

Transpower

Transmission Gully Project

Transmission Line Relocation

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Authors: **Gavin Lister**

Wade Robertson

QA: **Brad Coombs**

Isthmus

Level 3, 45 Courtenay Place

PO Box 24 116

Wellington

+64 4 499 9832

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CONTENTS

1	EXECUTIVE SUMMARY	5
2	INTRODUCTION.....	6
3	PROJECT DESCRIPTION.....	7
	Route Sections	7
	Route Section 1– McKays Crossing.....	8
	Route Section 2 and 3 - Wainui Saddle.....	8
	Route Section 3 - Horokiri Stream	8
	Route Section 4 - Battle Hill	8
	Route Section 5 – Golf Course	9
	Route Section 6 - State Highway 58	9
	Tower Design and Access Tracks.....	9
4	SCOPE AND METHODOLOGY	10
	Familiarisation and Site Visits	10
	Analysis and Appraisal of Existing Landscape	11
	Input to Design (workshops and best practice principles).....	11
	Consideration of re-alignment options	12
	Existing Corridor	12
	Western Corridor	13
	Eastern Corridor	13
	Wainui Saddle Bypass Options	13
5	LANDSCAPE AND VISUAL EFFECTS	15
	Analysis of Line Sections	15
	Outstanding Natural Landscapes	23
	Earthworks - access tracks and foundations.....	24
6	MONITORING AND MITIGATION	24
	Measures to avoid, remedy and mitigate adverse effects	24
7	APPENDIX 5A.A: TOWER LOCATIONS, HEIGHTS AND TYPES.....	26
8	APPENDIX 5A.B: BEST PRACTICE TRANSMISSION LINE DESIGN PRINCIPLES	28

9	APPENDIX 5A.C: BEST PRACTICE EARTHWORKS DESIGN PRINCIPLES FOR TRANSMISSION TOWER ACCESS TRACKS AND FOUNDATION PADS.....	29
10	APPENDIX 5A.D: KAPITI COAST DISTRICT COUNCIL ONL AREA PLAN	32

1 EXECUTIVE SUMMARY

- 1.1 Any adverse effects of changes to the existing transmission line on the existing environment will be minor in most instances. Only small modifications will be made to the existing line with the exception of the four-span bypass at Wainui Saddle.
- 1.2 Adverse visual effects from houses will be limited to 7 houses (on 6 properties)¹ and will be moderate^{2,3} in degree. Conversely there will be some minor positive visual effects for several properties in the Flightys Road area because towers will be moved further away from their dwellings and will be located at lower elevations beyond an intervening landform and closer to a hill backdrop.
- 1.3 The greatest potential for adverse landscape effects is the four-span deviation around Wainui Saddle (Towers 8A – 12A) which will result in three towers on spurs above the saddle. The deviation is within an area classified as an Outstanding Natural Landscape (ONL)⁴ so that consideration of whether the deviation is ‘appropriate’ is required. In this instance the deviation is considered appropriate for the following reasons:
- i) The ONL is already traversed by the existing transmission line;
 - ii) The selected bypass deviation is the best of the options considered and was aligned to reduce potential adverse effects as far as possible; and
 - iii) The degree of adverse landscape effects will be modest in degree: While two towers (9A and 10A) will be visible from the coastal plains they will be distant (typically greater than 4km from potential viewpoints), they will be part of the background beyond prominent middle-ground spurs, the towers will be located on the shoulders of spurs below the main ridgeline, and the presence of the existing gas-line access road will reduce the need for earthworks to provide access.
- 1.4 While effects on the existing environment will in most instances be minor, the line will be prominent from the proposed highway - an inevitable consequence of the alignment of the new highway along the valley occupied by the existing transmission line. However the changes to the alignment were designed to reduce such adverse effects, in particular

¹ 5 houses along Paekakariki Hill Road and 1 house along Flightys Road.

² Assessed using the 5 point scale described in the Transmission Gully Project LVA methodology and in relation to the existing environment.

³ Overall visual effects of the proposed realignment will be no more than minor.

⁴ See Appendix 5A.D attached to this assessment.

by reducing the number of road crossings and angle changes, and increasing the separation distance between road and line where possible.

1.5 Provision of landscape related guidelines and input into the route selection process at an early stage has helped to avoid and reduce potential adverse landscape and visual effects. Such effects have been balanced with those other relevant fields (e.g. ecology and geotechnical) to finalise the most appropriate alignment given the site's physical constraints.

1.6 Measures have been proposed to further remedy and mitigate the remaining adverse landscape effects. Measures include planting in strategic locations, controls on tower appearance, controls on locations of specific towers, and best practice guidelines for earthworks associated with tower access and foundations.

2 INTRODUCTION

2.1 The NZ Transport Agency (NZTA) has identified the need for a new inland state highway from Linden in Wellington City to MacKays Crossing in the Kapiti Coast District. This is known as the Transmission Gully Project and is part of the Wellington Northern Corridor Roads of National Significance (RoNS). The NZTA are progressing notices of requirement for designations and applications for resource consents for the Transmission Gully Project as a project of national significance under the Resource Management Act 1991 (RMA). NZTA's documentation that supports the notices of requirement for designations and applications for resource consents is contained in Volumes 1 to 5. These volumes contain a substantive description of the Transmission Gully Project.

2.2 In order to allow for the construction and operation of the Transmission Gully Project, parts of the existing electricity transmission line between the Pauatahanui substation at State Highway 58 and MacKays Crossing will need to be relocated. The Paekakariki-Takapu Road A (PKK-TKR A) 110kV transmission line is part of the National Grid and is owned and operated by Transpower New Zealand Limited (Transpower). This Line Relocation Project involves the relocation of sections of the PKK-TKR A between the Paekakariki and Pauatahanui Substations from Tower 1 to 49A. The line route generally follows the existing transmission line with the route design generally governed by the need to minimise crossings of the Transmission Gully Project cognisant of environmental, cultural, engineering and other factors.

