



T R A N S P O W E R

North Island 400 kV Upgrade Project

Investment Proposal

Part I – Project Description and Project Plan

1	SUMMARY.....	3
2	PROJECT DESCRIPTION.....	3
2.1	General.....	3
2.2	400 kV Overhead Transmission Line.....	4
2.3	400 kV Underground Cable.....	6
2.4	400/220 kV Substations	7
3.1	Investigation Process	9
3.2	Environmental Process	9
3.3	Property Rights Acquisition Process	10
3.4	Engineer/Procure/Construct Process.....	11
3.5	Critical Timeframes and Milestones.....	11
	APPENDIX IA - TRANSMISSION SCHEMATIC OF PROJECT (SIMPLIFIED).....	14
	APPENDIX IB - MAP OF ROUTE OPTIONS.....	15
	APPENDIX IC - NORTH ISLAND 400 KV PREFERRED UNDERGROUND CABLE ROUTE.....	16
	APPENDIX ID - NORTH ISLAND 400 KV GRID UPGRADE PROJECT CRITICAL PATH TIMELINE..	17

1 Summary

Part I introduces the proposed investment and sets out:

- the technical description of Transpower's proposed investment;
- the various processes required to implement the proposed investment; and
- the expected timeframes of undertaking each process.

The four key processes required to be undertaken to complete the proposed investment are:

- investigations including preliminary environmental, property and engineering work;
- environmental processes including securing designations and consents;
- acquisition of property rights; and
- engineering design, equipment procurement, construction.

Transpower has concluded in Part II of this submission that the proposed investment is required to be commissioned by pre-winter 2010 to ensure Transpower's grid reliability standards are met in the upper North Island. The timeframes are tight for each of the above processes if the commissioning date is to be achieved.

The critical dates required to be met to avoid delays to the commissioning of the proposed investment are:

- registration of interest in transmission line construction: **Completed (August 2005)**
- lodgement of the notice of requirement: **13 April 2006**
- commencement of compulsory acquisition process for property rights if required: **14 April 2006**
- commencement of tender process for the engineering, equipment procurement and construction contract: **10 April 2006**

2 Project Description

2.1 General

The proposed investment is the construction of a 400 kV transmission interconnection between the existing Whakamaru and Otahuhu substations, including:

- A 400 kV, double circuit, steel lattice tower, overhead transmission line of approximately 190 km from a new Whakamaru North substation to a new underground cable to overhead line transition station near Ormiston Road (south of Otahuhu substation).

- A 400 kV, double circuit, underground cable from the underground cable to overhead line transition station near Ormiston Road into Otahuhu substation with a route length of approximately 9 km.
- Two new 400/220 kV 500 MVA interconnector transformers and associated substation works at the new Whakamaru North substation.
- Two new 400/220 kV 500 MVA interconnector transformers and associated substation works at the existing Otahuhu substation.
- Dismantling and removal of all the Arapuni to Pakuranga 110 kV line, making good the affected land and consequential works at Pakuranga.

A schematic diagram of the proposed investment is included in Appendix I-A.

2.2 400 kV Overhead Transmission Line

The 400 kV overhead transmission line will run from the new Whakamaru North substation to a new underground cable to overhead line transition station near Ormiston Road. The transition station will connect the overhead line to underground cables and will require the construction of a small station yard to enclose the works. The transition station is approximately 9 route kilometres south of Otahuhu substation.

2.2.1 Design Parameters

The anticipated key design parameters for the 400 kV overhead transmission line are as described in Table 2-1:

Item	Value
Number of Circuits	2
Route Length	190 km
Line Rating	1200 MVA
Max Operating Temp	50 Deg C
Nominal System Voltage	400 kV
Conductors	Twin conductors @ 460mm spacing
Earthwire System	Twin earthwires: 1-OPGW and 1-SC/AC
Structure types	Double circuit lattice steel Tower types – Standard Suspension, Angle Heavy Suspension, Light Strain, Heavy Strain/Dead End
Maximum Electric Field Strength	In accordance with ICNIRP ¹ Guidelines
Maximum Magnetic Flux Density	In accordance with ICNIRP Guidelines
Audible Noise Level	45dBA (±1 dBA)
Radio Frequency Interference (RFI)	Compliance with NZS6869:2004
Easement Width	Minimum width based on Audible Noise. Maximum width based on Conductor Swing. Minimum width of 65 m

Table 2-1: Key Design Parameters of 400 kV Overhead Line

¹ ICNIRP - International Commission on Non-Ionizing Radiation Protection

Typical tower outlines are as follows, with the likely proportion of each type detailed underneath.

