

Schedule 11: Works Requirements

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Schedule 11: Works Requirements

Part 1 – General

1. Interpretation

- 1.1 Where there is any conflict in a requirement, standard, outcome or measure, between these Works Requirements, the Base Agreement, any other requirements, standard, outcome or measure in the Agreement, the RMA Conditions or any other document specifically relating to the P2Wk Project, the higher requirement, standard, outcome or measure will apply, provided that:
- (a) Appendix A (Technical Departures) will take precedence over Parts 2 to 4 of this Schedule 11; and
 - (b) Appendix B (Amendments to Design Philosophy Statement and Drawings) will take precedence over Appendix C (Design Philosophy Statement) and Appendix D (Drawings).
- 1.2 The distinction within this Schedule 11 between Works Requirements set out in Parts 2 to 4 of this Schedule 11 and the Contractor's Design Philosophy Statement is solely to set priority in the case of conflict between the Contractor's obligations. In all other parts of this Agreement, reference to Works Requirements is to the entirety of this Schedule 11. Further, except only where the context expressly requires, where reference to a Works Requirement is used as a cross referencing mechanism in this Schedule 11 that reference is to the entirety of that Works Requirement, including all related aspects of the Contractor's Design Philosophy Statement.

1.3 Definitions

In addition to the definitions set out in clause 1 (Definitions) of the Base Agreement:

ATCOP means the Auckland Transport Code of Practice;

Bridge means a Structure designed to carry a road or a path over an obstacle by spanning it;

Crime Prevention through Environmental Design is a crime prevention strategy that uses the knowledge that criminal behaviour can be influenced by the design of the physical environment to ensure that design, redesign, maintenance and/or management of physical environments is done in such a way that opportunities for criminal or anti-social activity are reduced and personal safety and perceptions of safety are improved;

Culvert means one or more adjacent pipes or enclosed channels for conveying surface water or a stream below formation level;

Dam Safety Guidelines means the New Zealand Dam Safety Guidelines, 2015 – New Zealand Society on Large Dams;

Design Philosophy Statement or **DPS** means the document set out in Appendix C (Design Philosophy Statement);

Guide to Pavement Technology means the manual of that name referred to in the Austroads guides;

Greenroads™ rating system means the points-based rating system made available by the Greenroads Foundation to certify sustainable transportation infrastructure projects;

Highway Classification System means the system utilised by the Transport Agency to classify State highways, details of which can be found on the Transport Agency’s website;

Horizontal Alignment is usually a series of straights (tangents) and circular curves that may or may not be connected by transition curves;

Limit State means the state beyond which the element no longer satisfies the intended design criteria;

Location Referencing Management System Manual means the location referencing management system (LRMS) manual (Manual No. SM051) as published by the Transport Agency;

Major Culvert means a Structure that is a Culvert with a waterway with a cross-sectional area greater than 3.4m²;

NZ Supplement means the NZTA 2007 “New Zealand Supplement to the Document, Pavement Design – A Guide to the Structural Design of Road Pavements (Austroads 2004)”;

Over-dimension Load means a motor vehicle that, with its load, exceeds the dimension limits set out in Section 6 of the Vehicle Dimensions and Mass Rule 2002;

Overweight Load means a heavy motor vehicle that, with its load, exceeds the mass limits set out in Section 4 of the Vehicle Dimensions and Mass Rule 2002;

PTZ means pan tilt zoom;

Regional Strategic Route has the meaning given to it in the Highway Classification System;

Safer Journeys means the Ministry of Transport, “NZ Safer Journeys - New Zealand’s Road Safety Strategy 2010 – 2020”;

Test Level 4 means test level 4 in accordance with the United States National Cooperative Highway Research Program Report 350, “Recommended Procedures for the Safety Performance of Highway Features” - Transportation Research Board (NCHRP350);

TM-2501 means NZTA Technical Memorandum TM-2501 “Superelevation Calculations”;

TM-2502 means NZTA Technical Memorandum TM-2502 “Preferred Method for calculating road surface water run-off in New Zealand”;

TM-2503 means NZTA Technical Memorandum TM-2503 “Guidelines for Edge Protection and Medians on Dual Carriageway Roads, incorporating a Safe System Philosophy”; and

Vertical Alignment means the longitudinal profile along the centreline of the road, which is made up of a series of grades and vertical curves.