2.3 Transpower is seeking the majority of the resource consents to enable the line relocation to occur under the regulations included in the Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009 (NESETA). These resource consents are set out in detail in the AEE and in summary are:

- Restricted discretionary land use consent for the relocation of 6 towers in Kapiti Coast District in accordance with the NESETA; and
- Restricted discretionary land use consent for the relocation of 18 towers in Porirua City in accordance with the NESETA.

No transmission lines will be relocated in Upper Hutt City or in Wellington City.

2.4 Regional consents for related works including earthworks and construction of culverts are not being applied for at this time. Where consents are required for these activities they will be applied for during detailed design.

2.5 This assessment addresses the landscape and visual effects associated with the Transmission Gully Line Relocation (hereafter referred to as ‘the Line Relocation Project’).

3 PROJECT DESCRIPTION

3.1 The Assessment of Environmental Effects report (AEE) accompanying the application for resource consent describes the Line Relocation Project in detail and the route selection process. This section is a summary of the Project.

Route Sections

3.2 The PKK-TKR A line between the Paekakariki and Pauatahanui Substations is approximately 15 km long. The existing line is a 110 kV double circuit line consisting of lattice steel towers. There are 50 existing towers along this section of the line.

3.3 For assessment purposes, the line route is split into six route sections. The following summarises the relocation works for each section.

Route Section 1– McKays Crossing

- 3.4 This route section covers the line route between Tower 1 and Tower 4. In order to accommodate the Transmission Gully Project, two existing towers will be relocated, one to the west and the other slightly to the east of the existing line. No alterations are required to towers or lines located north of the existing state highway.

Route Section 2 and 3 - Wainui Saddle

- 3.5 These sections cover the line route between Tower 5 and 15. Through this section, the line route runs to the west of the proposed road between Towers 5 and 8, at which point it is proposed to relocate the line to the west of Wainui Saddle. This is required in order to navigate around the Wainui Saddle, which will be occupied by the Transmission Gully Project. Towers will be erected halfway up the main spur west of the Saddle and will skirt round the high point of the saddle and then crossing the Transmission Gully Project between Towers 11 and 12, before dropping back into the Horokiri Valley at Tower 12. Minor relocations will be required to the remaining towers (including tower 13) in this section (as compared with current positions) in order to accommodate the proposed Transmission Gully Project with the line aligned roughly parallel and to the east of the existing line.

Route Section 3 - Horokiri Stream

- 3.6 This route section covers the line route between Tower 16 and 25. Minor relocations of towers (as compared with current positions) are required to accommodate the proposed Transmission Gully Project with the proposed line aligned roughly parallel and to the east of the existing line. Tower 23 is to be removed.

Route Section 4 - Battle Hill

- 3.7 This route section covers the line route between Tower 26 and 33. Relocations of towers is required to accommodate the proposed Transmission Gully Project with the proposed line aligned roughly parallel and to the east of the existing line. The proposed line crosses the Transmission Gully Project between Towers 32 and 33.

Route Section 5 – Golf Course

- 3.8 This route section covers the line route between Tower 34 and 42. Relocation of towers is required in order to accommodate the proposed Transmission Gully Project with the proposed line aligned roughly parallel and to the west of the existing line.

Route Section 6 - State Highway 58

- 3.9 This route section covers the line route between Tower 43 and 49A. Tower 43 is relocated to the west of the existing tower. No other tower relocations are needed in this section.

Tower Design and Access Tracks

- 3.10 The proposal is to relocate 24 existing tower structures, to strengthen 10 towers, entirely remove an existing tower. Table 1 summarises the changes to each of the towers.

Table 1 – PKK-TKR A Line Towers

Description	Towers	Quantity
Replaced structures	2A, 3A, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15A, 16A, 17A, 18A, 22A, 24A, 25A, 26A, 31A, 32A, 33A, 40A, 41A, 42A, 43A	24
Structures to be strengthened*	1, 4, 7, 19, 21, 27, 30, 34, 39, 44	10
Structures to be removed entirely	23	1
Unaffected Structures (not moving or being strengthened)	5, 6, 20, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 49a	15
Total		50

* Involves foundation and/or tower strengthening.

The “A” in the tower reference denotes relocated/replaced tower.

- 3.11 **Appendix 5A.A** contains details of each of the towers including co-ordinates and heights of both existing and proposed towers (and differential between the two). The replacement towers are expected to range in height from approximately 29 m through to 39 m.
- 3.12 The towers will be steel lattice design, similar to existing towers.

- 3.13 Tower foundations will be approximately 9m x 9m for a strain tower and for construction, an additional clearance buffer of approximately 3 m around each tower. In addition, generally an area of approximately 20 m x 25 m will be required to one side of each proposed tower for construction crane assembly purposes. This construction area will be able to reinstated following use.
- 3.14 Transpower has an existing access track along the line for maintenance purposes. This track is shown on the drawings contained in Volume 4: Plan Set. This existing access track and other existing tracks (including farm and forestry tracks) will be used for construction access to provide four wheel drive access to each tower. The tracks will be approximately 3.5m to 4.5m wide. At the Wainui Saddle, for the towers located outside the extent of works for the NZTA's Transmission Gully Main Alignment (i.e. for towers 9A, 10A and 11A), access is likely to be taken off the existing access track that currently serves the farm and the gas pipeline owned by Vector. New tracks will be constructed off this to gain access to Towers 9A and 10A.

4 SCOPE AND METHODOLOGY

- 4.1 The methodology that underpins this addendum assessment is based on the Transmission Gully Project Landscape and Visual Assessment methodology described in **Appendix 5A** of that report.
- 4.2 A full description of the route selection process is contained in the AEE. The following outlines the process as it relates to this assessment of landscape and visual effects.