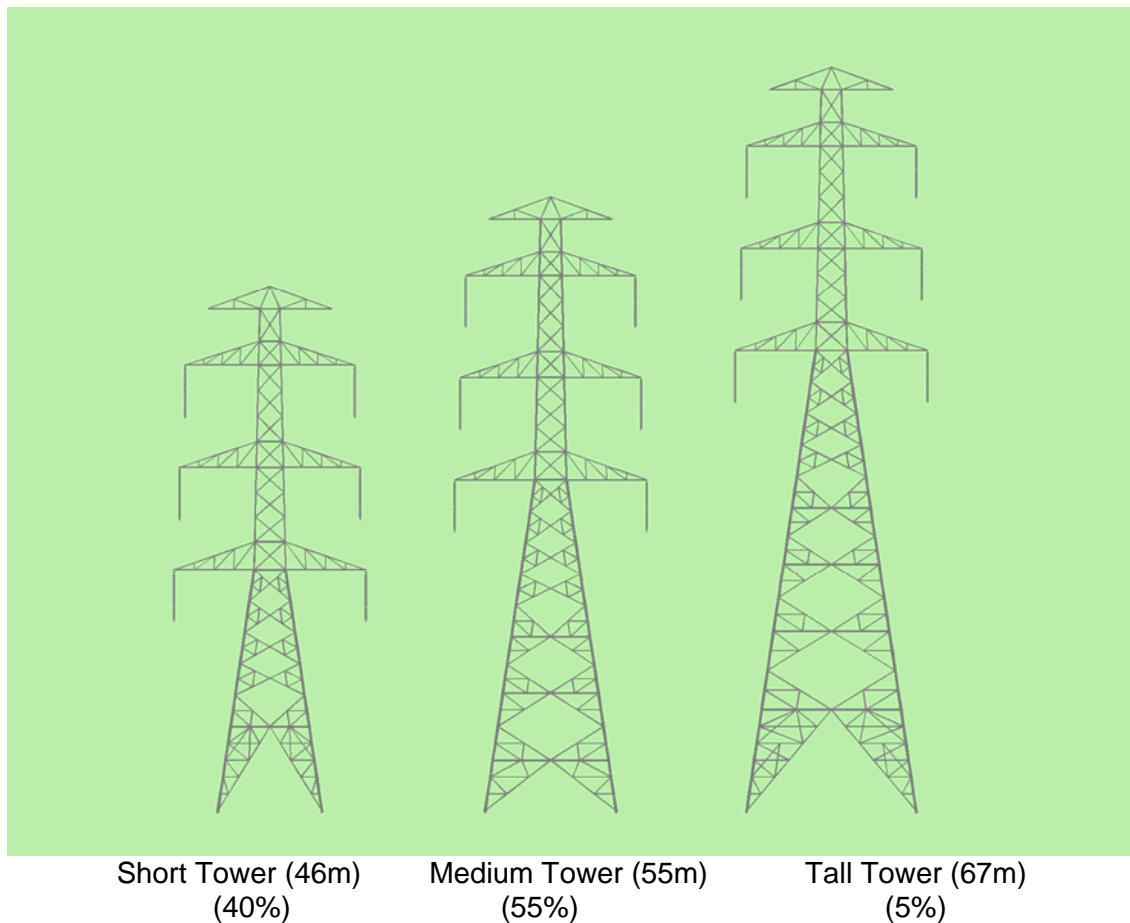


Figure 2-1: Typical 400 kV Suspension Towers General Outline

2.2.2 Transmission Line Route

Transpower has been using the ACRE (Area, Corridor, Route, Easement) process, described further in an appendix to Part III of this submission, to finalise a route and easement for the proposed 400 kV overhead transmission line. In October 2004, two route options (referred to as Eastern and Western) were publicly released. This commenced a significant period of consultation and technical/engineering, environmental investigation into determining the final route.

An interim route decision was made on 14 May 2005 which proposed a largely western route for the line. Following a period of written and verbal submissions a final route (confirming the interim decision) was announced on 19 July 2005, together with an indicative centre-line. Detailed investigations together with landowner negotiations are now underway with a view to determining a final easement centreline by late November 2005.

Transpower has confirmed that the Arapuni-Pakuranga 110 kV transmission line which follows the final route for most of its length would be removed in its entirety.

A map showing the final route can be found in Appendix IB.

2.3 400 kV Underground Cable

The proposed investment includes a 400 kV, double circuit, underground cable from the underground cable to overhead line transition station near Ormiston Road, via predominantly public roads into Otahuhu substation, with a route length of approximately 9 km.

