Appendix N

Options Report

OPTIONS REPORT

HAI-MTM-A AND B TRANSMISSION LINE ALTERATIONS, RANGATAUA BAY, TAURANGA

Transpower New Zealand Limited
July 2017

Keeping the energy flowing

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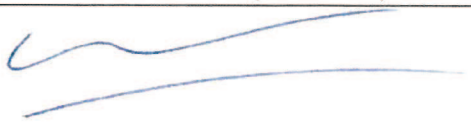
Signature	
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Glossary and Abbreviations

Blowout	The extent to which conductors swing in high wind conditions.
Cable	One or more insulated conductors forming a transmission circuit above or below the ground.
Circuit	Conductors on a transmission line that together form a single electrical connection between two or more system nodes
Conductor	A wire or cable used for carrying electric current along a transmission line; and includes any hardware and insulation associated with the wire or cable
CMA	Coastal Marine Area
HAI-MTM-A	Hairini-Mount Maunganui-A 110kV Transmission Line
HAI-MTM-B	Hairini-Mount Maunganui-B 110kV Transmission Line
HNZPT	Heritage New Zealand Pouhere Taonga
kV	Kilo Volts
Line	A series of structures carrying overhead one or more transmission circuits. Has the same meaning as *Transmission Line*
Monopole	A tubular steel pole that holds conductors clear of the ground. These are generally used as an alternative to Towers
NESETA	Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009
NZTA	New Zealand Transport Agency
Poles or Towers	Pole and Towers are support structures that have cross arms to hold the conductors clear of the ground. Towers are referred to sometimes as pylons.
RMA	Resource Management Act 1991
Substation	A building, structure or enclosure incorporating equipment used principally for the control of the transmission or distribution of electricity
Termination Structure	A steel pole structure used to enable overhead conductors to be transitioned to underground cables
Transmission Line	A series of structures carrying overhead one or more transmission circuits

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Executive Summary

The objectives of this project are to relocate the HAI-MTM-A 110kV transmission line to:

- enable Transpower to provide for the long-term security of electricity supply into Mount Maunganui;
- remove an existing constraint from an important cultural and social facility for the Maungatapu community; and
- honour a longstanding undertaking to the community/iwi dating back to mid-90's when the HAI-MTM-B transmission line was constructed.

On the Maungatapu side, there are two existing support structures located on the recreational sports fields owned by Ngāti Hē which are approaching or at replacement criteria, and one of these support structures (Pole A117) has required temporary measures involving support guy wires and anchor blocks on the foreshore below the cliff to be implemented, as the structure is at significant risk from coastal erosion as the cliff continues to erode. Ngāti Hē are opposed to replacement of these structures on their land. On the Matapihi side, the line crosses a number of horticultural blocks owned by Ngāi Tūkairangi trustees.

Feasible options to address the project objectives involve partially relocating the HAI-MTM-A overhead circuit onto or adjacent to the existing HAI-MTM-B transmission line support structures located along State Highway 29A. The structures on the HAI-MTM-B line were originally designed to accommodate an additional transmission circuit, although more recent engineering analysis shows that some pole upgrades and additional poles will still be required. On the Maungatapu side of Rangataua Bay, this will enable the removal of the HAI-MTM-A line from both the Ngāti Hē land and adjacent residential areas back to State Highway 29 where the two transmission lines currently come together and then diverge at a single support pole structure. On the Matapihi side of Rangataua Bay, a significant length of the HAI-MTM-A line can similarly be either removed from horticultural land or at least moved to the periphery of this land, by relocating this onto HAI-MTM-B transmission line support structures also located along State Highway 29A, or in one location a parallel set of poles immediately adjacent.

The methods for crossing Rangataua Bay have varying engineering, cost, health and safety, security of supply and environmental implications. A range of options have been considered including bridge or seabed cable options, and aerial line crossings. The seabed and bridge cable options assessed were all rejected by Transpower for various reasons including unacceptable costs, programming issues, health and safety effects and access and maintenance considerations. The cable options on the existing bridge and seabed have estimated costs of up to 20 times that of aerial crossing options.

Based on the high-level assessments undertaken on the 'long list' of options, two aerial crossing options were shortlisted for further assessment, and a preferred option has

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been identified to progress to the resource consent phase. The preferred option includes a single span crossing of Rangataua Bay with the construction of a new monopole support structure on either side of the waterway, and removal of the existing tower from Rangataua Bay. This preferred option was confirmed following key stakeholder and community consultation.

1 Project Description and Need

1.1 Background

The Hairini-Mount Maunganui-A (HAI-MTM-A) 110kV transmission line was built in 1958. This line starts at the Kaitimako Substation (formally known as Hairini Substation) on Kaitimako Road, and terminates at the Mount Manganui Substation located at Matapihi Road. Part of the HAI-MTM-A line crosses residential and recreational areas on the Maungatapu Peninsula, including the sports field on Ngāti Hē land at the end of the peninsula before crossing Rangataua Bay in Tauranga Harbour. On the northern (Matapihi) side of Rangataua Bay, the line crosses a series of horticultural blocks owned by Ngāi Tūkairangi Māori trustees before terminating at the Mount Maunganui Substation. Due to the length of span and size of support structures on either side of the waterway, the line is attached to a steel lattice tower in the Coastal Marine Area (CMA). This is known as Tower A118.

For a significant period of time Transpower has been in discussions with Ngāti Hē and Ngāi Tūkairangi concerning the HAI-MTM-A line crossing their land. Both hapū and the Māori trustees who own the land have a long-standing belief that there was an undertaking to remove the transmission line and any redundant structures from their land when the HAI-MTM-B line was constructed (discussed further below).

Treaty of Waitangi claims by Ngāti Hē and Ngāi Tūkairangi have cited the construction of the line over their lands as being in breach of the Crown's obligations under the Treaty. There are two existing support structures located on the recreational sports fields owned by Ngāti Hē at the end of the Maungatapu Peninsula which are approaching or at replacement criteria, and one of these support structures (Pole A117) has required temporary measures involving support guy wires and anchor blocks on the foreshore below the cliff to be implemented, as the structure is at significant risk from coastal erosion. The anchor blocks were installed as emergency works in 2005, and it took 9 years to obtain a retrospective resource consent due to Ngāti Hē's desire for the line to be removed from their land. A suitable replacement structure for Pole A117 would need to be located approximately 20m back from the cliff edge further into the Ngāti Hē site.

Ngāti Hē do not support the replacement of these structures on their land due to impacts on the utilisation of the sports fields and cultural concerns due to burial history on the site. Accordingly, in order to find a suitable long term solution that will enable replacement of the existing structures and suitable ongoing maintenance and access arrangements, Transpower has agreed to investigate options to potentially relocate the transmission line to avoid crossing this land.

In regard to the Ngāi Tūkairangi horticultural land on the Matapihi side of Rangataua Bay, the location of the line has raised some concerns from the land owners over impacts on their horticultural activities and in regard to attaining access for maintenance and repairs.

In 1995, Transpower constructed the HAI-MTM-B 110kV Transmission line. In the project area on both the Maungatapu and Matapihi sides (see Figure 1), this line is

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located on poles within the road reserve of State Highway 29A. There is a termination structure at either end of the State Highway 29A bridge, and from these structures the line is located underground as a cable for a short distance and is attached to the State Highway 29A bridge to cross Rangataua Bay. The support poles for the HAI-MTM-B line (predominantly in the road reserve) were specially designed and constructed to be able to support another circuit with potential future realignment of the HAI-MTM-A line in mind given the historic grievances of iwi as previously outlined[1]. However, the current bridge configuration is not specially designed to accommodate a further transmission line, and may need to be replaced at some point in the future.

The hapū and Māori trustees of Ngāti Hē and Ngāi Tūkairangi have expressed their concerns on an ongoing basis that the HAI-MTM-A transmission line has not been relocated off their land since the HAI-MTM-B transmission line was installed. The Tauranga Moana Iwi Management Plan 2016-2026, is a joint environmental plan representing the collective voice of Ngāti Ranginui, Ngāi Te Rangi and Ngāti Pūkenga. Ngāti Hē and Ngāi Tūkairangi are hapū affiliated to Ngāi Te Rangi. The Management Plan includes the following relevant policy and relevant specific action:

> *Policy 15: Manage the effects of coastal structures (including moorings and jetties) and infrastructure in Tauranga Moana.*
>
> *Action 15.2: Pylons are to be removed from Te Ariki Park and Opoopoti (Maungatapu) and rerouted along the main Maungatapu road and bridge.* [Lead Agency: Transpower]

Figure 1 below shows the current alignments of the HAI-MTM-A and HAI-MTM-B lines in the Maungatapu and Matapihi areas.

[1] More recent structural and blowout investigations have determined that a number of existing poles would require replacement and additional mid-span poles added to resolve structural and blowout issues associated with adding a second circuit.

Figure 1: Project Area

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1.2 Project Overview

The objectives of this project are to relocate the HAI-MTM-A 110kV transmission line to:

- enable Transpower to provide for the long-term security of electricity supply into Mount Maunganui;
- remove an existing constraint from an important cultural and social facility for the Maungatapu community; and
- honour a longstanding undertaking to the community/iwi dating back to mid-90's when the HAI-MTM-B transmission line was constructed.