Familiarisation and Site Visits

- 4.3 The following site visits were made:
- i) Initial project team site visit to look at possible locations for the line, 23rd September 2010.
 - ii) Site visit to northern end of route (Mackays Crossing) to look at potential visibility of towers at Wainui Saddle prior to constraint mapping process, 27th October.
 - iii) Along the section of the route between Mackays Crossing and Battle Hill following the desk top constraints mapping process, 9th December 2010.
 - iv) On to the western hills to analyse potential western 'by-pass' options, 18th March.

- v) To the wider landscape to confirm location of towers and update previous Housing Inventory findings, 22nd June 2011.

Analysis and Appraisal of Existing Landscape

- 4.4 A detailed description of the existing landscape is provided in Section 7 of Technical Report 5 of the Transmission Gully Project AEE. Given that the alignment of the proposed Transmission Gully and Line Relocation Projects are so closely related it is appropriate to use the previous description of the existing landscape as a basis for this assessment.
- 4.5 The landscape between MacKays Crossing and Battle Hill was specifically appraised and mapped in terms of its relative ability to accommodate changes to the transmission line taking into account existing landscape values, likely prominence of towers, and effects likely to arise from earthworks / native vegetation clearance required to provide access. The mapping was carried out following site visits and was aided by a 3D digital landscape model.
- 4.6 The analysis identified that the most sensitive locations are the steep hill faces, the areas of native bush, and the most prominent spurs and ridge top locations above the lower Te Puka Stream valley. The least sensitive locations are the valley floors in the vicinity of the existing line, and some of the less prominent ridgelines furthest from the coastal plain.

Input to Design (workshops and best practice principles)

- 4.7 Landscape input was integral to the realignment process. Isthmus staff provided best practice principles for transmission line alignment, took part in field visits with the other professions, and took part in the following workshops to select the preferred route:
 - i) Constraints workshop, 26 November 2010
 - ii) Route workshop, 22 February 2011
 - iii) Bypass workshop, 8 June 2011
- 4.8 Best practice landscape principles for the alignment of transmission lines were developed and circulated amongst the design team. The principles are provided in **Appendix 5A.B** and seek to integrate the proposed towers into the landscape mindful of

the fact that NZTA proposes to also construct a new road in this location. The principles can be summarised, as follows:

- i) Straight sections of lines are best.
- ii) Small angle changes are best.
- iii) Locate towers against landscape backdrop, avoiding skyline locations.
- iv) Maximise separation when lines are parallel with roads.
- v) Maintain consistency in tower design type (i.e. lattice tower or monopoles).
- vi) Maintain reasonable consistency in tower height and spacing (more applicable over flatter parts of the route rather than hilly country).
- vii) Minimise the number of road crossings and ensure they are as near to right angles as possible.
- viii) Avoid clearance of significant vegetation.
- ix) Locate tower platforms in a way that avoids the need for large cut batters.

4.9 It is not possible in practice to satisfy every principle in every situation, particularly in this instance where the highway will run parallel with the existing line. Rather the intent is to seek the best alignment using the principles 'in the round'.

Consideration of re-alignment options

4.10 Consideration of re-alignment options is discussed in detail in the A.E.E. The following section discusses the landscape considerations taken into account in selecting the re-alignment route.

Existing Corridor

4.11 The valley corridor traversed by the existing line is likely to have least landscape and visual effects for the following reasons:

- i) It is least visible from surrounding areas because it is in a valley, remote from public roads.
- ii) The land in the valley is relatively modified compared to the hills on either side.
- iii) There is reasonable separation between the existing line and houses. The line has been in existence for many years and development in the vicinity has typically been located in a manner that avoids or reduces potential effects of the line.

4.12 However such an alignment will be prominent from the proposed new road. While this is an adverse effect and measures have been taken to reduce the effects of the line on the road, it is considered acceptable that such effects fall on a new use rather than be imposed on existing landscapes elsewhere.

Western Corridor

4.13 A western corridor would create more significant effects for the following reasons:

4.14 Alignments on the ridges or spurs west of the valley would be more prominent from the north, including from the north parts of Paekakariki, Queen Elizabeth Park and from State Highway 1 in the vicinity of MacKays Crossing.

4.15 A western corridor would also impact on Battle Hill Farm Forest Park to a greater extent. The area west of Pipe Line Hill is the most heavily used part of the park and includes the education centre, park headquarters picnic areas and horse-riding.

4.16 A western corridor would also have greater visual effects on houses in the Paekakariki Hill Road area, and from the Pauatahanui Golf Clubhouse.

Eastern Corridor

4.17 A corridor on the hills east of Transmission Gully was discounted because of the likelihood of high level effects. Such a corridor would likely be more visually prominent compared with the existing valley corridor, and would require clearance of bush and construction of access tracks up steep spurs which in many instances are bush clad.

4.18 An eastern corridor in the Flightys Road area would be more elevated and would bi-sect an area of rural-residential properties.

4.19 In summary the existing 'corridor' along the valley was the preferred option in landscape terms.

Wainui Saddle Bypass Options

4.20 Although the existing corridor was preferred as a whole, bypass options were looked at in more detail at Wainui Saddle because of the significant space constraints at that location.

4.21 An alignment through the Saddle parallel to and adjacent to the highway was ruled out because it could not be constructed until after the NZTA's road project has been constructed, and thus a bypass option to allow this to occur would need to be constructed first to maintain electricity supply to Kapiti District. At this stage there is no certainty as to whether a suitable route through the Saddle could be found once the road has been constructed. Irrespective, the bypass option would need to be constructed to a permanent standard because of the importance of the line and the need to ensure electricity supply to the Kapiti is able to be maintained.

4.22 This alignment would also have significant effects on the amenity of the new road because of its proximity to the carriageway, and the elevation difference which would result in cross-arms and conductors at eyelevel with the road. The adverse effects would be compounded by the fact the saddle will be a memorable landmark on the highway.