2.3.1 Design Parameters

The anticipated key design parameters for the 400 kV underground cable are as described in Table 2-2 below:

Item	Value
Number of circuits	2
Number of cables per circuit	3 x single phase cables
Route length	9 km
Installation method	Direct burial or in ducts as required
Depth of burial	1.5 m, nominal
Distance between cable circuits	> 3m
Circuit rating	1000 MVA continuous
Rated voltage	420 kV
Conductor material and size	Copper 2500 sq mm
Insulation	XLPE or SCFF
Metal sheath	Aluminium
Oversheath	PVC or HDPE
Method of sheath bonding	Crossbonded
Maximum Electric field strength	Zero - Except at terminations in a restricted area where a limit of 10 kV/ m will apply. In accordance with ICNIRP Guidelines
Maximum Magnetic Flux Density	In accordance with ICNIRP Guidelines
Radio frequency interference	To comply with NZS 6869

Table 2-2: Anticipated Key Design Parameters of 400 kV Underground Cable

2.3.2 Environmental and Property

Transpower considered that obtaining designations under the Resource Management Act and securing of property rights for a 400 kV overhead transmission line, through densely populated urban areas into Otahuhu would create significant environmental, property, political and financial risks to the projects success. It would also be likely to lead to unacceptable time delays in the project. The environmental process followed has identified that, due to these reasons, the closest distance that the 400 kV overhead line can approach to Otahuhu substation is 9 route kilometres.

An overhead line to underground cable transition station is planned to be constructed at this point, near Ormiston Road in South Auckland.

The cables would exit this transition station and, where practicable, be direct buried in public roads all the way into Otahuhu substation. In August 2005, Transpower

announced a preferred underground cable route for further consultation with affected parties. A map of the preferred underground cable route is attached as Appendix IC.

Transpower would need to secure approvals under the Resource Management Act for the cable route by way of designation.

2.4 400/220 kV Substations

The proposed investment includes two new 3-phase, 500 MVA, 400/220 kV interconnector transformers at a new Whakamaru North substation (WHN) and two new 3-phase, 500 MVA, 400/220 kV interconnector transformers at the existing Otahuhu substation (OTA) to terminate the 400 kV line and provide interconnection to the existing transmission system.

The switching arrangement for the new 400 kV substations at Otahuhu and Whakamaru North will be breaker and a half configuration.

2.4.1 Design parameters

The anticipated key parameters for the 400/220 kV substations are as provided below in Table 2-3:

Item	Value
Substation Type	400 kV (OTA): Outdoor Air Insulated Switchgear or Indoor Gas Insulated Switchgear (to be confirmed) 400 kV (WHN): Outdoor Air Insulated Switchgear or Indoor Gas Insulated Switchgear (to be confirmed) 220 kV (OTA): Outdoor Air Insulated Switchgear or Indoor Gas Insulated Switchgear (to be confirmed) 220 kV (WKM): Outdoor Air Insulated Switchgear
Substation arrangement switching	400 kV (OTA): 1 ½ breaker 400 kV (WHN): 1 ½ breaker 220 kV (OTA): 1 ½ breaker
System voltage	220 kV and 400 kV Nominal 245 kV and 420 kV Maximum
No. of transformers	2 at each site
Transformer rating	500 MVA, 400/220 kV, 3-phase
No. of shunt reactors	2 (one on each circuit)
Shunt reactor rating at Otahuhu	75 Mvar, 400 kV, 3-phase

Table 2-3: Anticipated Key Design Parameters for 400/220kV Terminal Stations

2.4.2 Whakamaru North Substation

A new substation site will be developed at Whakamaru North to accommodate the new 400/220 kV interconnection facilities and to provide for future 400 kV expansion

if required. The new 400/220 kV substation will be constructed approximately 1 km to the North of the existing 220 kV substation to provide physical separation from the existing switchyard. Two 220 kV tie-lines will be established to connect the output of the 400/220 kV interconnector transformers to the existing Whakamaru 220 kV bus.

The new substation will be designed to provide the necessary number of connections at 400 kV to the two new circuits and interconnector transformers. Provision will be made for the site to be expanded to ten 400 kV bays and nine 220 kV bays in the future if required.

Transpower plans to use outdoor air insulated switchgear at Whakamaru substation for the 220 kV but is still investigating indoor gas-insulated switchgear (GIS) versus air-insulated switchgear (AIS) for the 400 kV. A final decision will be made by December 2005.

2.4.3 Otahuhu Substation

A new 400/220 kV substation will be constructed at Otahuhu substation within the boundary of Transpower's existing substation and ancillary facilities.