The design of the HAI-MTM-B support structures to take a second circuit provides the opportunity to remove the line where it crosses a number of properties as previously outlined, although as noted later in this assessment, more recent engineering investigations have confirmed that upgrading of some of these existing structures and the addition of supplementary poles will still be required to suitably address structural and conductor blowout issues. The overall proposal concept is to realign the HAI-MTM-A line from the point where the two transmission lines currently converge in the State Highway 29A road reserve in Maungatapu at Pole B28, to Pole B48 on the Matapihi side, before continuing to the Mount Maunganui Substation via several new intermediate poles to Pole A128, and then continuing on the current HAI-MTM-A alignment. Pole B50 carrying the HAI-MTM B line is currently an anomaly located on the eastern side of SH29A, and can be relocated back to the same side as the balance of the HAI-MTM A and B transmission lines as part of this project.

While the HAI-MTM-A circuit would be relocated onto or adjacent to the support poles of the HAI-MTM-B for much of the project length[2], there are several potential options for crossing Rangataua Bay which have required analysis to confirm feasibility.

[2] Various sub-options, other than the waterway crossing solution, to relocate a new circuit onto the HAI-MTM B alignment have been considered

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2 Purpose of this Document

Transpower has considered a number of alternative solutions for achieving the project objectives, and has now shortlisted a preferred solution to take forward to the resource consent phase. This preferred option was confirmed following key stakeholder and community consultation.

In order to report on the work carried out on a 'long list' of options to realign the HAI-MTM A transmission line, the purpose of this document is:

- to describe the various alternatives that have been considered to date for this project;
- to outline which options have not been shortlisted for further consideration, and the reasons for this; and
- to assist with stakeholder engagement and community consultation.

As this project involves the realignment of an existing transmission line, it is subject to the Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009 (NESETA). The HAI-MTM-B transmission line poles installed in 1995 were originally designed to enable a second circuit to be installed with the expectation that the HAI-MTM-A transmission line would ultimately be relocated onto these poles.

As assessment of the alternatives considered will be required to support resource consent applications lodged for this project.

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3 High Level Overview of Consent Requirements

In general terms, relocation of an additional circuit onto the HAI-MTM-B line is a permitted activity under the NESTA given the poles were originally designed to accommodate a second circuit. These poles have a spare cross arm on the western side to which new insulators and conductors can be attached. However, as a number of existing poles will require upgrading/replacement, a resource consent may be required for the replacement poles as either a controlled or restricted discretionary activity, depending on the extent of any height increases and lateral shift that may be required.

Further, any additional poles required over and above replacement poles will require resource consent under the NESETA as a discretionary activity, although attaching the actual conductors to these poles where they cross Rangataua Bay is a permitted activity under the NESETA. Resource consent (regional council jurisdiction only) will be required in regard to any seabed disturbance associated with tower removal from the harbour and some earthworks on land including land that may be subject to contamination from historic and current horticultural spray activity.

An authority from HNZPT will be required in regard to land disturbance in the vicinity of listed archaeological sites at either side of the waterway, and potentially in other parts of the project area subject to the outcome of archaeological investigations.

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4 Summary of Options

4.1 Options Long List

As the objectives of this project require the realignment of part of an existing transmission line off a particular land holding, the feasible options are limited to those that generally run along the SH 29A State highway corridor. Accordingly, the Transpower ACRE Model (Area, Corridor, Route, Easement), developed for the North Island Grid Upgrade Project (NIGUP) where a new major transmission line was proposed from the central North Island to Auckland, was not considered to be appropriate in this instance[3].

Transpower has assessed a number of realignment options to resolve issues with the existing assets on and crossing Ngāti Hē land at Maungatapu. In general, these involve variants to a relocation of the HAI-MTM-A circuit onto the HAI-MTM-B transmission line support structures (noting that some upgrades to or supplementary structures would be required due to engineering requirements), with the main differences between the options relating to the method for crossing Rangataua Bay and the associated treatment at each shore end. One further option to underground solely within the Ngāti Hē land was also considered.

These options have been considered on an iterative basis over several years with inputs from the Transpower environmental team, feedback from ongoing iwi consultation (relevant hapū and Māori land owners at both sides of the waterway) and inputs from external visual/landscape, planning and engineering consultants. The shortlisted option for community consultation was confirmed following a Transpower workshop including engineering, environmental and community relations participants. Following key stakeholder consultation and community open days held in May 2017, the preferred option was confirmed to take forward to the resource consent phase.

A summary of the list of principle options considered is set out in Table 1 below.

Option Number	Option Description	Comments
1	Do Nothing	Poles A116 and A117 will still require replacement. Ongoing maintenance and access issues will remain. Does not resolve historic grievances with iwi.

[3] The ACRE model is designed for major lines projects where multiple corridor options can initially be considered within an overall project area, followed by alternative route options within a preferred corridor and finally a preferred route alignment for which an easement is sought.

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Option Number	Option Description	Comments
2	Underground cable between Poles A116 and A117 on Ngāti Hē land (sports field)	Would require two new cable termination structures to replace Poles A116 and A117. Ongoing maintenance and access issues will remain. Does not resolve historic grievances with iwi.
All remaining options below involve relocation of the circuit onto or adjacent to the HAI-MTM-B support poles between poles B28 and B48, and removal of redundant HAI-MTM-A line poles from Te Ariki Park, residential and horticultural land.		
3(a)	Aerial crossing of Rangataua Bay in a single span.	Requires two monopoles of approximately 34.7m on the Maungatapu side and 46.8m high on the Matapihi side, and removal of the existing Tower A118 from the CMA.
3(b)	Aerial crossing of Rangataua Bay utilising a strengthened or replacement Tower A118 in the CMA.	Requires one monopole of up to 40m high on the Maungatapu side of the harbour and a 12m to 17m high concrete pi-pole on the Matapihi side. Existing Tower A118 in the CMA is retained.
4(a)	Integrate a cable into a potential future replacement road bridge.	New cable termination structures required on either side in the order of 15m to 20m high. New bridge would need to be designed to accommodate an additional transmission cable.
4(b)	Cable across estuary on a new standalone footbridge or cable bridge	New cable termination structures required on either side in the order of 15m to 20m high. New bridge structure required.
4(c)	Cable across existing bridge – east side	New cable termination structures required on either side in the order of 15m to 20m high. Terminate on west side adjacent to Marae, but then cross to east side (opposite side to existing cable) as soon as practicable. Thrust bore under road required.

Option Number	Option Description	Comments
4(d)	Cable across existing bridge – west side.	New cable termination structures required on either side in the order of 15m to 20m high. Attach cable to same side as existing cable. No space in existing electricity duct.
5	Seabed cable	New cable termination structures required on either side in the order of 15m to 20m high. Cable thrust bored under the seabed.

Table 1: Summary of Options - Long List

4.2 Long List Options Discussion

This section summarises the main issues associated with the options set out in Table 1 above, and the reasons why several of the options have not been progressed further.

4.2.1 Option 1: Do Nothing

Do Nothing is the default option if the realignment options are either prohibitively expensive or resource consents are not obtained. Do nothing would not resolve existing access and maintenance issues associated with upgrading of poles A116 and A117, and would not be in line with the long-held expectations of Ngāti Hē, Ngāi Tūkairangi and Māori trustees for the ultimate relocation of the lines off their land. Significant benefits associated with removal of lines from residential areas would also not be realised.

4.2.2 Option 2: Underground Cable on Ngāti Hē land between poles A116 and A117

An option of undergrounding between existing poles A116 and A117 on the Ngāti Hē land was initially considered as an alternative lower cost option to a full realignment onto the HAI-MTM-B line. This would require two new termination structures to be installed, and installation of approximately 170m of underground cable around the edge of the current sports field. The line would then continue overhead via Tower A118 across the harbour.

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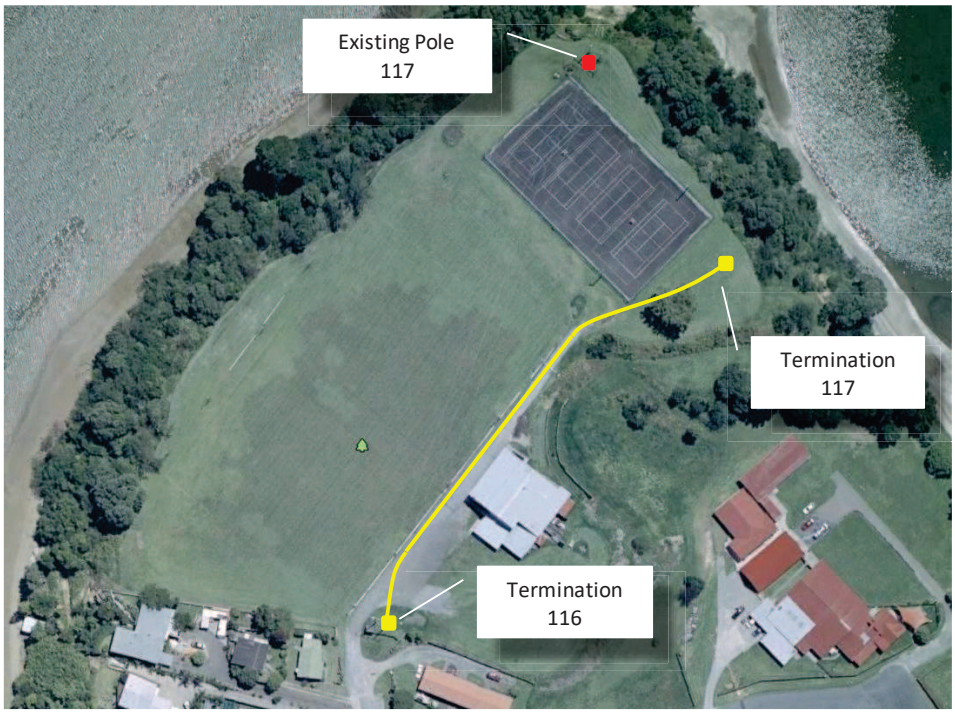

Figure 2: Underground between Poles A116 and A117

This option would not resolve the historic grievances of Ngāti Hē as the existing poles would need to be replaced by two new termination structures, and therefore not resolve ongoing maintenance and access issues. The termination structure to replace Pole A117 would need to be located further into the Ngāti Hē site away from cliff, impacting on Ngāti Hē's stated desire to be able to reorient the sports fields to have two instead of one. Excavations associated with cable undergrounding and new structures have issues given the previous burial history of the site. This option also does not have any of the wider benefits such as removal of overhead lines from the adjacent residential areas, or Ngāi Tūkairangi horticultural land on the Matapihi side.

