoid constraints on the operation of the site. • The log and liquids yard are relatively close to Bunnythorpe and operations may be constrained, unless these can be shifted to behind the workshop area. • Mitigation including treating buildings and upgrading the road may be required on Kairanga Bunnythorpe Road between the new intersections. • Mitigation including treating buildings might be required by the north pull back track in Bunnythorpe.
Option 4	• The log yard is likely to have constrained operations due to proximity to rural lifestyle properties unless it can be relocated to where the liquids yard is, with the liquids yard moved east. • Transfer of existing traffic at Bunnythorpe from Campbell Road to Waughs Road (including the unformed section), brings it close to houses causing adverse effects. Mitigation including treating buildings and upgrading the road are likely to be required. • Mitigation including treating buildings might be required by the north pull back track in Bunnythorpe.

For all site options it is recommended that options/variations for proposed road connections to each site, and consequential network changes (such as road/rail grade separation and level crossing closures) should be separately evaluated. In some cases there appears to be scope to reduce adverse noise effects associated with heavy vehicle movements by adjusting these road connections.

3. Criteria being assessed

Approach to the assessment

The noise and vibration impacts of each option have been scored using the following scale:

Score	1	2	3	4	5
Impact	Low	Medium low	Medium	Medium high	High

To score each option, the following three factors have been considered in combination and a judgement has been made as to the absolute noise impact:

a) Effects of on-site activity on surrounding houses and other noise sensitive locations,
b) Effects of off-site heavy vehicle movements on houses near road links and altered roads, and
c) Compatibly with surrounding land-uses.

Potential effects from on-site activity has carried the greatest weight in this evaluation, followed by potential effects from off-site heavy vehicle movements and compatibility with surrounding land-uses. Before making the overall judgement, each of the three factors have been considered individually using both quantitative and qualitative matters set out below.

The prime consideration addressed by the three factors listed is operational noise from on-site and off-site activity. However, insofar as there might be effects, the factors considered are also relevant in terms of operational vibration and construction noise and vibration.

The following sets out how each factor has been considered individually. Where objective measures have been used, these are shown in three figures appended to this assessment, one for each of the options.

a) On-site activity

The site layout for all options has one side that is or can be screened by warehouses, and other sides with the container terminal, marshalling yard and log yard where screening would have limited effectiveness. There are likely to be significant adverse noise effects at houses within approximately 500m of the unscreened sides of the site. Unless the site layouts can be adjusted, either operations may be constrained or houses in this area might need to be designated and removed.

In the wider area approximately 1km from the unscreened sides of the site or 500m from the screened side, houses might require treatment to avoid constraints on the site. Buildings might also need to be treated where they are close to the pull back tracks.

A GIS query has been used to count the number of buildings within:

1) 0-500m of the unscreened sides of the site;
2) 500-1000m of the unscreened sides of the site;
3) 0-500m of the screened side of the site; and
4) 0-100m of the pull back tracks.

The buildings counted are those provided by Stantec excluding buildings:

- already counted in any of the preceding categories using the order set out above,
- with an attribute of “outbuilding” in the GIS dataset,
- less than 100 m^2,
- not in district plan zones: residential, rural, rural 1, rural 2,
- not within the site footprint, or
- for the area between 0-500m of the unscreened sides, buildings that from inspection of aerial photographs do not appear to be houses or other noise sensitive activities.

Other than the 0-500m unscreened area, this process counts buildings containing noise sensitive activities such as dwellings and also other buildings such as large sheds. With the data and time available this process has not been refined to count only buildings containing noise sensitive activities, which is the variable of interest.

Of the buildings counted as set out above, the number within 0-500m of the unscreened sides of the site is the most significant. These numbers have been considered alongside the following qualitative factors relating to on-site activity:

- Potential for altering the site layout to address significant issues, and
- Likely effectiveness of noise screening.

The buildings identified in this process are shown on the three figures appended to this assessment.

b) Off-site heavy vehicles

Where the facility gives rise to significant increases in heavy vehicles travelling past houses there is likely to be an adverse noise effect. This has been assessed using a GIS query to count all buildings within 100m of a road where heavy vehicle movements increase by more than 50%. This has been calculated using the forecast traffic from the site provided by Stantec for the year 2031 compared to a baseline 2031 forecast. All buildings within 100m of new road links have also been counted. Consideration has also been made for:

- Sections of road likely to have significantly increased general traffic due to network changes, and
- Potential for adjusting the indicative road connections to reduce noise effects.

c) Surrounding land-uses

A qualitative assessment has been made considering the current district plan zoning, the existing environment (any industry, road, rail, and airport noise), and the Palmerston North 10 year plan. Key features are shown on the three figures appended to this assessment. Sites by surrounding land-uses that are not noise sensitive have been considered as having lesser noise impact.