In order to provide diversity of supply at Otahuhu substation, the 400/220 kV interconnector transformers will be connected to a new 220 kV busbar which is physically separate from the existing 220 kV bus. The existing 220 kV circuits from Otahuhu to Henderson and Penrose will be rearranged so that these key loads are supplied from both the existing and new 220 kV busses to achieve this diversity. Provision will also be made so that other key loads can be supplied from the extended 220 kV substation in the future. The new and existing sections of the 220 kV substations at Otahuhu will be interconnected by two tie-lines.

Transpower is still finalising its switchgear arrangements at OTA. It is likely that the 400 kV will be indoor GIS switchgear, and the 220 kV will be AIS switchgear. A final decision will be made by December 2005.

3 Project Plan

There are a significant number of activities and processes that need to be completed prior to, and during, the physical construction of the proposed investment. These form part of Transpower's project plan and are as follows:

3.1 Investigation Process

The investigation process has included all engineering and system planning work to identify the need for investment, identify all possible transmission options and non transmission alternatives and to select a preferred solution to provide long term security of supply into the upper North Island.

This process also includes environmental, property and engineering work required to investigate and select the preferred route corridor and investigate and select two 500m wide routes within that route corridor. It also includes consultation on the preferred routes and the preparation of the documentation required to lodge notices of requirement (in respect of the designation process).

3.2 Environmental Process

Since October 2004 Transpower has been following a public consultation process to gather information to assist in determining which of two 500 m wide route options will be selected as the preferred option.

An interim decision on a preferred route was announced on 14 May 2005, and the public were provided with a summary of the consultation process undertaken and the data on which Transpower based its decision. The public were invited to give submissions to Transpower (either written or oral) on this interim decision. Following review of these submissions, Transpower announced a final route on 19 July 2005 together with an indicative centre-line.

The final easement centre-line will be confirmed by late November 2005 and Transpower will prepare statutory Resource Management Act (RMA) documentation for Notice of Requirement (NoR) lodgement.

The NoR process depends on whether it is 'called in' by the Minister for the Environment. In the event that the NoR is 'called in', the Minister can either appoint a board of enquiry, or refer the matter directly to the Environment Court for consideration. Although 'call in' procedures are still being resolved by the Ministry for the Environment, this will affect notification and timeframes for submissions.

In the event it is not 'called in', the NoR when lodged with the applicable Councils must go through the public notification, recommendation and decision making process before it is confirmed as a designation. The key steps in the designation process are outlined in sections 168 to 179 of the RMA. As appropriate, the NoR documentation will be accompanied by applications for resource consents, which will need to be supported by detailed assessments of effects on the environment.

The designation process will offer a number of opportunities for people to become further involved in the process. Once the Councils have received the NoR, it will be publicly notified. Any member of the public then has 20 working days within which to lodge their support or opposition to the proposed transmission line (NoR).

A hearing will be held to consider the NoR and the Requiring Authority (Transpower) and all those who lodge a submission in support or opposition to the NoR can speak at the hearing. Submitters are able to speak their submission, and may also bring along someone to represent them, and/or present evidence on their behalf.

Following the hearing, the Councils will recommend to Transpower whether it thinks the NoR should be confirmed, should be confirmed with modifications and/or conditions; or should be withdrawn.

Transpower will then decide whether or not to accept the Councils' recommendation. Once the Councils have received Transpower's decision, it will serve a copy of the decision on all submitters as well as landowners and occupiers whose land is directly affected by the transmission line.

Anyone who lodged a submission, and the Councils, can appeal the decision or parts of the decision to the Environment Court within 15 working days of when the decision was sent out. A one-year timeframe has been estimated to resolve all Environment Court appeals, resulting in final statutory approval in March 2008.

Other approvals that may be required include Authorities under the Historic Places Act and permits/concessions where a line crosses Crown or Department of Conservation land, or reserve land. Building consents may also be required for relevant construction work coming under the Building Act 2004.

3.3 Property Rights Acquisition Process

The property acquisition process will commence in full following the determination of the final centre-line of the 400 kV transmission line in December 2005.

To build the proposed line, Transpower will need to secure an appropriate interest (usually an easement) in all properties the line will cross and pay fair compensation for this interest. The compensation will reflect any loss in value to the property arising from the presence of the new transmission line and associated easement that crosses it.

During earlier consultations, a number of landowners indicated that their preference would be to sell their property to Transpower rather than grant an easement. Transpower will consider buying properties that the proposed transmission line would cross on a case-by-case "willing buyer willing seller" basis.