The headland is identified in the District Plan as a Significant Māori Area (M41). The District Plan schedule identifies this as Te Ariki Pa/Maungatapu. Resource consent issues aside, this option would likely require an authority from Heritage New Zealand Pouhere Taonga (HNZPT) to modify an archaeological site. Such approval would require the support of Ngāti Hē and any other iwi groups with an interest in the pa.

4.2.3 Options 3(a) and 3(b): Realignment onto HAI-MTM-B line and aerial crossing of Rangataua Bay

These two options involve relocating the existing circuit onto or adjacent to the HAI-MTM-B line support poles between Poles B28 and B48, and a realigned crossing of Rangataua Bay either in a single span or via existing Tower A118 in the CMA. An aerial crossing is preferred by Transpower as it meets the objectives of the project of realigning the lines off Ngāti Hē and Ngāi Tūkairangi Māori land has broader benefits in terms of removing overhead lines from adjacent residential areas, may potentially

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allow for removal of the existing tower in the CMA (depending on which option is progressed), and have more acceptable costs compared to bridge and seabed crossing options[4].

While there are significant benefits for both of these options, they will also introduce large new structures at either side of Rangataua Bay which will have some adverse visual effects, particularly for the local viewing catchments. The issues associated with each of these aerial crossing options are discussed further in Section 4 below.

Whilst the area is identified as an Outstanding Feature and Landscape (ONFL) and Significant Cultural Value (ASCV) in the Proposed Bay of Plenty Regional Coastal Plan, as is identified as High Natural Character in the Regional Policy Statement, these options do not require any new structures to be located within the CMA, and if Option 3(a) is adopted enables the removal of the existing tower within the CMA.

4.2.4 Options 4(a) and 4(b): Cable on new bridge structures

Option 4(a) would involve integrating a cable into any future bridge replacement project undertaken by the New Zealand Transport Agency (NZTA). The NZTA advised Transpower that a full replacement of the bridge would likely occur sometime in the next 50 years, and if so at that point it would likely be replaced with a four-lane bridge. However, there is no project currently planned for a bridge replacement in the foreseeable future (30 years), and accordingly this option was not considered further.

A new footbridge or cable bridge separate to the road bridge was considered but was rejected on the basis it would be cost prohibitive (in the order of $7M to $13M for the cable cost and termination structures, and an additional $5M to $7.5M for a new bridge structure). There may also be environmental issues associated with constructing a new standalone bridge over Rangataua Bay, but these were not considered in any detail as this option was assessed as being cost prohibitive.

4.2.5 Options 4(c) and 4(d): Cable across existing bridge

At face value these options appear very attractive as they utilise the existing HAI-MTM-B support structures as well as avoiding a new aerial crossing of Rangataua Bay. A second termination structure would be required at either side adjacent to and similar to the ones that currently exist, but the height of this structures would be in the order 15m to 20m high at either side compared with approximately 34.7m to 46.8m high[5] for aerial crossing options. The existing HAI-MTM B termination structures are approximately 17.6m and 17.8m high above ground level respectively.

[4] Subject to business case approval by Transpower.
[5] Option 3(b) only requires a 12m to 17m high concrete pi pole on the Matapihi side. Option 3(a) includes a 34.7m structure on the Maungatapu side.

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Figure 3: Indicative bridge crossing route showing approximate termination structure locations

Figure 4: Photo of existing termination structure at Maungatapu side

Visually these options are lower impact than aerial crossing options. However, the cost differences are substantial due to the much higher cost of cable hardware (compared with overhead lines), and costs associated with retrofitting/strengthening the bridge to accommodate the equipment.

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Other issues include less network resilience with both cables being located on the same bridge structure, difficulties in access for maintenance and repair due to the strategic function of the road, and long term cost liabilities of relocating the cable when the bridge is ultimately replaced. The New Zealand Transport Agency has also stated a preference that Transpower does not attach an additional cable to the bridge as it may reduce the capacity for heavy load crossings.

The high-level cost estimates of the two options involving retrofitting a cable onto the existing bridge are in the order of $7M to $13M for the cable costs and termination structures alone, plus an additional $5M to $7.5M for anticipated bridge upgrade and strengthening costs. This compares to $730K to $1.35M or Option 3(a) and $800K – $1.5M for option 3(b) for the waterway crossing component of the work.

Even without having to undertake bridge remediation works, the costs with these options are still in the order of 5-10 times that of the aerial crossing options for the harbour crossing component. On this basis, Transpower has rejected the options involving attaching a cable to the existing bridge on the basis of the costs being unacceptably high, as well as from other network reliance factors (see 4.2.7 below).

4.2.6 Option 5: Seabed cable crossing

This option involves termination structures equivalent to those required for the bridge crossing options with a submarine cable thrust bored under the harbour. The short length of cable hardware would be very expensive. Further, the use of a subsurface submarine cable would result in less access for maintenance and repair compared with other options.

This is also a very expensive option with the costs estimated in the order of $12M - $22.7M. On this basis, Transpower has rejected a seabed cable option on the basis of the costs being unacceptably high, as well as from other network reliance factors (see 4.2.7 below).

A cable on the surface of the seabed was not considered due to, security of supply and health and safety considerations. However, the cable hardware costs would still be considerable compared with aerial line options.

4.2.7 Other network risks with a bridge or seabed cable option

In addition to costs, all cable options (bridge and seabed) have more risk to the Mount Maunganui electricity supply than aerial options. Mount Maunganui is fed solely by the two circuits of the HAI-MTM A and B transmission lines. If both circuits fail, then Mount Maunganui would be without electricity. Cable circuit faults can take days to weeks to return to service depending upon the fault/damage, whilst overhead circuits can usually be returned to service within hours, and generally within a maximum of one day. The risk of cabling both circuits, such as from a seismic event or bridge collapse is therefore much higher than maintaining at least one circuit with an aerial crossing.

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4.3 Summary

In summary, Transpower elected to further consider two aerial crossing options prior to selecting a preferred option to take forward for community consultation. These two aerial crossing options are discussed further in the next section. Other options that would meet the project objectives have been rejected primarily on the basis of the costs being unacceptably high, network resilience, programming (e.g. there is no current NZTA bridge replacement project), issues with future access for maintenance and repair, and other potential health and safety and environmental issues (e.g. impacts of new bridge structures).

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5 Shortlisted Options

This section outlines the two shortlisted options considered prior to confirming Option 3(a) as the preferred option. These options have been shortlisted on the basis they meet the project objectives (particularly relocating infrastructure off Ngāti Hē land and horticultural blocks), provide broader community benefit by removing significant lengths of line from crossing over private land including residential land, are substantially less expensive than bridge and seabed cable options, and are superior to cable options in regard to network resilience.

5.1 Aerial crossing options: consistent components

Options 3(a) and 3(b) differ in the manner that they cross Rangataua Bay, but aside from that they are largely the same in regard to relocation of the HAI-MTM A circuit onto or adjacent to the HAI-MTM B support structures between Poles B28 and B48, and new intermediate poles to existing structure A128 to transition the HAI-MTM A circuit back to its original alignment to the Mount Maunganui Substation. The general shore based components consistent to both options are outlined in this section, whilst the alternative options for crossing Rangitaua Bay are outlined in Section 5.2 below.

Figure 5: Existing Line Layout

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As shown in Figure 5, the existing HAI-MTM-A circuit and support poles will be removed from between Pole B28 and Pole A117 on the Maungatapu side, and between Pole A119 and Pole A128 on the Matapihi side.

As the original design for the HAI-MTM B line support structures in the project area was intended to be suitable for an additional circuit to be added onto these poles, the initial assumption was that between Poles B28 and B53 (excluding the actual crossing of the harbour), the new circuit would simply be located onto existing poles within NZTA road reserve with new insulators attached to the vacant cross arms on the western side of these poles. However, after undertaking further engineering and feasibility analysis, it was determined that a number of existing poles would need to be replaced by stronger poles, and additional structures installed. Further, the project is being used as an opportunity to relocate Pole B50 to the western side of State Highway 29A.

Given a new circuit will be located on the western side of the poles closer to adjacent property boundaries, a blowout analysis determined that on the Maungatapu side a trade-off was required between additional trimming of vegetation on the State Highway 29A boundary with residential properties versus a height increase of the structures. A new purpose built structure to replace B28 will also be required at the point where the two lines currently converge. On the Matapihi side, to reduce impacts on adjacent horticultural shelter belts it was found to be necessary to install a number of additional mid-span poles as well as run a new parallel set of single circuit poles supporting the HAI-MTM A transmission line circuit parallel to the HAI-MTM B transmission line but within the adjacent horticultural property for part of the realignment. Existing HAI-MTM A pi-pole A128 will be upgraded from a suspension to a strain structure to integrate the HAI-MTM A conductors back onto the existing alignment to the Mount Maunganui substation. A number of new intermediate poles are also required between existing pole B48 and upgraded Pole A128.