2. Overall Requirements

2.1 Works Requirements

- (a) The Contractor must comply with all Works Requirements set out in Parts 2 to 4 of this Schedule 11 and Appendix C (Design Philosophy Statement) of this Schedule 11.

- (b) In relation to all Works Requirements, the Contractor must comply with the requirements of the following (in the order of priority listed) when satisfying the Works Requirements:
- (i) all Laws;
 - (ii) the RMA Conditions;
 - (iii) all applicable requirements of the New Zealand Building Code; and
 - (iv) except to the extent a Works Requirement directly conflicts (in which case the Works Requirement prevails) (in the order of priority listed):
 - (A) Transport Agency manuals, specifications and notes, technical memoranda and standards drawings (including without limitation the Bridge Manual);
 - (B) Auckland Transport specifications, manuals, standards and guidelines;
 - (C) Austroads; and then
 - (D) all applicable AS/NZS standards.

2.2 **Overriding Outcomes**

The Contractor must ensure that the P2Wk Project in its entirety is designed and constructed to:

- (a) enable the Service Requirements to be delivered; and
- (b) achieve the Objectives.

2.3 **RMA Conditions**

- (a) The Contractor must comply with the RMA Conditions.
- (b) Except as other specified in the Enabling Works Plan, the Contractor must comply with all RMA Conditions as if the definition of “Construction Works” (and all references to “construction” or “construction works”) applied to all activities undertaken to construct the Project, and did not exclude “Enabling Works” (as defined in the RMA Conditions).
- (c) The Contractor must comply with the Enabling Works Plan in respect of all activities that it seeks to carry out as Enabling Works.

2.4 **Urban and Landscape Design Framework**

The Contractor must design and construct the Project in accordance with the Urban and Landscape Design Framework to meet Designation Condition D26; that is to appropriately integrate the permanent works into the surrounding landscape and topography, having regard to the local landscape character and contexts along the highway route.

2.5 **Road Safety**

The Contractor must design and construct the P2Wk Project in accordance with Safer Journeys and utilising a Safe System approach. The Contractor must also design and construct the P2Wk Main Alignment to meet or exceed a four star KiwiRAP rating.

2.6 Greenroads

The Contractor must design and construct the P2Wk Roads to achieve, as a minimum, a Silver certification under the Greenroads™ rating system.

2.7 Design Working Life Expectancy

The Contractor must ensure that the design working life of the works elements of the P2Wk Roads from the Service Commencement Date is not less than that stated in this Schedule 11. Where the required design working life for a particular works element is not specified, the Contractor must ensure that the design working life of that particular works element is the appropriate industry standard for the road classification to which that works element relates.

2.8 Third Party Property Agreements and Neighbour Agreements

The Contractor must:

- (a) ensure that all works the Transport Agency has agreed to undertake under each of the Third Party Agreements and Neighbour Agreements are undertaken in accordance with requirements of the relevant Third Party Agreement or Neighbour Agreement (as the case may be), including as to communication, liaison, timing, scheduling and materials; and
- (b) ensure that it protects land value by ensuring that Surplus Land is not landlocked and that resale values for the Transport Agency are not otherwise unreasonably reduced as a result of the Contractor’s actions. However, notwithstanding the foregoing, the Contractor will not be required to prevent a property from being landlocked where Schedule 5 (Property) permits such property to remain landlocked on return to the Transport Agency.

Part 2 – Roading

3. Road layout and geometrics

3.1 Road layout

- (a) The extent of the works on the State highway network will be as follows:

<i>Extent of works on State highway network</i>	
Northern Connection	Kaipara Flats Road intersection
Southern Connection	Northern Portals of Johnstone’s Hill Tunnels
Existing northbound carriageway of State highway 1 (SH1) between the northern tunnel portal and the southern abutment of the Waiwera Bridge	The existing carriageway will be remarked as a 2 lane carriageway

- (b) The Contractor must ensure that, as a minimum, the roading making up the Project incorporates the following:
 - (i) for the P2Wk Main Alignment, a minimum of four traffic lanes (two in each direction), median divided carriageway, with a design speed of 100 km/hr (except where otherwise specified in the Works Requirements), suitable for gazetting by the Transport Agency as a motorway, must be provided tying into the existing SH1 at the northern end between Kaipara Flats Road and Hudson

Road and the existing SH1 at the southern end at the northern portals of the Johnstone's Hill Tunnels. The connections with SH1 must take into consideration the existing Horizontal Alignment, Vertical Alignment and cross section at each end;