For all property acquisitions (whether easement or property purchase), negotiations in good faith will be the key objective. However, it is anticipated that there will be a number of landowners where negotiations in good faith will not result in an agreement being reached. In the event this occurs, Transpower as a Requiring Authority will seek to use the compulsory acquisition processes within the Public Works Act 1981 to secure the necessary property right so that it can construct, operate and maintain the proposed line.

3.4 Engineer/Procure/Construct Process

This process will include all the detailed engineering design, procurement of all equipment, construction and commissioning of the project.

The project will be split into several implementation packages to provide programme flexibility, and to align the individual implementation packages with their related risks to ensure that these risks are placed where they are best managed. In general terms the implementation packages will all be “design/build” and there are likely to be four basic packages covering:

- The 400 kV overhead transmission line
- The 400/220 kV interconnecting transformers and associated substation works at OTA and WHN (including the overhead to underground transition station)
- The 400 kV underground cable
- The dismantling of relevant existing transmission lines.

The 400 kV overhead transmission line is the project critical path, and this is therefore the implementation package that will be most intolerant of project delays. In order to ensure that Transpower is able to secure the best engineering solution and commercial arrangement it sought an international registration of interest (ROI) during August 2005. The ROI process involves the receipt of detailed submissions, their evaluation, face to face interviews, reference checking (technical and commercial), and short listing. The ROI process closes in October 2005, with a short list for tendering to be determined by January 2006.

It is planned that short listed tenderers be asked to bid for an engineering, procurement and construction contract on 10 April 2006. The contract is planned to be awarded no later than 6 November 2006.

3.5 Critical Timeframes and Milestones

A project of the proposed investment’s magnitude would normally be expected to take a period of eight years from initial mobilisation to final commissioning. Transpower has identified that the proposed investment is required by May 2010 therefore all major project milestones are critical to the successful implementation of the proposed investment.

A summary of key milestones for each process is set out below and further highlighted in the bar chart in Figure 2-2.

3.5.1 Environmental & Property

- Preferred Route Announced: 19 July 2005
- Easement Centre Line Confirmed: December 2005
- Notice of Requirement (NoR - for a designation under the RMA) Lodged with Councils, or “called in” by the Minister for Environment: April 2006
- Designation Granted: March 2008
- Property Rights Secured: September 2008

3.5.2 Transmission Line Engineer/Procure/Construct

- Commencement of Registration of Interest & Short List: 31 August 2005 (completed)
- Commencement of Tender/Evaluation/Negotiation Process for Design/Procure/Construct: 10 April 2006
- Commencement of Design/Procure/Construct Process: 6 November 2006
- Final Commissioning: 27 May 2010