Eastern Bypass

4.23 A potential eastern by-pass option was mapped. While the towers and conductors by themselves would have relatively low visual effects (because the alignment does not cross the highway, it has a reasonably fluid alignment that avoids abrupt horizontal and vertical alignments, it would be less visible from the coastal plain to the north compared with the western bypass option, and the line would be seen from most angles against a backdrop of vegetation which would reduce their prominence) the alignment would require clearance of native vegetation to provide for access tracks and foundation platforms, and might require further removal beneath the conductor spans (lines) to maintain sufficient clearance. The tracks required to access the platforms would have both visual and biophysical effects.

Western Bypass

4.24 A potential western by-pass by comparison would have greater visual effects because the hills west of the saddle are more visible from areas on the coastal plain, the line will be more visible against a pasture backdrop (compared with a bush backdrop), there is potential for towers to be on the skyline, the bypass introduces significant angles in the line, and the line will cross the road twice.

4.25 However the western hills are in pasture so that there will be no effects on native vegetation, and there are existing access tracks associated with the gas line maintenance

road on the main ridge which would reduce the need for earthworks. Taking these things into account, on balance the western bypass was preferred in overall landscape terms.

- 4.26 The visual effects will also be reduced by minimising the length of the western by-pass. Towers north of a prominent spur adjacent to tower 4 would have been very prominent and would be inappropriate in terms of the Outstanding Natural Landscape. In general the further south the by-pass is commenced the less prominent the line will be from the coastal plain. The preferred alignment limits the by-pass to four spans (three towers), and uses three saddles on tributary spurs above Wainui Saddle for tower locations. While Towers 9 and 10 will be visible on the skyline from some places on the coastal plain, the visual effects will be low for the following reasons:
- i) The towers are in relatively recessive location on spurs below the main ridge.
 - ii) The towers will be distant to views from the coastal plain.
 - iii) The towers will be in the background. Intervening middle-ground spurs will increase the perspective depth.

5 LANDSCAPE AND VISUAL EFFECTS

Analysis of Line Sections

- 5.1 The following assessment is based on the indicative tower locations and heights described in the AEE. It is acknowledged that a 20m flexibility is proposed around each indicative tower location. Recommendations are made to limit such flexibility in those instances where it might result in a significant increase in adverse landscape effects.

Towers 1-4

- 5.2 The changes to the existing line in this area will be small:
- i) Tower 1 will remain in the same location, with some likely strengthening;
 - ii) Tower 2A will be relocated approximately 20m to the west resulting in a small increase to the existing angle, and a heavier strain tower. The new tower will be 33m high: 9.6m higher than the existing tower;
 - iii) Tower 3A will be shifted approx 20m to the north and 5m to the east of the existing tower. There will be a 2.3m increase in tower height (33m proposed vs 23.4m existing);

iv) Tower 4 will remain in the same location, with some likely strengthening.

5.3 Any effects on the **existing environment** of changes to this section of the line will be minor.

5.4 The line will however be prominent from the proposed new highway. The most prominent element in this section will be tower 2A which is in the centre of a 'viewshaft' on the outside of a bend, is associated with a crossing of the line over the road, and is at a strategic location where views in a northbound direction will begin to open up to the coastal plain.

Towers 5-15A

5.5 The most significant change to the existing alignment will be through the Wainui Saddle area, where three strain towers (9A, 10A, 11A) will be relocated to spurs above the saddle, and heavier angle towers will be required for towers 8A and 12A. As discussed above the deviation is required because of the space constraints within the saddle imposed by the saddle's narrowness and steep sides, and the native bush on the eastern slopes.

- i) Towers 5, 6 and 7 will remain in the same location with some likely strengthening of the latter;
- ii) Tower 8A will be replaced with a 30m high (5.2m increase) heavy angle (strain) tower relocated approx. 15m to the east and 12m higher on the eastern side of the valley than the current tower.
- iii) The line will take a sharp angle at this location, will cross the road, and will be strung above a tributary gully to Tower 9A on a spur 120m above the road. The base of Tower 9A will be approximately 70m below the western ridge. The top of the tower will be approximately 40m below the ridge;
- iv) Tower 10A will on a spur approximately 145m above the road and 30m below the western ridge. A photomontage from Queen Elizabeth Park has been prepared and attached as **Viewpoint 14** (pages LA103 to LA106) of the Volume 4 Plan Set. Parts of Tower 9A and 10A will 'cut' the skyline when viewed from parts of the coastal plain to the north, although they will be distant in such views. Towers south of 10A will not be visible from the north. Conversely, towers north of 10A will not be visible from the south;

- v) Tower 11A will be on a spur south of Wainui Saddle. The base of the Tower will be 80m above the proposed road and 70m lower than the main western ridge. The top of the tower will be 40m below the ridge;
- vi) Tower 12A at the opposite end of the deviation will also be relocated approx. 35m to the east and 20m higher on the eastern side the valley, replaced with a heavy angle (strain) tower, and the line will take a sharp angle across the road and climb to Tower 11A.
- vii) Towers 13A, 14A and 15A will all move to the south of their current location in the order of 50-60m. Although they will be placed higher than their current location on the eastern hill slopes, they will remain at a lower elevation than the road which will be benched on the western side of the valley.

5.6 Within its immediate environs the Wainui Saddle deviation will be more obtrusive than the existing alignment. It will be higher on the hills, will contain sharp horizontal and vertical angles, and two of the towers (9A & 10A) will be visible on the skyline from parts of the coastal plain in Kapiti Coast District. However the potential effects will be reduced for the following reasons:

- i) The towers visible will be a long way inland from the coastal plain, for instance greater than 4km from Queen Elizabeth Park / MacKays Crossing area. Lattice towers tend to fade in prominence relatively quickly at such a distance.
- ii) The landscape effects of earthworks will be limited because access will be provided by the existing gas pipeline road along the main ridge. Tracks will be constructed down spurs from the main ridge, in some places following existing farm tracks. No clearance of native vegetation will be required.
- iii) Apart from towers in the by-pass deviation, the remainder of this section will mostly have a backdrop of hills.

5.7 The deviation will be relatively prominent from the new highway, in particular the angles at towers 8A and 12A, and towers 9A and 11A which will be sky-lined on spurs above the road. (Tower 10A will be less visible from the road).