In terms of the replacement poles on the Maungatapu side, visual and landscape advice received was that taller poles were considered to be a superior option visually to retaining the existing pole height and undertaking substantial vegetation trimming. On the Matapihi side the solution has been developed in consultation with the affected property owners to reduce impacts on horticultural shelter belts.

Where poles and their associated conductors or conductor blowout affects properties outside of State Highway 29A, Transpower will be required to secure easements with the relevant landowners. This affects a small part of a single Tauranga City Council owned property adjacent to the Maungatapu end of the waterway crossing, and a number of horticultural properties on the Matapihi side already traversed by the existing HAI-MTM A transmission line.

Explanatory figures of the overall preferred scheme including the proposed solution for relocating the HAI-MTM A circuit onto the HAI-MTM B poles is included in Appendix A1. A schedule of existing and proposed pole heights is also included in Appendix A1.

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5.2 Option 3(a): Aerial Crossing of Rangataua Bay Estuary in single span

This option involves placing a new steel monopole at either side of Rangataua Bay generally adjacent to Stage Highway 29 to enable crossing of the bay in a single span without the need to connect to Tower A118. To achieve a single span crossing, the monopoles on each side will need to be approximately 34.7m above ground level on the Maungatapu side, and 46.8m on the Matapihi side. The heights have been selected to minimise the pole height on the Maungatapu side whist still achieving a suitable minimum waterway crossing height to meet relevant Maritime New Zealand navigable waterway clearances.

A vertical and horizontal insulator arrangement was considered for these poles, with the horizontal arrangement preferred due to the ability to reduce overall pole heights by approximately 7m and is therefore preferred in terms of visual amenity. It is also necessary for the pole on the Matapihi site to meet the Tauranga Airport height limit of 49m AMSL. The proposed structure will be approximately 48.4m AMSL in the location currently proposed with the horizontal conductor arrangement.

While the pole at the Maungatapu side will be able to be positioned within road reserve, the pole on the Matapihi side will be required to be located on a block of Ngāti Hē land before traversing Ngāi Tūkairangi and other Māori trustee land before it can be connected back onto the HAI-MTM-B line support poles. A suitable property agreement with the landowners will be required for these works which will be progressed in parallel with the resource consent applications. Other poles will also need to be located on horticultural land parallel to the existing HAI-MTM B line towards the northern end of the work to avoid substantial trimming or removal of horticultural shelter belts, although this enables removal of the existing line traversing more centrally through this land.

The general area of the landfall on the Matapihi side is near an area identified as a Significant Māori Area (M44) in the District Plan, and is identified as Te Ngaio Pa. Accordingly, this scope of work will require an authority from HNZPT to modify an archaeological site for any pole foundations and construction access. Support of relevant iwi/hapū will be required for this authority.

While the two new monopoles introduce a new visual element to each end of the bridge, this option has the advantage of enabling the removal of Tower A118 from within the harbour. Regional consent for seabed disturbance associated with removal of the tower foundations will be required.

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Figure 6: Existing Tower A118 in Rangataua Bay

A summary of the expected benefits and costs for this option include:

Benefits

- Removal of existing lines and support structures from significant areas of private residential and Māori land, resulting in substantial amenity benefits.
- Removal of Tower A118 from harbour.
- Resolution of access and maintenance issues on Ngāti Hē and Ngāi Tūkairangi Māori land.
- Addresses security of supply risk due to coastal erosion issues affecting Pole A117, and need for a long-term replacement or upgrade of Pole 116.
- Enables better use and/or redevelopment of sports fields on Ngāti Hē land, and better utilisation of horticultural land at Matapihi (e.g. more flexibility in farming practices and use of shelter planting).
- Enables utilisation of an existing utility corridor for both transmission lines.

Costs

- Large monopole structure on either side of Rangataua Bay will have some adverse visual/landscape effects.

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- Some adjacent properties to SH29A may be affected to a minor degree by line swing in air space – would require easements.
- Potential disturbance of archaeology on Matapihi side from earthworks, although these are limited and can be managed.
- Ngāi Tūkairangi representatives indicated Tower A118 foundation is valued for the shell fish that have established on it. This will be affected by removal of tower and foundation. It is understood that Ngāti Hē may prefer this is removed. However, without a party prepared to take ownership and responsibility for maintenance of this structure, Transpower will remove it.
- Temporary seabed disturbance associated with tower foundation removal.
- Additional visual effects from taller and additional poles in and adjacent to SH 29.

5.3 Option 3(b): Aerial Crossing of Rangataua Estuary via Tower A118

Similar to Option 3(a), this option also involves placing a new steel monopole on the Maungatapu side of Rangataua Bay of up to approximately 40m high (depending on design). However, the main point of difference to Option 3(a) is that rather than crossing in a single span, it would connect to Tower A118. The main benefit of retaining Tower A118 is that on the Matapihi side, a substantially shorter 12m to 17m high concrete pi-pole could be used. However, the benefits of removing Tower A118 from within the CMA would not be realised.

Initial indications are that a substantial structural upgrade of Tower A118 would be required to retain it.

As with option 3(a), while the pole at the Maungatapu side will be able to be positioned within road reserve, the pole on the Matapihi side will be required to be located on Ngāi Tūkairangi Māori trustee land before it can be connected back onto the HAI-MTM-B line support poles. A suitable property agreement will be required for these works which will be progressed in parallel with the resource consent applications. The general area of the landfall on the Matapihi side is identified as a Significant Māori Area (M44) in the District Plan, and is identified as Te Ngaio Pa. Accordingly, this scope of work will require an authority from HNZPT to modify an archaeological site for any pole foundations. Support of relevant iwi/hapū will be required for this authority.

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Figure 7: Proposed Layout - Option 3(b)

A summary of the expected benefits and costs for this option include:

Benefits

- Removal of existing lines and support structures from significant areas of private residential and Māori land, resulting in substantial amenity benefits.
- Resolution of access and maintenance issues on Ngāti Hē and Ngāi Tūkairangi Māori land.
- Addresses security of supply risk due to coastal erosion issues affecting Pole A117, and need for a long-term replacement or upgrade of Pole 116.
- Enables better use and/or redevelopment of sports fields on Ngāti Hē land, and better utilisation of horticultural land at Matapihi (e.g. more flexibility in farming practices and use of shelter planting).
- Retention of Tower A118 and foundation will retain shellfish habitat identified by Ngāi Tūkairangi representative.
- Enables utilisation of an existing utility corridor for both transmission lines.

Costs

- Large pole structures on either side of Rangataua Bay will have some adverse visual/landscape effects.
- Adjacent properties to SH29A may be affected to a limited degree by line swing in air space – would require easements.

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- Potential disturbance of archaeology on Matapihi side from earthworks, although these are limited and can be managed.
- Extent of any encroachment into airspace of line over corner of property between new Maungatapu monopole and Tower A118 may be more extensive than Option 3(a), depending on exact pole location selected.
- Additional visual effects from taller and additional poles in and adjacent to SH 29.

5.4 Preferred Option

The overall preferred option to take forward for community consultation is Option 3a, which involves a relocation of the HAI-MTM A line between poles B28 and B48 to the same general alignment of the HAI-MTM B line, with a new aerial single span crossing of Rangataua Bay. The existing HAI-MTM A line and all associated support structures including Tower A118 in the CMA can be removed within this area.

The overall preferred solution including treatment of replacement poles, and proposed additional poles is summarised in the figures attached in Appendix A1.

Visual simulations of the preferred aerial option are included in a separate graphic attachment prepared by Isthmus Group.

6 Summary

This document outlines the various options that have been considered to address long term access and maintenance issues with existing infrastructure associated with the HAI-MTM-A transmission line where it crosses Māori owned land of Ngāti Hē and Ngāi Tūkairangi on either side of Rangataua Bay.

Undergrounding of the line across the Ngāti Hē land (Te Ariki Park) was rejected on the basis that it did not resolve long term grievances of iwi, has issues of culturally acceptability due to the burial history on the Ngāti Hē land, and also does not provide any wider benefits such as removal of the lines from other land that is crossed by the transmission line.

The support poles for the HAI-MTM-B transmission line that runs along State Highway 29A were originally designed to take another circuit with a future realignment of the HAI-MTM-A line in mind. Accordingly, a number of options were developed around use of these structures, with variation in the methods to cross Rangataua Bay being investigated. Further engineering investigations have determined that a number of existing poles will require replacement or supplementary poles to address structural issues, manage conductor blowout and minimise the extent of vegetation trimming or removal where it is proposed to combine both circuits onto a single set of support structures on the current HAI-MTM B alignment.

Options involving attaching the cable to the existing State Highway 29A bridge, use of a new cable/foot bridge or a cable thrust beneath the seabed are considered by Transpower to have operational and security of supply risks (network resilience), and unacceptable costs due to hardware and engineering considerations, and would not

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eliminate the need for substantial termination structures on either side of the waterway, while there is no road bridge replacement project forecast in the foreseeable future that a new cable crossing could be integrated into. Accordingly, two aerial crossing options were shortlisted for further consideration, with the preferred option involving a single span aerial crossing of Rangataua Bay adjacent to the State Highway 29A bridge.