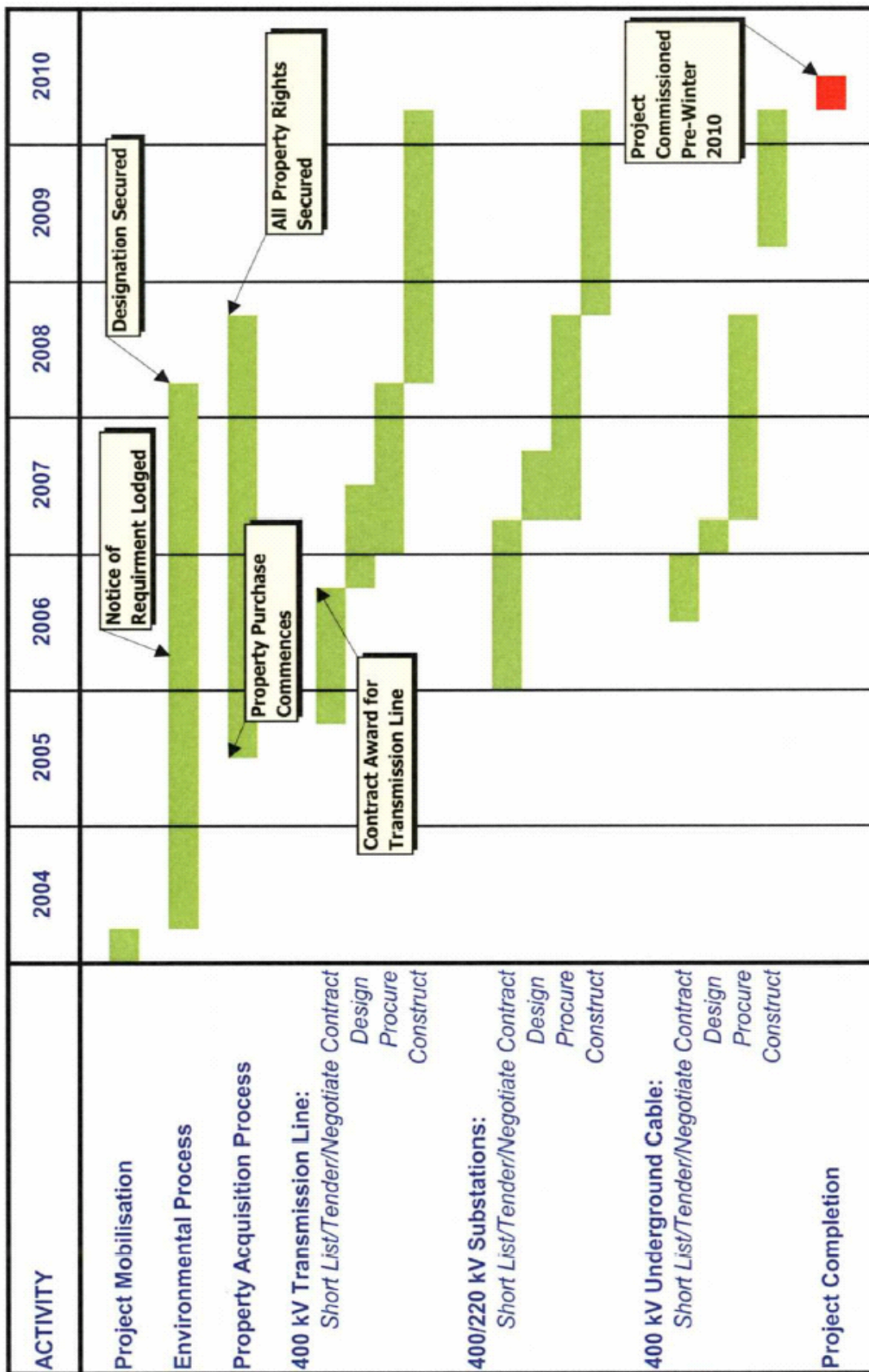
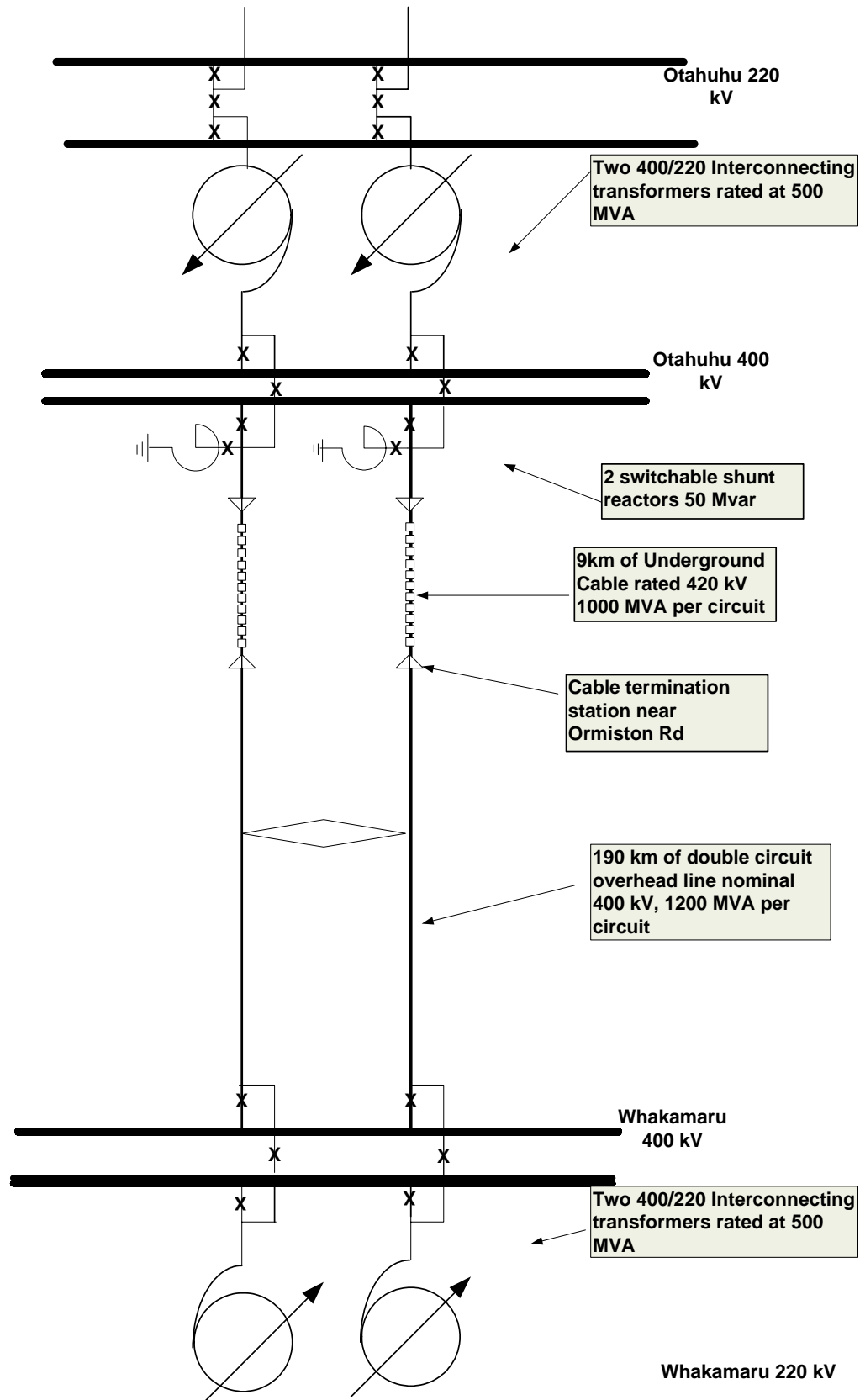