<u>Assumptions</u>

- Inclusion of buildings not containing noise sensitive activities does not change overall findings,
- Mitigation will include those measures set out below in Section 6, and
- Errors drawing assessment areas in the GIS analysis which could not be fixed/refined in the available time would not materially alter the overall findings.

4. Fatal Flaws

Site	*Flaw Description*	*Explanation*
Option 2	None*	• There is a risk that hours of operation for some activities may be limited, or other operational constraints imposed (by the Environment Court) to address noise effects. These could represent fatal flaws. • There are likely to be significant adverse noise effects with all options. There are possibilities for adjusting the site layout and road connections, purchasing houses and implementing mitigation to reduce these effects to some extent, although again this could represent a fatal flaw
Option 3	None*	
Option 4	None*	

*As set out in the explanation, there is a risk that operational constraints and/or significant adverse noise effects might become fatal flaws.

5. Comparative assessment

Site	*Affected buildings*	*Road connections*	*Surrounding land-uses*	*Score*
2	*0-500m unscreened* - 24 buildings *500m-1km unscreened plus 0-500m screened* - 67 buildings *0-100m pull back track* - 9 buildings Screening likely to have limited effectiveness Potential to reverse layout east/west	*0-100m by new roads or 50%+ heavy vehicle increase* - 130 buildings	Low density of rural dwellings Rural with no significant noise sources other than existing road/rail	4
3	*0-500m unscreened* - 164 buildings *500m-1km unscreened plus 0-500m screened* - 176 buildings *0-100m pull back track* - 0 buildings Screening likely to have limited effectiveness Limited potential to reverse layout east/west	*0-100m by new roads or 50%+ heavy vehicle increase* - 90 buildings	Adjacent to industrial area and airport Rural to east Existing rural lifestyle area immediately opposite workshop	5
4	*0-500m unscreened* - 21 buildings *500m-1km unscreened plus 0-500m screened* - 78 buildings *0-100m pull back track* - 58 buildings Potential to move log yard to liquid yard area (this is the basis for the building counts)	*0-100m by new roads or 50%+ heavy vehicle increase* - 46 buildings	Emissions primarily towards industrial and airport on west of railway. All rural on east of railway Dense residential 1km to south	4*

*Option 4 is preferred in terms of noise and vibration effects. The main unscreened side of the site generally faces towards industrial land uses. The site is co-located with existing environmental noise sources of the airport and industrial activity.

6. Mitigation

Site	*Mitigation*
Option 2	• Designation and purchase of houses to west of Waughs road or switch marshalling yard and warehouses. • Investigation and treatment if required for houses affected by roads and pull back tracks. • Rebuild pavements of Campbell Road (north) and Waughs Road (south). • Noise barrier by Ashhurst/Stoney Creek Roads roundabout. • Bunds by Bunnythorpe bypass roads.
Option 3	• Designation and purchase of houses to east of site. • Investigation and treatment if required for houses affected by roads and pull back tracks. • Move log and liquids yards behind workshop. • Rebuild pavement of Kairanga Bunnythorpe Road
Option 4	• Designation and purchase of houses to north and south of site. • Investigation and treatment if required for houses affected by roads and pull back tracks. • Move log yard in place of liquids yard and move liquids yard east. • Noise barrier by Ashhurst/Stoney Creek Roads roundabout. • Bunds by Bunnythorpe bypass roads.
All options	• Perimeter screening 3 to 5m high solid bund/wall. • District plan change to create control boundaries prohibiting future noise sensitive activities close to the site and requiring mitigation for future noise sensitive activities in an area beyond. • Implementation of management plans to address noise from site operations and associated off-site vehicle movements. • All operating surfaces to be designed without features that can induce vehicle noise. • No tonal alarms on vehicles and equipment on the site. • Asphaltic mix road surfaces and limited speeds on all altered roads near houses.

Legend

Effects areas

- 2 Unscreened (500m)
- 2 Unscreened (1000m)
- 2 Screened (500m)
- 2 Pullback (100m)
- 2 Roads (100m)

Sources

- Site footprint
- 2a_new_road

Context

- Airport
- Caccia Birch
- Conservation and Amenity
- Flood Protection
- Fringe Business
- Industrial
- Inner Business
- Institutional
- Local Business
- North East Industrial
- Outer Business
- Race Training
- Racecourse
- Recreation
- Residential
- Rural
- Showgrounds