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A.1 Realignment Solution Explanatory Figures, Pole Height Schedule

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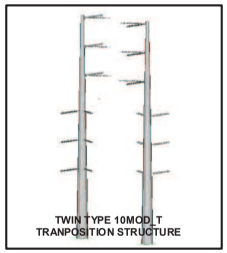
POLE NO	NEW POLE ID	PROPOSED WORK ON POLE	EXISTING POLE COORDINATES		EXISTING POLE HEIGHT ABOVE GL (m)	NEW POLE COORDINATES			NEW POLE HEIGHT ABOVE GL(m)	TYPE	CHANGE IN HEIGHT (m)	STRUCTURE HEIGHT FULLY COMPLIES WITH TAURANGA AIRPORT HEIGHT RESTRICTIONS	RADIAL DISTANCE FROM EXISTING STRUCTURE WHERE APPLICABLE (m)	DESCRIPTION OF WORKS	REQUIRE DEEP INSULATED EARTH
			X	Y		X	Y	Z							
28 (LHS)	28A	TWIN POLE REPLACED WITH TWIN POLE	1880443.5	5820994.3	18.2	1880439.4	5820991.4	53.9	25.5	TWIN TYPE 10M0D_P	7.3	YES	5.0	POLE LENGTH 25.5m, FOUNDATION UPSTAND = 0.5m, STRUCTURE TOTAL HEIGHT ABOVE GL = 26.0m. STRUCTURE HEIGHT ABOVE MSL = 49.3m.	YES
28 (RHS)	28B		1880446.9	5820990.7		1880443.4	5820987.0	53.9							
28T		NEW TEMPORARY POLE				1880436.7	5821001.7	53.9	19.4	TYPE 10		YES		NEW 23m TP150 HS CONCRETE POLE CARRYING BOTH CIRCUITS	NO
29	29A	POLE REPLACEMENT	1880536.7	5821076.4	16.3	1880540.7	5821079.4	55.6	28.2	TYPE 14	11.9	YES	5.0	POLE REPLACED WITH 32m STEEL POLE AND INSTALL SECOND CIRCUIT. NEW POLE MOVED 5m TOWARDS HAI TO ALLOW FOR INSTALLATION WORKS.	YES
30	30A	POLE REPLACEMENT	1880645.0	5821158.9	17.2	1880641.0	5821155.9	52.3	28.2	TYPE 14	11.0	YES	5.0	POLE REPLACED WITH 32m STEEL POLE AND INSTALL SECOND CIRCUIT. NEW POLE MOVED 5m TOWARDS HAI TO ALLOW FOR INSTALLATION WORKS.	YES
31	31A	POLE REPLACEMENT	1880735.0	5821237.7	18.1	1880731.2	5821234.4	44.1	28.2	TYPE 14	10.2	YES	5.0	POLE REPLACED WITH 32m STEEL POLE AND INSTALL SECOND CIRCUIT. NEW POLE MOVED 5m TOWARDS HAI TO ALLOW FOR INSTALLATION WORKS.	YES
32	32A	POLE REPLACEMENT	1880810.7	5821317.5	18.0	1880807.3	5821313.9	41.6	28.2	TYPE 14	10.2	YES	5.0	POLE REPLACED WITH 32m STEEL POLE AND INSTALL SECOND CIRCUIT. NEW POLE MOVED 5m TOWARDS HAI TO ALLOW FOR INSTALLATION WORKS.	YES
33		NO CHANGE	1880862.0	5821394.7	17.1					CTS	0.0	YES		EXISTING CTS POLE REMAINS UNCHANGED	NO
33A		NEW POLE				1880876.4	5821387.5	38.7	19.4	TYPE 14MOD_SC	19.4	YES		NEW 23m TP150 HS CONCRETE POLE AND SECOND CIRCUIT INSTALLED	YES
33B		NEW POLE				1880895.9	5821423.5	36.3	22.4	TYPE 10	22.4	YES		NEW 26m STEEL POLE CARRYING SINGLE CIRCUIT	YES
33C		NEW POLE				1880955.4	5821531.1	32.8	34.7	TYPE 16MOD_ECS	34.7	YES		POLE LENGTH 33.0m, VERTICAL LINE POST LENGTH = 1.4m, FOUNDATION UPSTAND = 0.3m, STRUCTURE TOTAL HEIGHT ABOVE GL = 34.7m. STRUCTURE HEIGHT ABOVE MSL = 36.9m.	YES
33D		NEW POLE				1881249.5	5822129.1	32.2	46.8	TYPE 16MOD_ECS	46.8	YES		POLE LENGTH 45.1m, VERTICAL LINE POST LENGTH = 1.4m, FOUNDATION UPSTAND = 0.3m, STRUCTURE TOATL HEIGHT ABOVE GL = 46.8m. STRUCTURE HEIGHT ABOVE MSL = 48.4m.	YES
33E		NEW POLE				1881363.7	5822254.1	53.4	24.0	TYPE 10	24.0	YES		INSTALL NEW 24m STEEL POLE CARRYING SINGLE CIRCUIT	YES
34		NO CHANGE	1881275.9	5822127.8	16.8					CTS	0.0	YES		EXISTING CTS POLE REMAINS UNCHANGED	NO
35		NO CHANGE	1881337.2	5822198.1	16.9					TYPE 14MOD_SC	0.0	YES		EXISTING POLE REMAINS UNCHANGED	NO
36		NO CHANGE	1881377.4	5822247.2	16.9					TYPE 14MOD_SC	0.0	YES		EXISTING POLE REMAIN UNCHANGED	NO
37		NO CHANGE	1881435.7	5822294.7	15.6					TYPE 14	0.0	YES		EXISTING POLE WITH 2ND CIRCUIT INSTALLED	YES
38		NO CHANGE	1881509.3	5822326.5	15.6					TYPE 14	0.0	YES		EXISTING POLE WITH 2ND CIRCUIT INSTALLED	YES
39	38A	POLE REPLACEMENT	1881594.9	5822356.9	15.6	1881658.6	5822369.0	50.2	19.4	TYPE 14	3.9	YES	64.8	NEW 23m TP150 HS CONCRETE POLE CARRYING BOTH CIRCUITS	YES
39A		NEW POLE				1881658.6	5822369.0	50.2	19.4	TYPE 14	19.4	YES		NEW 23m TP150 HS CONCRETE POLE CARRYING BOTH CIRCUITS	YES
40		NO CHANGE	1881727.5	5822382.1	19.4					TYPE 14	0.0	YES		EXISTING POLE WITH 2ND CIRCUIT INSTALLED	YES
40A		NEW POLE				1881830.3	5822398.4	50.5	19.4	TYPE 14	19.4	YES		NEW 23m TP150 HS CONCRETE POLE CARRYING BOTH CIRCUITS	YES
41		NO CHANGE	1881880.9	5822406.4	16.9					TYPE 14	0.0	YES		EXISTING POLE WITH 2ND CIRCUIT INSTALLED	YES
41A		NEW POLE				1881932.0	5822420.1	50.4	19.4	TYPE 14	19.4	YES		NEW 23m TP150 HS CONCRETE POLE CARRYING BOTH CIRCUITS	YES
42		NO CHANGE	1881978.0	5822433.0	15.6					TYPE 14	0.0	YES		EXISTING POLE WITH 2ND CIRCUIT INSTALLED	YES
42A		NEW POLE				1882022.7	5822450.7	49.5	19.4	TYPE 14	19.4	YES		NEW 23m TP150 HS CONCRETE POLE CARRYING BOTH CIRCUITS	YES
43A	43B	POLE REPLACEMENT	1882069.4	5822469.8	16.9	1882073.8	5822472.3	49.0	19.4	TYPE 14	2.6	YES	5.0	POLE REPLACED WITH 23m TP150 CONCRETE HS POLE AND INSTALL SECOND CIRCUIT. NEW POLE MOVED 5m TOWARDS HAI TO ALLOW FOR INSTALLATION WORKS.	YES
43C		NEW POLE				1882116.6	5822495.6	48.6	19.4	TYPE 14	19.4	YES		NEW 23m TP150 HS CONCRETE POLE CARRYING BOTH CIRCUITS	YES
44A		NO CHANGE	1882158.1	5822519.0	18.2					TYPE 14	0.0	YES		EXISTING POLE WITH 2ND CIRCUIT INSTALLED	YES
44B		NEW POLE				1882206.9	5822550.7	47.9	19.4	TYPE 14	19.4	YES		NEW 23m TP150 HS CONCRETE POLE CARRYING BOTH CIRCUITS	YES
45		NO CHANGE	1882243.9	5822575.3	18.2					TYPE 14	0.0	YES		EXISTING POLE WITH 2ND CIRCUIT INSTALLED	YES
45A		NEW POLE				1882281.3	5822606.8	47.7	19.4	TYPE 14	19.4	YES		NEW 23m TP150 HS CONCRETE POLE CARRYING SINGLE CIRCUITS	YES
46		NO CHANGE	1882319.9	5822640.6	18.2					TYPE 14	0.0	YES		EXISTING POLE WITH 2ND CIRCUIT INSTALLED	YES
47	47A	POLE REPLACEMENT	1882413.9	5822730.8	19.4	1882403.9	5822721.2	48.1	22.8	TYPE 14	3.4	YES	13.8	POLE REPLACED WITH 26m STEEL POLE AND INSTALL SECOND CIRCUIT. NEW POLE MOVED 13.8m TOWARDS HAI TO ALLOW FOR INSTALLATION WORKS.	YES
48	48A	POLE REPLACEMENT	1882526.7	5822829.9	19.4	1882510.0	5822827.3	46.1	22.8	TYPE 10	3.4	YES	16.8	POLE 48 REPLACED WITH A 26.0m TALL STEEL POLE, CARRYING ONE CIRCUIT	YES
48B		NEW POLE				1882513.5	5822823.4	46.1	22.8	TYPE 10	22.8	YES		NEW 26m STEEL POLE CARRYING SINGLE CIRCUIT	YES
49A	48C	POLE REPLACEMENT	1882619.2	5822928.5	19.0	1882602.2	5822924.2	43.7	28.7	TYPE 16	9.7	YES	17.5	POLE REPLACED WITH 32.0m STEEL POLE CARRYING BOTH CIRCUITS.	YES
50	48D	POLE REPLACEMENT	1882733.2	5823057.7	15.2	1882674.5	5823024.5	40.9	26.2	TYPE 16	11.0	YES	67.4	POLE REPLACED WITH 30.0m STEEL POLE CARRYING BOTH CIRCUITS.	YES
48E		NEW POLE				1882707.3	5823102.4	38.9	22.8	TYPE 14	22.8	YES		NEW 26m STEEL POLE CARRYING DOUBLE CIRCUIT	YES
51	48F	POLE REPLACEMENT	1882747.3	5823198.8	17.8	1882744.4	5823199.2	36.6	21.8	TYPE 10	4.0	YES	3.0	NEW 26m STEEL POLE CARRYING SINGLE CIRCUIT - 1.0m ADDED IN TO THE STANDARD 3.2m EMBEDMENT BRINGING THE TOTAL EMBEDMENT TO 4.2m	NO
127A		NEW POLE				1882737.0	5823226.1	36.1	19.4	TYPE 16	19.4	YES		NEW TWIN 23m TP150 HS CONCRETE POLE CARRYING SINGLE CIRCUIT	YES
128	128A	POLE REPLACEMENT	1882752.5	5823495.4	12.6	1882751.3	5823492.6	33.4	11.2	TYPE 16	-1.4	YES	3.1	POLE REPLACED WITH 18.5m TP150 CONCRETE HS POLE AND INSTALL SECOND CIRCUIT. NEW POLE MOVED 3m TOWARDS HAI TO ALLOW FOR INSTALLATION WORKS.	YES
113A		POLE REMOVAL	1880499.0	5821097.8	16.0						-16.0			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 16m	NO
114		POLE REMOVAL	1880514.9	5821127.7	16.3						-16.3			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 16.3m	NO
115		POLE REMOVAL	1880643.9	5821373.2	12.3						-12.3			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 12.3m	NO
116		POLE REMOVAL	1880721.2	5821559.1	15.5						-15.5			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 15.5m	NO
117		POLE REMOVAL	1880796.8	5821737.8	13.1						-13.1			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 13.1m	NO
118		POLE REMOVAL	1881085.7	5822012.8	31.0						-31.0			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 31m	NO