Towers 16A – 25A

5.8 There will be small to moderate changes to this section of the line. Six of the nine towers (16A, 17A, 18A, 22A, 24A and 25A) will be replaced and shifted to the east - in

most cases providing greater separation from the highway. Towers 19, 20 and 21 will remain on the existing alignment. Tower 23 will be removed. Each tower is discussed below:

- i) Tower 16A will be a new 32m strain tower (14.7m increase) located approx. 60m to the south and approx. 10m below existing tower 16;
- ii) Tower 17A will be a new 36m suspension tower (17.3m increase) located 40m east of the existing line and 25m below existing tower 17;
- iii) Tower 18A will be 5-10m to the east of the existing tower, and will replace the existing suspension tower with a 30m angle (strain) tower (12.4m increase). The line is angled at this location to maintain separation between the highway and the new line. It will also be some 25m below existing tower 18.
- iv) Towers 19, 20 and 21 will remain in the same location and will be approx. 5m below the road, with some strengthening likely for towers 19 and 21. A small angle in the line will be introduced at tower 21 to maintain separation between the highway and the new line to the south.
- v) Tower 22A will be a 35m strain tower (6.8m increase) and some 5m higher and 25m to the east of the existing alignment.
- vi) Tower 24A will be a 33m strain tower (11m increase) located on a spur some 40m higher on the toe slope than the existing tower and 100m east of the existing alignment. The location is within the edge of a pine plantation in contrast to other towers in this section which are in pasture.
- vii) Tower 25A will be a 39m suspension tower (14.3m increase) located some 70m east of the existing alignment and approx. 5m higher on the slope, adjacent to the edge of the pine plantation.

5.9 The proposed changes will have a minor adverse effect on the **existing environment** compared with the present line. A number of towers are proposed to be relocated to higher land and on the hill toe slopes. Some towers will be taller (between 6.8 and 17.3m) and will be 'heavier' (larger steel lattice components) than existing towers along this part of the project, and some further earthworks will be required to create access and tower platforms. However the majority of changes in alignment are reasonably small, there will be one less tower (Tower 23), and the proposed alignment is fairly linear.

- 5.10 The most significant change is Tower 24A which will be relocated some 100m to the east in order to avoid crossing the new highway, and will be located on a locally prominent spur above a 30m side cut of the proposed road. This location is visible from Gas Line Ridge in Battle Hill Farm Forest Park as illustrated in **Viewpoint 2A** (Page LA29 to LA34).
- 5.11 Additional earthworks will be required to provide a building platform for tower 24A and additional vegetation clearance⁵ will also be required. These factors will increase the overall visual prominence of the tower and result in moderate visual effects. Mitigation planting is proposed for areas adjacent to the tower (whilst providing for required line clearance) and the earthworks guidelines attached as **Appendix 5A.C** will need to be closely considered during design detail phases to ensure visual effects remain acceptable.
- 5.12 The line will be prominent from the proposed new highway. Mitigating factors include the line being viewed mainly be against a backdrop of hills, and the realignment which means that road crossings are avoided and that there will be at least a small separation distance between the road and transmission line.

Towers 26A – 33A

- 5.13 There will be little change to most of this section of line which traverses the southern end of Battle Hill Farm Forest Park, with the exception of the realignment between towers 31A – 33A.
- i) Tower 26A will remain on the valley floor, but approx 100m north and 40m east of the existing alignment. It will be a 40m suspension tower (11.8m increase in height).
 - ii) Towers 27, 28, 29 and 30 will remain in the same locations with likely strengthening of towers 27 and 30 required.
 - iii) Tower 31A will move 20m to the east of existing tower 31 on a low spur. It will be 14m taller than existing tower 31 and the highway will cut through the ridge on the 'inland' side so that the tower will now be located on a small hillock but at a similar elevation to its current location.
 - iv) Tower 32A will be shifted approximately 80m to the east and 20m higher on the west-facing hill slope. It will be 6.7m taller than the existing tower 32; it will be an

⁵ Established pine trees and regenerating native scrub

angle (strain) tower; and it will support large spans (approximately 350m - 400m) to the north and south. The tower will be located on the edge of the existing pine plantation and grassed hill face. The existing pine plantation in the vicinity of the line will be cleared to provide access, tower platform and conductor clearance.

- v) Tower 33A will be on the opposite side of the highway from Tower 32A. The existing tower will be replaced with a heavier angle strain tower to connect the deviation to the existing alignment (tower 34) some 490m to the south. There will be a 2m decrease in tower height.

- 5.14 The proposed changes will have minor adverse effects on the **existing environment** compared with the present line
- 5.15 Towers 31A-33A will have moderate adverse visual effects from a small number of properties and dwellings west of the line (properties accessed off Paekakariki Hill Road).
- 5.16 Although this is a relatively short section of the alignment, tower 32A will be higher on the hill slope, towers 32A and 33A will be heavier strain towers, the line will have an angle compared with the existing straight alignment, and existing vegetation (pine trees) will need to be removed to allow for line clearance. However, the potential visual impact of these factors will be reduced by the fact the line will have a significant hill backdrop, and it will be a little further away from the nearest houses compared to the present situation. Proposed mitigation planting is also proposed.
- 5.17 The housing inventory attached as **Appendix 5D** to the Transmission Gully Project LVA, includes appraisal of the effects on these properties. Note that the assessment of changes to the existing transmission line is separate from the effects of the proposed highway works.
- 5.18 The most prominent element will be tower 31A which will be elevated on what will become a small knoll above the highway cutting. Recommended measures to mitigate the appearance of the tower for existing property owners and road users (particularly south-bound) include:
 - i) Integrating the edge of the platform to tie in with the adjacent road cutting;
 - ii) Tying the remaining platform edges into the natural landform; and
 - iii) Plant the north-west and south-west slopes of the knoll to reduce the tower's prominence.