Project:
CNIFH

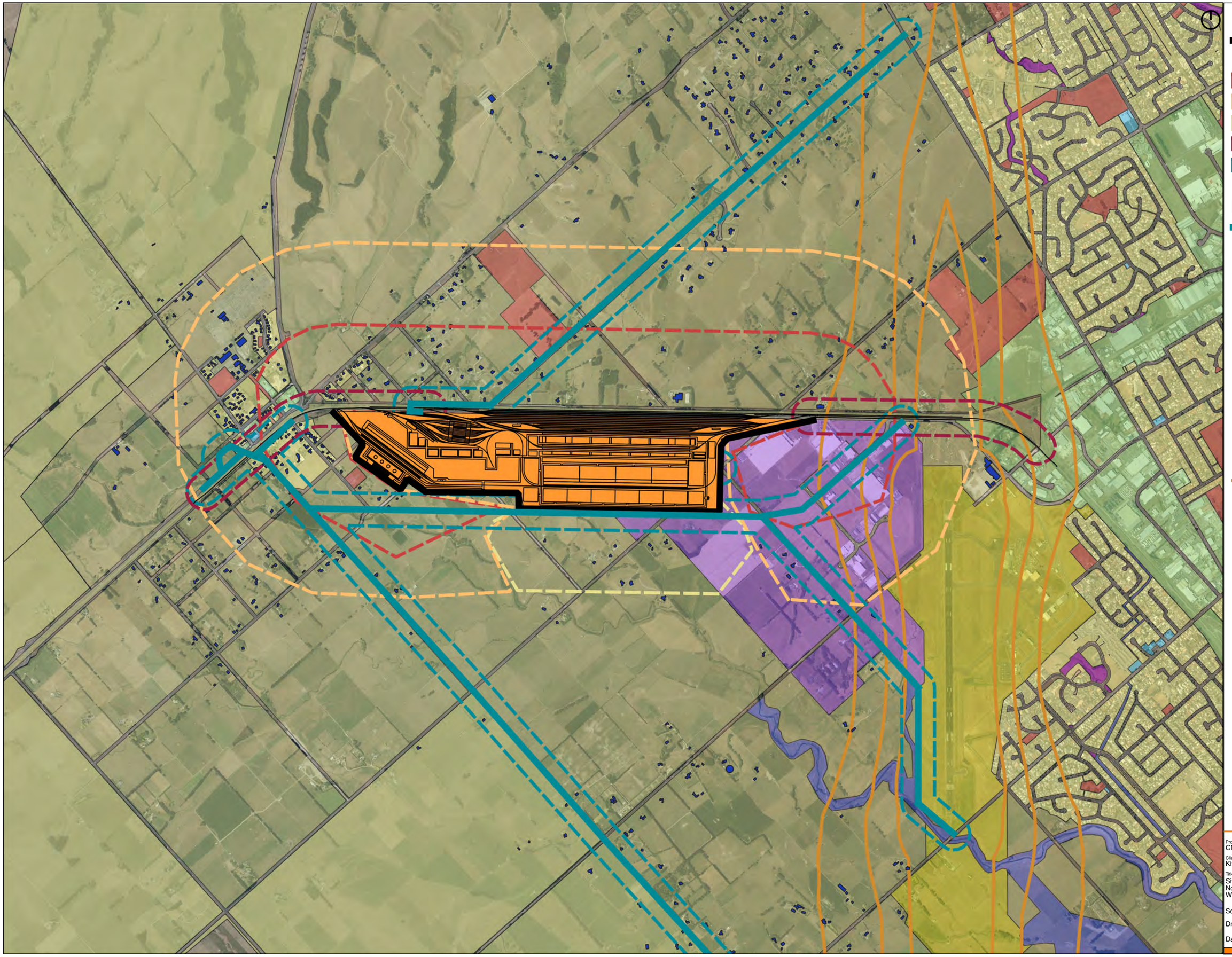
Client:
KiwiRail

Title:
Site 2A
Noise assessment for
Workshop 3

Scale: 1:30000

Drawn: MS

Date: [15/11/19]



Project:
CNIFH

Client:
KiwiRail

Title:
Site 3c
Noise assessment for
Workshop 3

Scale: 1:20000

Drawn: MS

Date: [16/11/19]

Legend

Noise walls

Effects areas

- Unscreened (500m)
- Unscreened (1000m)
- Screened (500m)
- Pullback (100m)
- Roads (100m)

Sources

- Site footprint
- Roads with increased HV

Context

- Airport
- Conservation and Amenity
- Flood Protection
- Fringe Business
- Industrial
- Institutional
- Local Business
- North East Industrial
- Outer Business
- Recreation
- Residential
- Rural
- Water Recreation
- Airnoise contour

Project:
CNIFH

Client:
KiwiRail

Title:
Site 4
Noise assessment for
Workshop 3

Scale: 1:30000

Drawn: MS

Date: [15/11/19]