POLE NO	NEW POLE ID	PROPOSED WORK ON POLE	EXISTING POLE COORDINATES		EXISTING POLE HEIGHT ABOVE GL (m)	NEW POLE COORDINATES			NEW POLE HEIGHT ABOVE GL(m)	TYPE	CHANGE IN HEIGHT (m)	STRUCTURE HEIGHT FULLY COMPLIES WITH TAURANGA AIRPORT HEIGHT RESTRICTIONS	RADIAL DISTANCE FROM EXISTING STRUCTURE WHERE APPLICABLE (m)	DESCRIPTION OF WORKS	REQUIRE DEEP INSULATED EARTH
			X	Y		X	Y	Z							
119		POLE REMOVAL	1881398.0	5822310.5	13.1						-13.1			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 13.1m	NO
120		POLE REMOVAL	1881570.1	5822418.6	19.2						-19.2			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 19.2m	NO
121		POLE REMOVAL	1881770.7	5822544.3	16.4						-16.4			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 16.4m	NO
122		POLE REMOVAL	1881934.8	5822647.4	15.0						-15.0			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 15m	NO
123		POLE REMOVAL	1882071.4	5822733.4	15.0						-15.0			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 15m	NO
124		POLE REMOVAL	1882237.7	5822837.7	15.4						-15.4			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 15.4m	NO
125		POLE REMOVAL	1882394.4	5822936.4	13.7						-13.7			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 13.7m	NO
126		POLE REMOVAL	1882552.0	5823035.2	15.6						-15.6			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 15.6m	NO
127		POLE REMOVAL	1882649.4	5823258.4	16.1						-16.1			EXISTING POLE TO BE REMOVED. EXISTING HEIGHT ABOVE GL = 16.1m	NO

NOTE:
1 SHADED CELLS INDICATE EXISTING STRUCTURES REMAINING UNCHANGED.
2 THE HEIGHTS SPECIFIED FOR 33C AND 33D ARE TO THE CONDUCTOR ATTACHMENT POINT AT THE TOP OF THE VERTICAL LINE POST (VLP) INSULATOR FOR THE MID PHASE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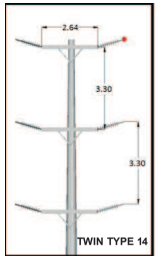
TRANPOSITION STRUCTURE



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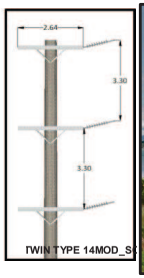
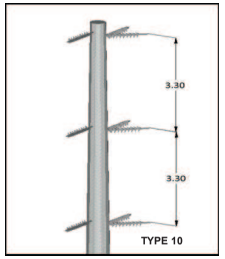


TWIN TYPE 14MOD_S


CTS
ABLE TERMINATION STRUCTUR



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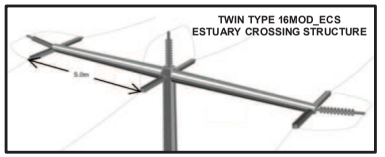
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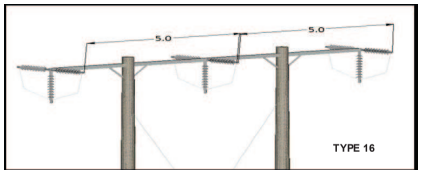
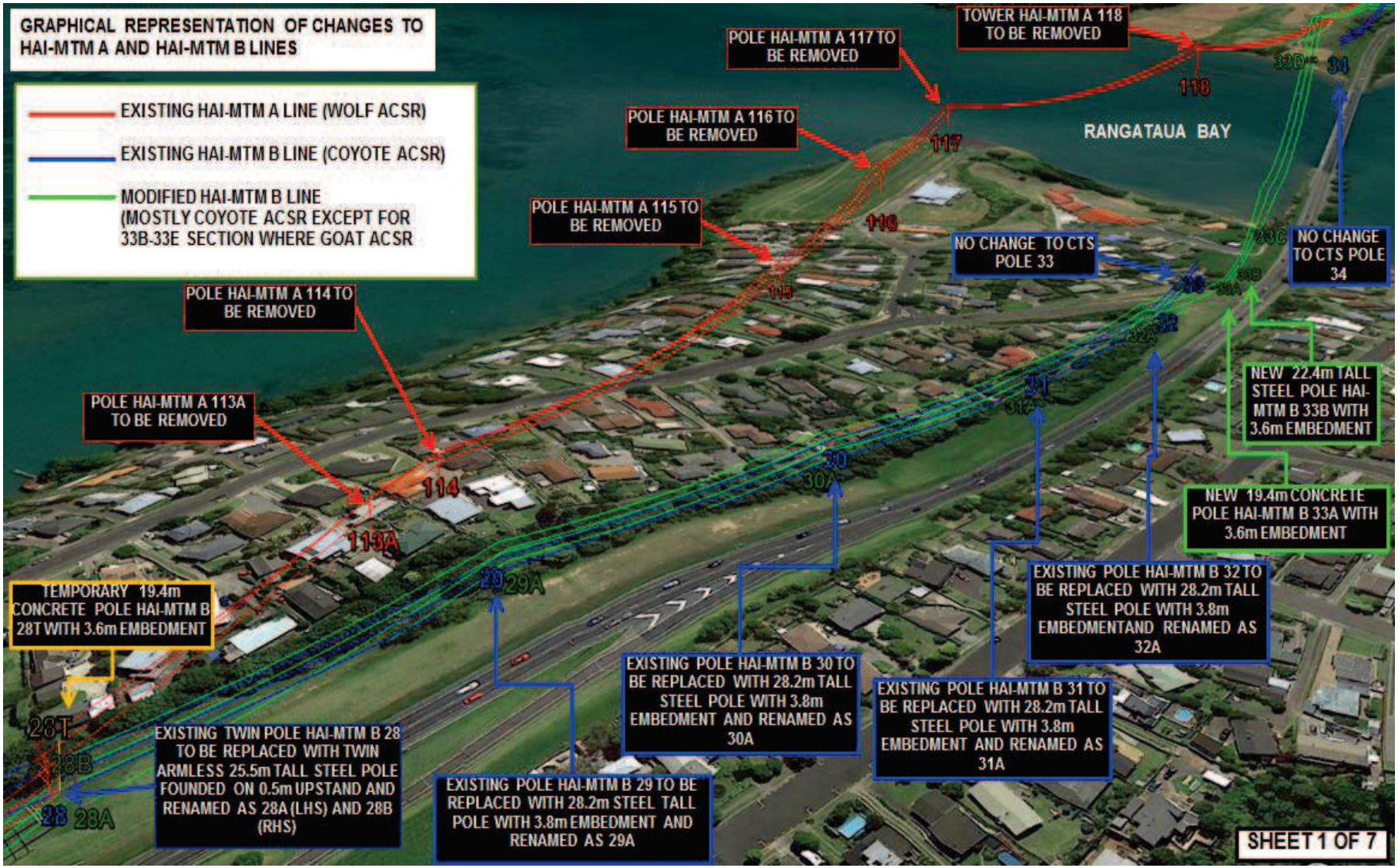
ESTUARY CROSSING STRUCTURE