5.19 Tower 32A and 33A will be prominent above side-cuts into the toe of spurs, and there will be parallel views along the line south of tower 33A. Recommended mitigation include:

- i) Planting north of Tower 33A to intercept views along the line (addressed by mitigation planting required for the proposed road);
- ii) Planting on the gully slope to reduce the prominence of Tower 32A. The location and extent of this mitigation planting is illustrated on Plan LA09, Volume 4 of the Transmission Gully Project AEE.

Towers 34 – 42A

5.20 There will be relatively small changes to this section of line:

- i) Towers 34-39 will remain in the same locations with likely strengthening of towers 34 and 39.
- ii) Tower 40A will be relocated 28m to the north of the existing alignment. Tower height will increase by 15.3m and the base of the tower will be between 5-10m higher than the existing tower.
- iii) Tower 41A will be relocated 70m to the west of the existing alignment. The tower will increase by 14.3m and the base of the tower will be approximately 15m lower than the existing tower.
- iv) Tower 42A will be relocated 110m to the north-west of the existing alignment. Tower height will increase by 19.8m but the base of the tower will be approximately 10-15m lower than the existing tower.

5.21 This section will be relatively straight and parallel to the highway. It will be aligned close to the edge of the existing pine plantation and some perimeter pines will need to be removed to provide for line clearance between Towers 42A, 43A and 44.

5.22 Any effects on the **existing environment** of changes to this section of the line will be minor. The changes in alignment are small and significant earthworks required for access and tower platforms and vegetation clearance are unlikely given the gently rolling terrain.

5.23 Any adverse visual effects from houses will generally be very low:

- i) The line will be moved further from the nearest houses.

- ii) Although towers increase in height, the tower bases will be at a lower elevation and behind intervening landform.
- iii) The new alignment will be closer to the backdrop hill and pine plantation.
- iv) The line crosses easy rolling terrain mostly in pasture so that the adverse visual effects of earthworks should be minor.
- v) Although Tower 40A will be directly adjacent to an area of native vegetation that was introduced as ecological mitigation as part of the previous Transmission Gully designation process, any clearance of this vegetation will be minimal (see Technical Report 11A).

5.24 For the majority of houses located on Flightys Road, that have views of the existing towers the proposed realignment will have positive effects. The exception being two houses located to the east of proposed tower 40A⁶ where the increase elevation and tower height combine to ensure the top 1/3 of the proposed tower will 'cut' the skyline⁷ – resulting in moderate visual effects.

5.25 The line will be visible from the proposed highway. However views will be restricted by the succession of box cuts, and the line will be seen against a back-drop of rising land that is currently in pine plantation.

Towers 43A – 49A

5.26 There will be only small changes to this section of line.

- i) Tower 43A will increase in height 11.3m (21.7m to 33m) and be relocated west of the existing alignment. This section will be straight and parallel to the highway. It will be aligned close to the edge of the existing pine plantation and some clearance of pines will be required between towers 42A – 44.
- ii) Tower 44 will be in the same location, but will be strengthened.
- iii) Towers 45, 46, 47, 48 and 49A & B will remain in the same locations with no changes to the towers likely.

5.27 Any adverse visual effects on the existing environment resulting from changes to this section of the line will be negligible. The only changes in alignment are between towers 43A and 44. The changes will be small and the line will be moved a little further from

⁶ 247c and 317 Flightys Road.

⁷ The current tower does not 'cut' the skyline.

the nearest houses closer to the backdrop hill and pine plantation. Some minor clearance will be required on the edge of the pine plantation. Otherwise the line will remain in its current configuration.

- 5.28 The line will be visible from the proposed highway. However, views will be restricted by the succession of box cuts, and the line will be seen against a back-drop of rising land that is currently in pine plantation.

Outstanding Natural Landscapes

- 5.29 Te Puka valley and the hills on either side are mapped in the Kapiti Coast District Plan as part of “the foothills of the Tararua Ranges” which is classified as an ‘outstanding natural landscape’ (ONL)⁸. Therefore, consideration also needs to be given to whether the changes to the transmission line are ‘appropriate’ in terms of s6(b) of the RMA.
- 5.30 The District Plan does not outline the reasons for the area being classified as an ONL. In the absence of such information, Technical Report 5: Landscape and Visual Assessment (paragraph 8.1.145) assessed the main value of the hills as their boldness and sharp escarpment backdrop to the coastal plains. Contributing values include the expressiveness of the Ohariu Fault, historical and tangata whenua values associated with the toe of the hills in the Whareroa /MacKays Crossing area, and the natural science values of the bush and streams.
- 5.31 While the deviation between towers 8A – 12A at Wainui Saddle will have some adverse landscape effects on part of the ONL, it is considered ‘appropriate’ for the following reasons:
- i) The ONL is already traversed by the existing line.
 - ii) The deviation was designed to minimise environmental effects and was selected as the best of several options.
 - iii) The landscape and visual effects will be relatively modest in degree: **Viewpoint 14** (LA103 to LA106) illustrates that the deviation will have low prominence from the coastal plains primarily due to distance inland and location on the shoulders of spurs below the main ridge. Effects of earthworks for access and platforms will be relatively minor because access will be provided by the exiting gas line access road on the ridge.

⁸ The location of proposed towers within the KCDC ONL area are illustrated in Appendix 5A.D.

Earthworks - access tracks and foundations

5.32 Consents are not being sought at this time for earthworks and the related creation of access tracks and foundations. However these aspects of the proposal have been considered as part of the landscape and visual assessment, and where appropriate are discussed above. The assessment in this regard does rely on the use of best practice principles being used during the design of earthworks which can be reasonably anticipated and are attached as **Appendix 5A.C**.

6 MONITORING AND MITIGATION

Measures to avoid, remedy and mitigate adverse effects

6.1 The design sought to avoid adverse effects through the refinement of the alignment and tower locations during the design process. That process included the application of best practice principles, site visits, workshops, and consideration of different alignment options outlined above.