- (ii) an upgrade to the intersection of SH1 and Kaipara Flats Road, in accordance with Designation Condition D70A;
 - (iii) for the existing SH1 between the P2Wk Main Alignment northern terminus intersection and Kaipara Flats Road, a design speed of 100 km/hr must be provided;
 - (iv) for the existing SH1 east of the P2Wk Main Alignment northern terminus intersection, and extending to Hudson Road, a minimum design speed of 80 km/hr must be provided; and
 - (v) for the P2Wk Main Alignment, all crossings of Local Roads will be stopped or must be grade separated as follows:
 - (A) Woodcocks Road must be grade separated;
 - (B) Carran Road must be grade separated;
 - (C) Wyllie Road must be grade separated;
 - (D) the portion of Perry Road that crosses the designation will be stopped;
 - (E) Moir Hill Road must be grade separated;
 - (F) the portion of Cook Road that crosses the designation will be stopped;
 - (G) Pūhoi Road must be grade separated; and
 - (H) the portion of the unformed Billing Road beneath and west of the consented Okahu Viaduct envelope will be stopped.
 - (vi) the Pūhoi connections as required by Designation Condition D1; and
 - (vii) for connection(s) between the existing SH1 carriageway south of Billing Road and Hibiscus Coast Highway, the northbound and southbound connection(s) between Billing Road and Fowler Access Road must be grade separated if in the final layout either cross the P2Wk Main Alignment; and
 - (viii) no additional connections to the P2Wk Main Alignment will be permitted.
- (c) The structure(s) over the Okahu Inlet must be located in accordance with Resource Consent Condition RC69AA, and must be consistent with the requirements of the Pā Management Plan.

3.2 Road design

The Contractor must ensure that, as a minimum, the road design for the P2Wk Roads delivers the following outcomes:

- (a) a Horizontal Alignment that complies with TM-2503, TM-2501 and Austroads;
- (b) a Vertical Alignment that complies with TM-2503 and Austroads. In particular:

- (i) steep gradients both ascending and descending must be assessed for impacts on heavy commercial vehicle performance. Crawler lanes, brake check and rest areas or arrester beds must be provided as necessary to achieve the Objectives and the requirements of Schedule 13 (Performance Regime);
 - (ii) the P2Wk Main Alignment and interchange Ramps carriageways must have a minimum vertical clearance of 6.1m (excluding any required allowance for settlement of the overhead structures during their design service life for Local Roads);
 - (iii) minimum vertical clearances over Local Roads must be:
 - (A) 6.1m for Woodcocks Road;
 - (B) 6.1m for Carran Road;
 - (C) 5.5m for Wyllie Road;
 - (D) 5.5m for Moir Hill Road;
 - (E) 6.1m for Pūhoi Road; and
 - (F) 6.1m for the Hibiscus Coast Highway connections;
 - (iv) co-ordination of the Horizontal Alignment, the Vertical Alignment and the highway surface drainage that avoids the occurrence of aquaplaning and flooding on the carriageway in accordance with TM-2502;
- (bA) cross section widths, slopes and side protection, including the median and any median barriers, that are designed in accordance with TM-2503, Transport Agency specification M/23 and Austroads, except that:
- (A) for the P2Wk Main Alignment, the minimum left hand shoulder width must be 3.0m (but refer also to paragraph 18.4(f) of this Schedule 11);
 - (B) for the P2Wk Main Alignment, a continuous Test Level 4 wire rope edge barrier systems must be provided, located a minimum of 3.5m from the adjacent traffic lane edge and widened as necessary for sight distance;
 - (C) median barriers must be continuous Test Level 4 wire rope barrier systems, except where required to ensure safe carriageway connections for use by emergency services and in constrained locations or where assessment of the contexts concludes that concrete barrier protection of Test Level 4 or higher is required. The Contractor must submit details for approval by the Transport Agency; and
 - (D) a minimum median width of 6.0m must be used;
- (c) superelevation, warp rates and camber that are designed in accordance with TM-2501, TM-2503 and Austroads. In addition:
- (i) maximum superelevation for the P2Wk Main Alignment must be 6.0%;
 - (ii) superelevation of the P2Wk Main Alignment horizontal curves must be designed to a minimum design speed of 110 km/hr; and