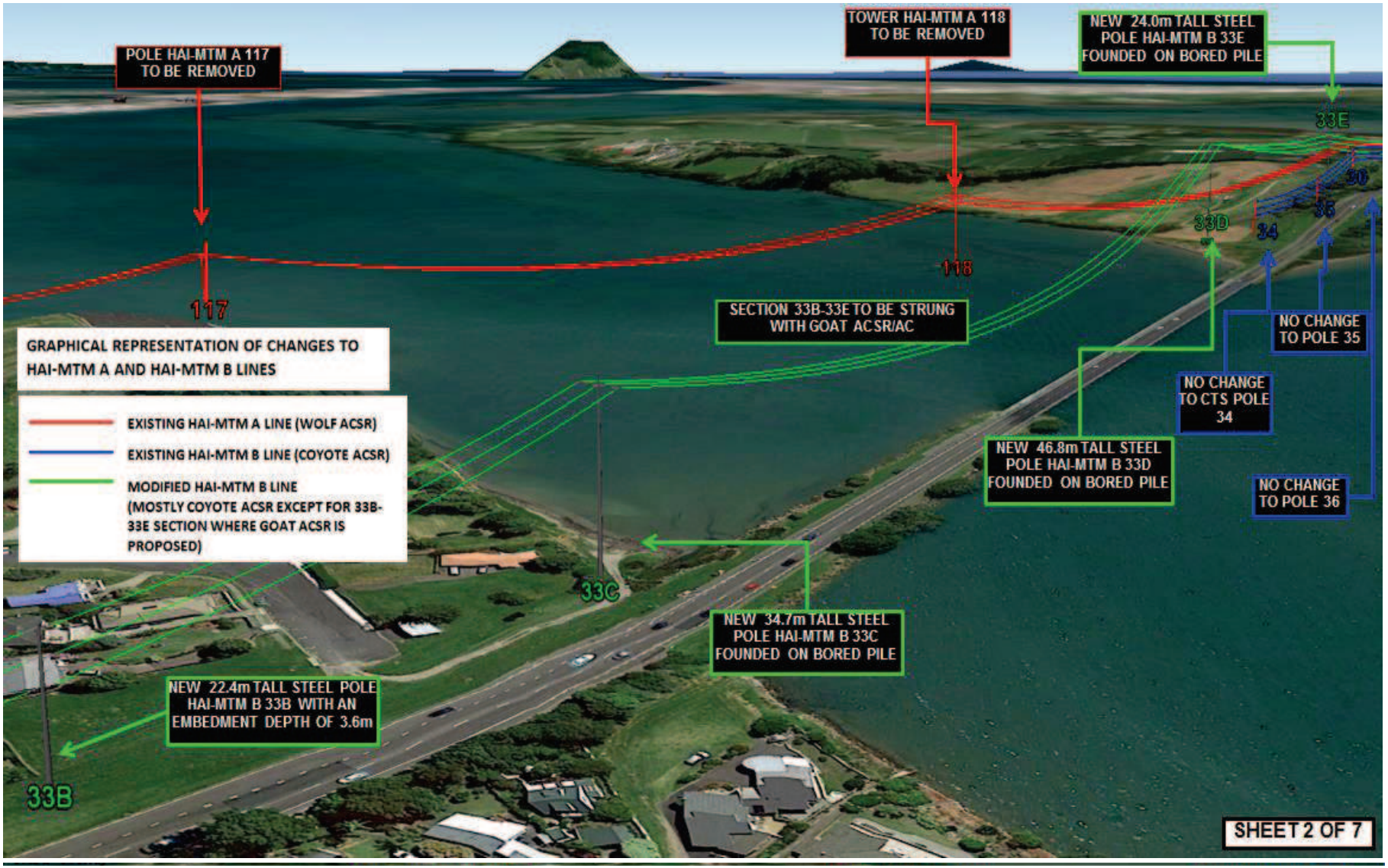


TYPE 16

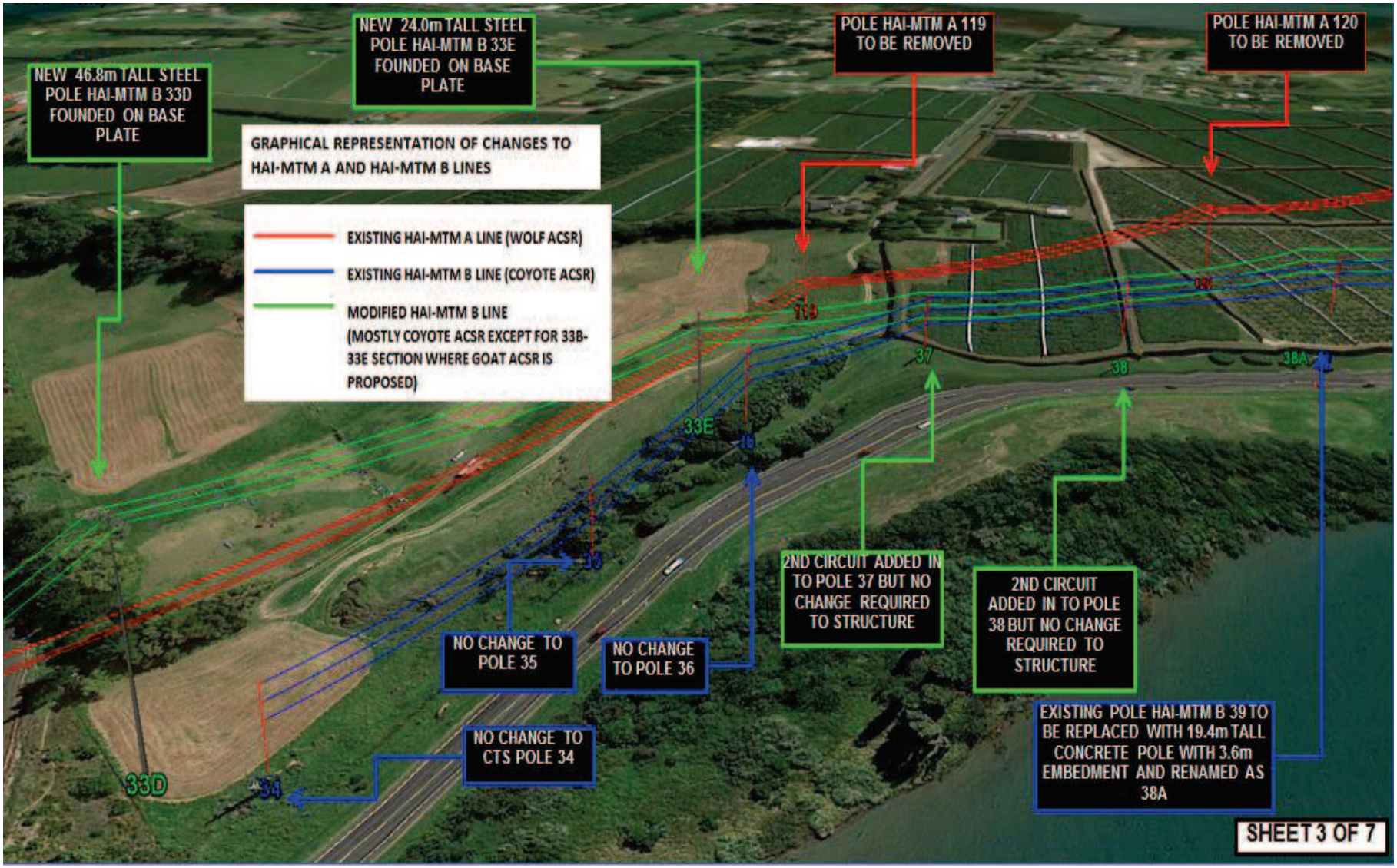
HAI-MTM LINES MODIFICATION



HAI-MTM LINES MODIFICATION



HAI-MTM LINES MODIFICATION



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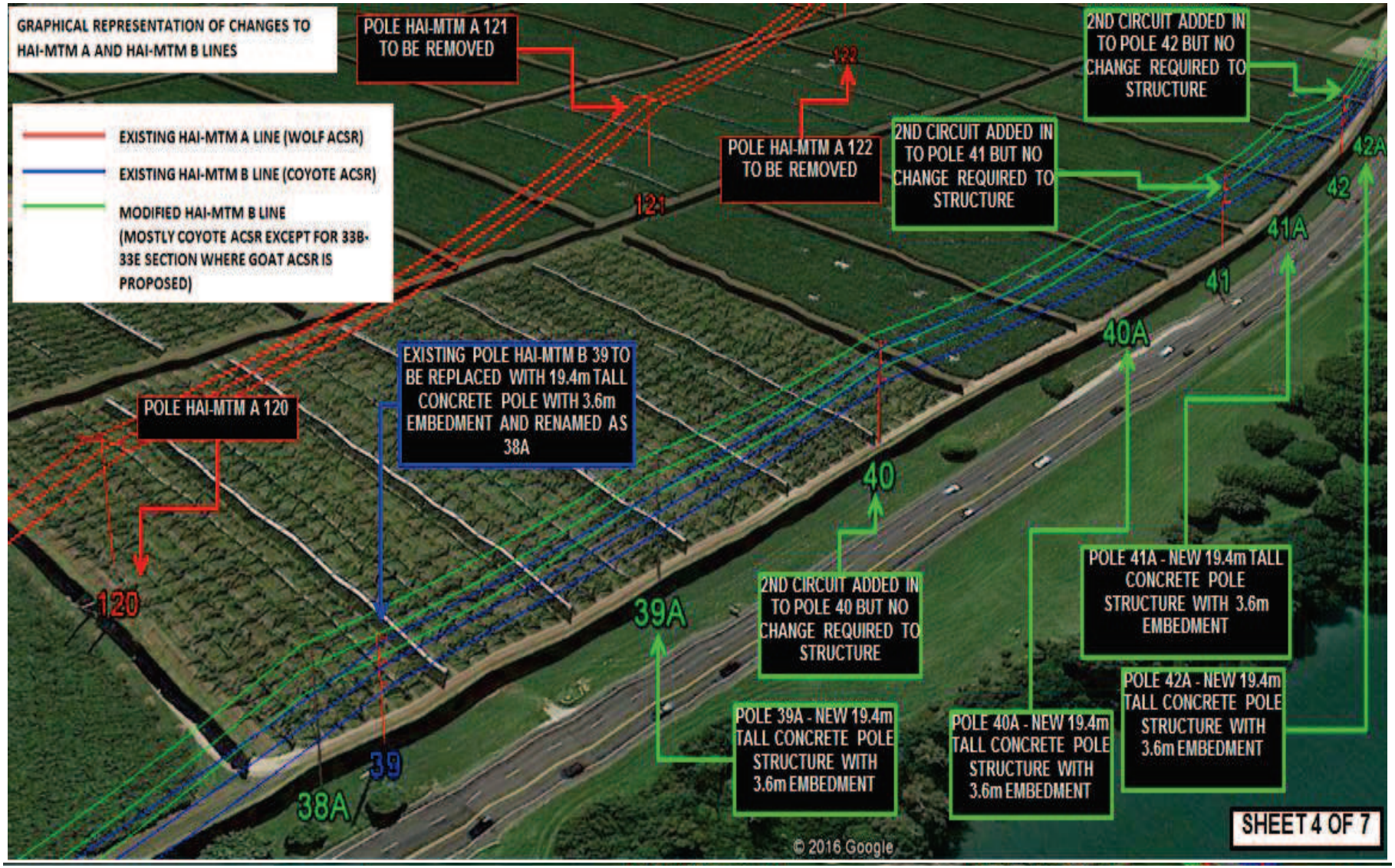