6.2 The following additional measures are recommended to remedy and mitigate adverse effects:

- i) Best practice principles should be adopted for earthworks for access tracks and tower platforms. Suggested principles are attached as **Appendix 5A.C** below.
- ii) Towers should be part of a consistent design 'family' and should be broadly similar in appearance to the current towers.
- iii) The location of tower 40A should not increase in elevation to the location shown and removal of existing adjacent ecological mitigation planting shall be avoided.
- iv) Earthworks associated with tower 31A should tie in with adjacent earthworks required for the road. Particular attention should be shown to rounding the edges of cut faces and avoiding sharp geometric edges. Finished surface profile should be consistent with the nature of adjacent landforms and should reflect the surrounding rolling pastoral hill country. The desired outcome is to avoid tower 31A being located high on the crest of a prominent, geometrically shaped 'knob' located directly adjacent to the proposed road – thus increasing overall prominence of the tower to road users and adjacent rural lifestyle properties.

- v) Mitigation planting in proximity to towers 24A, 31A and 32A (as shown on Landscape Plans LA07, LA08 and LA09) shall be implemented to reduce potential adverse visual effects to an acceptable level. A landscape plan should be prepared that includes a planting plan and is designed so as to:
- intercept parallel views along the line;
 - partially screen towers or to increase the visual separation between the line and road; and
 - 'bed' the towers into the landscape and reduce visual prominence.

6.3 Monitoring requirements for mitigation planting should be consistent with those required under the consent conditions proposed as part of the NZTA Transmission Gully Project NOR application. Of particular relevance are those conditions requiring the preparation of Site Specific Environmental Management Plans and a Landscape Management Plan.

APPENDIX 5A.A: TOWER LOCATIONS, HEIGHTS AND TYPES

Existing tower	Proposed tower	Existing/ proposed	Strength ening	Existing		Proposed		Type	Span (m)	Existing height (m)	Proposed Height (m)	Height difference (m)
				Northing (m)	Easting (m)	Northing (m)	Easting (m)					
1	-	Existing	Yes	5461376	1765624			Strain	308	17.3	No change	-
2	2A	Proposed		5461117	1765471	5461122	1765451	Strain	361	23.4	33.0	9.6
3	3A	Proposed		5460749	1765416	5460764	1765405	Strain	440	30.7	33.0	2.3
4	-	Existing	Yes	5460327	1765353			Suspension	421	41.5	No change	-
5	-	Existing		5459909	1765300			Suspension	273	31.3	No change	-
6	-	Existing		5459638	1765266			Suspension	337	24.2	No change	-
7	-	Existing	Yes	5459304	1765223			Strain	252	17.5	No change	-
8	8A	Proposed		5459058	1765145	5459057	1765172	Strain	381	24.8	30.0	5.2
9	9A	Proposed		5458709	1765030	5458899	1764826	Strain	239	28.8	30.0	1.2
10	10A	Proposed		5458518	1764925	5458714	1764675	Strain	280	28.0	30.0	2.0
11	11A	Proposed		5458294	1764805	5458436	1764713	Strain	401	28.8	30.0	1.2
12	12A	Proposed		5458142	1764748	5458038	1764762	Strain	234	15.7	32.0	16.3
13	13A	Proposed		5457906	1764660	5457817	1764687	Strain	355	23.5	32.0	8.5
14	14A	Proposed		5457575	1764615	5457466	1764633	Suspension	349	21.9	36.0	14.1
15	15A	Proposed		5457260	1764571	5457121	1764580	Suspension	319	28.0	36.0	8.0
16	16A	Proposed		5456923	1764525	5456807	1764528	Strain	229	17.3	32.0	14.7
17	17A	Proposed		5456694	1764449	5456590	1764455	Suspension	253	18.7	36.0	17.3
18	18A	Proposed		5456488	1764380	5456350	1764374	Strain	307	17.6	30.0	12.4
19	-	Existing	Yes	5456049	1764316			Suspension	387	28.2	No change	-
20	-	Existing		5455666	1764260			Suspension	213	28.2	No change	-
21	-	Existing	Yes	5455455	1764229			Suspension	405	18.6	No change	-
22	22A	Proposed		5455113	1764178	5455051	1764195	Strain	503	28.2	35.0	6.8
23	-	Removed		5454783	1764131					24.8	Removed	-

24	24A	Proposed		5454478	1764087	5454548	1764211	Strain	324	22.0	33.0	11.0
25	25A	Proposed		5454158	1764040	5454234	1764131	Suspension	314	24.7	39.0	14.3
26	26A	Proposed		5453834	1763993	5453929	1764056	Suspension	445	28.2	40.0	11.8
27	-	Existing	Yes	5453498	1763943			Strain	367	23.5	No change	-
28	-	Existing		5453164	1763794			Suspension	280	28.1	No change	-
29	-	Existing		5452909	1763678			Suspension	387	22.0	No change	-
30	-	Existing	Yes	5452555	1763521			Suspension	369	28.1	No change	-
31	31A	Proposed		5452218	1763370	5452213	1763384	Strain	399	16.0	30.0	14.0
32	32A	Proposed		5451893	1763216	5451828	1763278	Strain	347	23.3	30.0	6.7
33	33A	Proposed		5451516	1763106	5451525	1763109	Strain	490	31.0	29.0	-2.0
34	-	Existing	Yes	5451045	1762969			Suspension	197	21.9	No change	-
35	-	Existing		5450856	1762915			Suspension	267	15.8	No change	-
36	-	Existing		5450600	1762842			Suspension	344	16.2	No change	-
37	-	Existing		5450269	1762748			Suspension	355	28.0	No change	-
38	-	Existing		5449927	1762650			Suspension	290	21.9	No change	-
39	-	Existing	Yes	5449651	1762561			Suspension	270	21.8	No change	
40	40A	Proposed		5449368	1762479	5449396	1762474	Strain	317	15.7	31.0	15.3
41	41A	Proposed		5449067	1762392	5449113	1762328	Strain	224	15.7	30.0	14.3
42	42A	Proposed		5448798	1762311	5448900	1762259	Suspension	400	17.2	37.0	19.8
43	43A	Proposed		5448514	1762166	5448518	1762140	Strain	469	21.7	33.0	11.3
44	-	Existing	Yes			5448089	1761949	Strain	291	21.9	No change	
45	-	Existing				5447829	1761820	Suspension	323	27.7	No change	
46	-	Existing				5447540	1761675	Strain	299	17.1	No change	
47	-	Existing				5447416	1761404	Suspension	199	18.4	No change	
48	-	Existing				5447336	1761221	Suspension	130	15.7	No change	
49	-	Existing				5447325	1761099	Strain	25	18.5	No change	
49a	-	Existing				5447256	1761118	Strain	21	16.5	No change	

Note: Information contained in table was sourced from spreadsheets provided by Transpower via BECA.