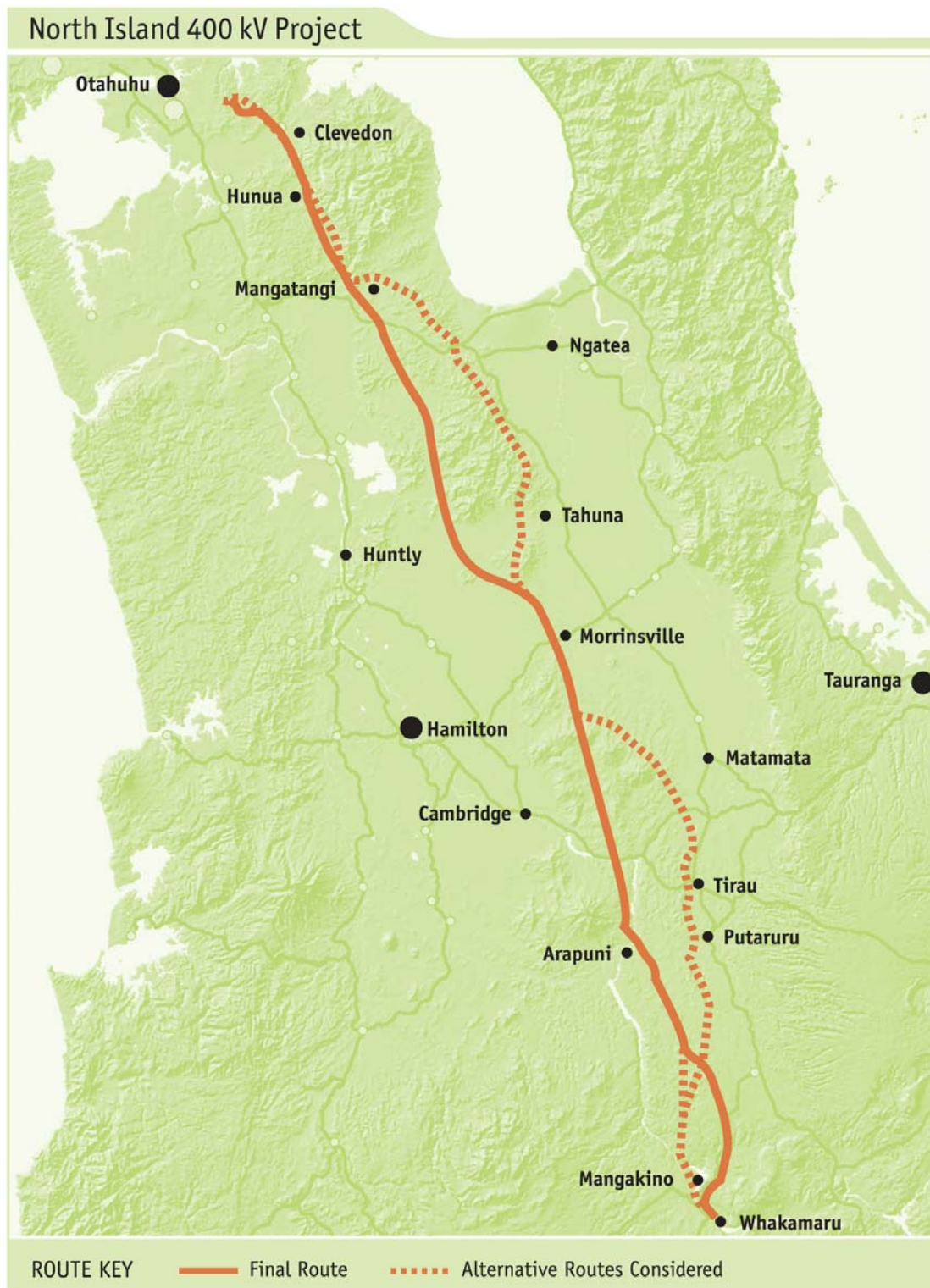