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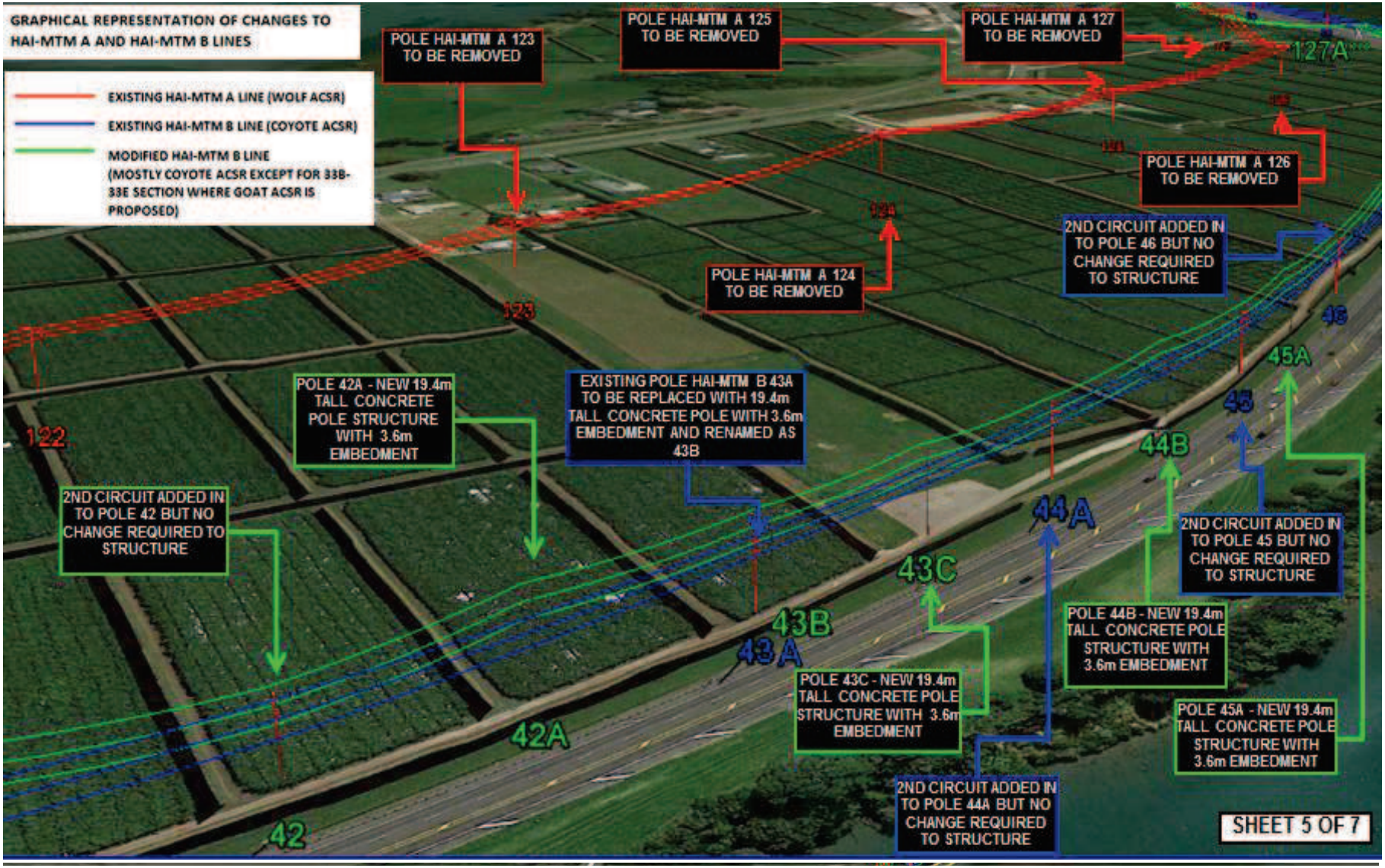
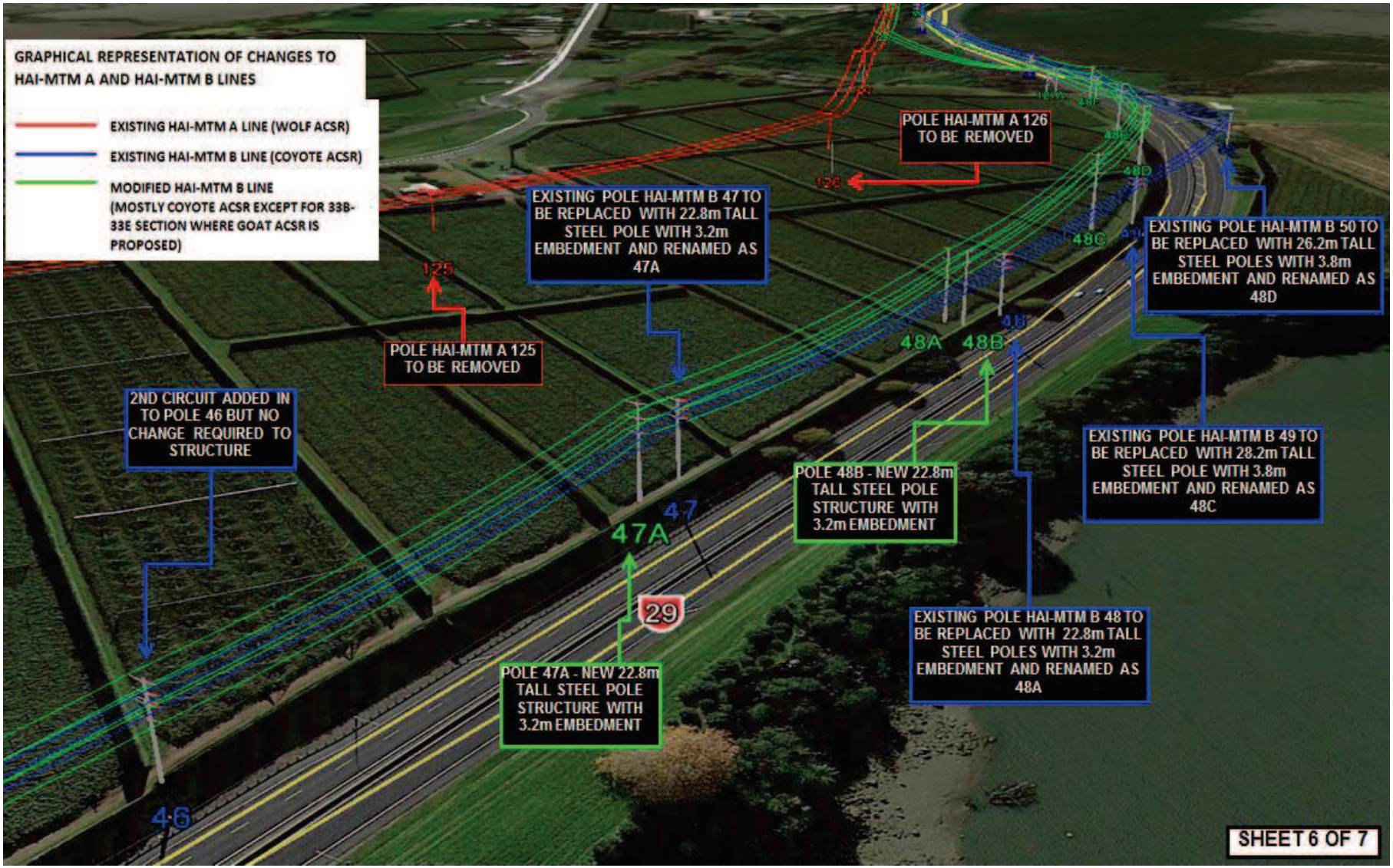


HAI-MTM LINES MODIFICATION



HAI-MTM LINES MODIFICATION