LANDSCAPE PRINCIPLES FOR RECONFIGURATION OF EXISTING 110KV LINE⁹

The following landscape principles are proposed for the 110kV line. These are tailored to the Transmission Gully project from principles developed for the North Island Grid Upgrade Project (NIGUP) and the 'Holford Rules' (attached):

- i) Use straight alignments as much as possible.
- ii) Avoid doglegs in the alignment.
- iii) Use small angles where change in direction is necessary in order to avoid abrupt angles and to reduce the need for heavy angle towers. (It may be better to split large angles between consecutive towers to avoid abrupt angles).
- iv) Locate angle towers in unobtrusive locations to reduce the prominence of the change in angle.
- v) Fine-tune individual tower locations to maximise set-back from road and to avoid locating towers in the centre of view-shafts along the road.
- vi) Maintain consistency in tower design type (i.e. lattice tower or monopoles)
- vii) Maintain reasonable consistency in tower height and spacing (more applicable over flatter parts of the route rather than hilly country).
- viii) Minimise the number of times the road is crossed.
- ix) Where road crossing is necessary, traverse roads as near to right angles as possible, with maximum set-back of towers from road.
- x) Maximise distance separation between line and road.
- xi) Make use of topography to increase the extent to which towers are seen against a land backdrop ('back-clothed') and to reduce extent to which towers are seen against the sky.
- xii) Avoid clearance of significant vegetation.
- xiii) Locate tower platforms in a way that avoids the need for large cut batters.

The Principles should be applied 'in the round' in order to balance competing demands.

⁹ These principles were tabled at the constraints workshop on the 26th November 2010.

APPENDIX 5A.C: BEST PRACTICE EARTHWORKS DESIGN PRINCIPLES FOR TRANSMISSION TOWER ACCESS TRACKS AND FOUNDATION PADS

Existing Landscape

Align access tracks to follow the easiest terrain to minimise the size of cut batters,

Align access tracks to minimise visibility by avoiding steep hill faces and skyline ridges where possible.

Utilise existing access tracks where possible, including farm access tracks, construction tracks associated with the proposed highway, and the existing pipeline access.

Avoid encroaching where possible on specific features including the following:

- i) Prominent hill slopes and skylines;
- ii) Area of native vegetation;
- iii) Watercourses.

The tower locations have been assessed allowing for some tolerance. Within this tolerance, the precise location of tower platforms shall seek to avoid and provide sufficient separation from local topographic features such as knolls, escarpment edges and prominent ridges. Such avoidance will increase the figure-ground separation between the transmission line and the underlying landscape.

Track Cross Section

Design construction and maintenance access tracks/ road to the smallest possible width to reduce earthworks footprint and need for local spoil disposal. Note: this is less critical on relatively flat surfaces such as those found within Battle Hill Farm Forest Park, and is more critical on steep topography with narrow ridges.

Batters over 5m should be avoided where possible. Any batters over 5m should be designed with input of a landscape architect, so that adverse effects are minimised as detailed below.

Cut and Fill Batters

In rolling terrain cut batters should be formed at a grade that will support topsoil and re-grassing. However in steeper terrain it is preferable to form steeper batters to avoid chasing the underlying hill slope.

Rehabilitate cut batters:

- i) Round-off top edges to prevent edge frittering and also to soften skyline edges of batters,
- ii) Feather ends of batters into adjacent slopes,
- iii) Re-topsoil and re-grass where batter slope can carry topsoil, in order to match adjacent areas of pasture.
- iv) Scarify cut faces and use hydroseed or hydromoss where batters are too steep for topsoiling.

The dimensions of fill batters are often less critical than those for cut batters because they are formed at shallower grades (e.g. 1V:2H) and are easier to re-grass or re-plant, but may in some instances be critical where the footprints encroach into streams or vegetation. Special engineering may be appropriate in such instances to avoid encroaching into vegetation or streams.

Where crossing watercourses (including ephemeral streams) is unavoidable, use 'fish friendly' culverts in accordance with recommendations of the ecologist. Minimise culvert length by adopting steeper fill batter slopes and reducing embankment height. Avoid perched culverts.

Transmission Tower Pads

Contour the side-cast material around tower pads to marry into the natural terrain to reduce visibility of un-natural flat spots.

Restore tower pads to a grass surface following construction by re-spreading topsoil and re-grassing. This helps ensure that the continuity of the underlying land surface.

Spoil Disposal

Locate spoil disposal adjacent to areas of works where practicable.

Side-cast material should be contoured on the outside of access tracks to reduce visibility of tracks and to reduce the extent to which such tracks are 'sky-lined'.

Where more extensive spoil disposal is required it may be preferable to extend fill batters to marry with adjacent slopes. Otherwise preference should be given to sites on gently sloping areas near ridges or valley heads. Avoid disposal sites in watercourses, deep gullies, or areas with natural vegetation.

Topsoil

Topsoil shall be stored in such a way to maintain the soil's structure and biological activity. Stockpiles should be shallow, compaction by machinery should be avoided, and the surface stabilised with straw mulch or temporary grass cover. Minimise the time topsoil is stockpiled.