Figure 2-2: Key activity timeline

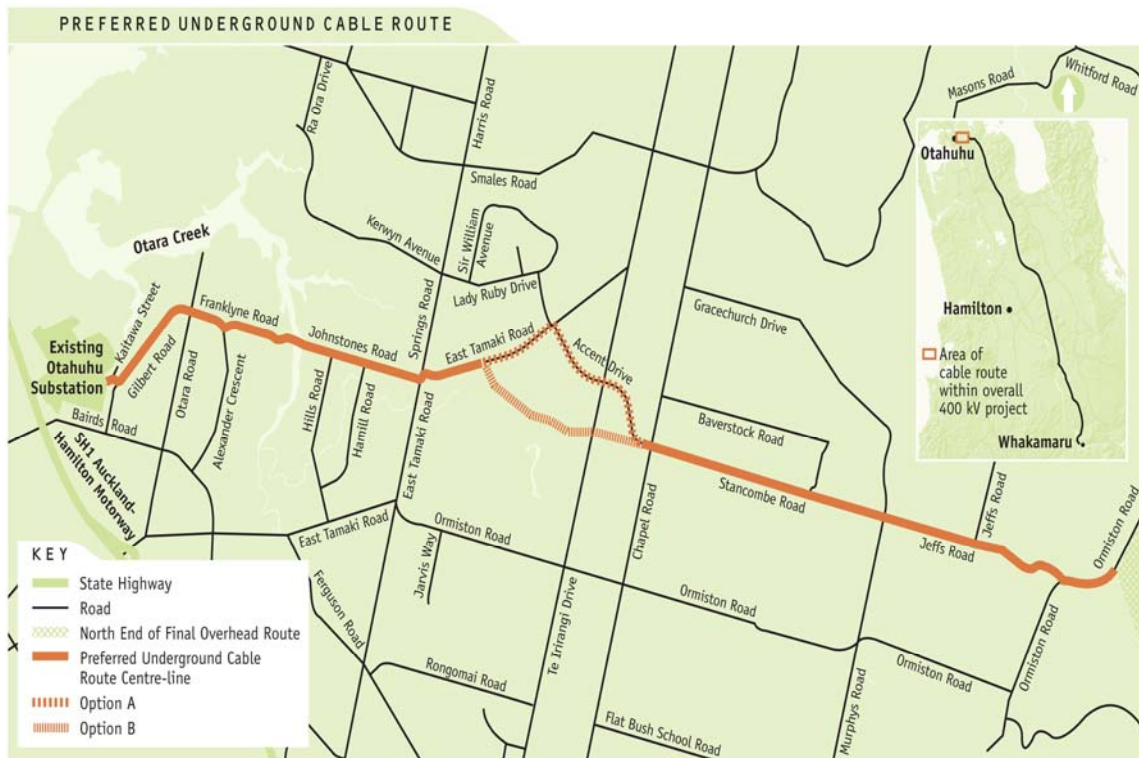
Appendix IA - Transmission Schematic of Project (Simplified)



Appendix IB - Map of Route Options



Appendix IC - North Island 400 kV Preferred Underground Cable Route



Appendix ID - North Island 400 kV Grid Upgrade Project Critical Path Timeline

Date	Action	Comment
31 May 2005	Lodge submission with Electricity Commission	Triggers EC process
15 July 2005	Commence "good faith" property rights acquisition negotiations	EC approval required prior to TP commitment to significant expenditure
13 April 2006	Lodge NoR Commence compulsory property rights acquisition	Requires Minister of Lands approval. Will almost certainly require unfettered approval by EC before Minister will "sign off"
3 Nov 2006	Award "Construction" contract	Needs to be conditional on designations and certainty of property rights acquisition. If there is uncertainty about the recovery of the cost of the risk of cancellation/delay then TP shareholders will need to underwrite.
28 Mar 2008	Designation granted Start "Field" construction	Requires designations to be granted and property right acquisition certainty to be in place (ie section 23 PWA)
25 Sept 2008	Property Rights secured	
27 May 2010	Commission 400 kV project	