- (iii) all P2Wk Main Alignment horizontal curves with radii less than 3700m must be superelevated;
- (d) sight distances that are designed in accordance with TM-2503 and Austroads. In addition:
 - (i) a reaction time of 2.5 seconds must be used on all Local Roads and State highways, including the P2Wk Main Alignment; and
 - (ii) longitudinal coefficient of deceleration must be:
 - (A) $d=0.26$ for the P2Wk Main Alignment; and
 - (B) $d=0.36$ for all other roads;
- (e) all intersections must be designed in accordance with Austroads;
- (f) interchange Ramps must be constructed incorporating operational ramp metering;
- (g) vehicle underpasses, where included with respect to the passage of State highway or Local Road traffic, that comply with the requirements of the Bridge Manual and Austroads;
- (h) lighting of the new State highway in accordance with Designation Condition D75, and in particular:
 - (i) all interchanges and channelised intersections must be lit to a minimum lighting category of V3;
 - (ii) all new lighting installations must be LED type luminaires;
 - (iii) where installing new lighting at an intersection or interchange, the Contractor must replace all existing non-LED lighting with the same new lighting; and
 - (iv) existing SH1 lighting levels north of the Johnstone's Hill Tunnel Portals must be maintained on P2Wk Main Alignment for a minimum of 400m;
- (i) the geometric design must satisfy the following:
 - (i) the geometric layout of the P2Wk Main Alignment, interchanges, ramp terminal intersections and the P2Wk Main Alignment northern terminus is designed using an 18m quad axle semi-trailer (as described in Land Transport New Zealand publication RTS18 New Zealand on-road tracking curves for heavy vehicles, August 2007) design vehicle that must not encroach into adjacent traffic lanes. The Contractor must also utilise a check vehicle that is a 25m long HPMV that must not cross into opposing traffic lanes; and
 - (ii) for other Local Road intersections the selection of design tracking vehicles must be as defined in section 7.5.2 of the ATCOP.

3.3 Local Road specific requirements

- (a) Woodcocks Road which has a 'secondary arterial' classification under ATCOP and must:
 - (i) have a minimum design speed of 80 km/hr;

- (ii) have a minimum lane width of 3.5m;
 - (iii) have a minimum shoulder width of 0.5m, except where a bridge is to be constructed over the P2Wk Main Alignment, in which case the minimum shoulder width on the structure and approach embankments must be 2.0m;
 - (iv) not preclude future pedestrian or cycle facilities, except where a bridge is to be constructed over the P2Wk Main Alignment, in which case a 1.8m wide footpath located on each side must be constructed on the structure and approach embankments; and
 - (v) not contain any P2Wk Main Alignment Bridge abutment or pier formations within 10m of the proposed Woodcocks Road centreline;
- (b) Carran Road has a 'collector road' classification under ATCOP and must:
- (i) have a minimum design speed of 80 km/hr;
 - (ii) have a minimum lane width of 3.5m;
 - (iii) have a minimum shoulder width of 0.5m, except where Carran Road connects to a Woodcocks Road alignment that bridges over the P2Wk Main Alignment, in which case the minimum shoulder width must be 1.5m;
 - (iv) not preclude future pedestrian or cycle facilities, except where Carran Road connects to a Woodcocks Road alignment that bridges over the P2Wk Main Alignment, in which case a 1.8m wide footpath must be constructed on each side of Carran Road; and
 - (v) not contain any P2Wk Main Alignment Bridge abutment or pier formations within 10m of the proposed Carran Road centreline;
- (c) Wyllie Road has a 'local road' classification under ATCOP and must:
- (i) have a minimum design speed of 80 km/hr if it passes beneath the P2Wk Main Alignment and 60 km/hr if it passes over the P2Wk Main Alignment;
 - (ii) have a minimum lane width of 3.5m;
 - (iii) have a minimum shoulder width of 0.5m;
 - (iv) not contain any P2Wk Main Alignment Bridge abutment or pier formations over Wyllie Road:
 - (A) within the existing road reserve if the Horizontal Alignment is unchanged; or
 - (B) within 10m either side of the realigned Wyllie Road centreline;
 - (v) not preclude future pedestrian or cycle facilities except where a Bridge is to be constructed over the P2Wk Main Alignment, in which case a footpath of 1.8m width must be provided on one side of the structure; and
 - (vi) be sealed in accordance with Resource Consent Condition RC43(b);
- (d) Moir Hill Road has a 'local road' classification under ATCOP and must:

- (i) have a minimum design speed of 50 km/hr;
 - (ii) have a minimum lane width of 3.5m;
 - (iii) have a minimum shoulder width of 0.5m;
 - (iv) not preclude future pedestrian or cycle facilities except where a Bridge is to be constructed over the P2Wk Main Alignment, in which case a footpath of 1.8m width must be provided on one side of the structure; and
 - (v) be sealed in accordance with Resource Consent Condition RC43(a);
- (e) Pūhoi Road has a 'collector road' classification under ATCOP and must:
- (i) have a minimum design speed of 80 km/hr;
 - (ii) have a minimum lane width of 3.5m;
 - (iii) have a minimum shoulder width of 0.5m; and
 - (iv) not preclude future pedestrian or cycle facilities;
- (f) The existing SH1 carriageway south of Billing Road must connect with Hibiscus Coast Highway. The connection(s) between Billing Road and Fowler Access Road must have an 'arterial road' classification under ATCOP and must:
- (i) have a minimum design speed of 80 km/hr;
 - (ii) provide a minimum of one lane in each direction;
 - (iii) have a minimum lane width of 3.5m; and
 - (iv) have a shoulder width of 2.5m to cater for cyclists where practical, and a minimum shoulder width of 1.5m;
- (g) Where the following Local Roads have been realigned and are either partly or wholly located outside the legal road reserve the Contractor must meet all necessary legal requirements to provide a 20m minimum width road reserve centred on the final road centreline for the length of the realignment, in respect of:
- (i) Woodcocks Road;
 - (ii) Carran Road;
 - (iii) Wyllie Road; and
 - (iv) Moir Hill Road.

4. Traffic Integration

4.1 The Contractor must ensure:

- (a) that all P2Wk Roads traffic integrates safely and efficiently with the connecting road network;

- (b) that, in terms of the Highway Classification System, the P2Wk Main Alignment is capable of classification as a 'National Strategic High Volume Route' and the connections to the existing SH1 between Kaipara Flats Road and Hudson Road must be classified as a Regional Strategic Route (with a lower inferred level of service);
- (c) residents of Billing Road are able to gain access to Billing Road when travelling southbound on the Hibiscus Coast Highway (existing SH1); and
- (d) all connections from the existing SH1 carriageway and the Hibiscus Coast Highway between Tiffords Bridge and Fowler Access Road must be located within the existing State highway designation.

5. Pavements and surfacing

5.1 The Contractor must:

- (a) ensure all pavements are designed, constructed and maintained (during the construction period) to ensure safety and ride quality and to support the overriding outcomes set out in paragraph 2.2 of this Schedule 11; and
- (b) apply appropriate pavement design loadings;
- (c) ensure its design methodology complies with the Guide to Pavement Technology as modified by the NZ Supplement;
- (d) ensure that the full pavement structural depth extends beneath all sealed shoulders;
- (e) ensure that the pavement surfacing for the P2Wk Main Alignment complies with Designation Condition D71;
- (f) ensure that the pavement design life for altered sections of the existing SH1 carriageway and Local Roads is a minimum of 25 years from the Service Commencement Date; and
- (g) ensure that materials for Auckland Transport Local Road pavements are in accordance with the relevant Auckland Transport standards and guidelines.

6. Road safety barrier systems

6.1 The Contractor must ensure that all road safety barriers systems:

- (a) comply with the Transport Agency specification M/23 for Road Safety Barrier Systems and TM-2503;
- (b) provide a minimum Test Level 4 (noting that Test Level 4 concrete F-shape barriers must be 915mm high);
- (c) comply with paragraph 3.2(b)(bA) of this Schedule 11; and
- (d) where a safety barrier system is required to shield a non-frangible hazard, 'Vehicle roll allowance' of 1.1m must be provided where the hazard is protected by a rigid concrete barrier. 'Vehicle roll allowance' as defined in Table 6.8 of Austroads GRD Part 6 must only be used where the hazard is protected by a semi-rigid or flexible barrier system.

7. Signs, delineation and pavement marking

- 7.1 The Contractor must ensure that the design and construction of the Project provides every road user with safe and effective continuous guidance.
- 7.2 The Contractor must ensure that all traffic signs, delineation and pavement markings are designed in accordance with:
- (a) the Land Transport Rule: Traffic Control Devices 2004 and subsequent amendments;
 - (b) the Traffic Control Devices Manual;
 - (c) the Manual of Traffic Signs and Markings (**MOTSAM**); and
 - (d) be consistent with the relevant Auckland region local policy guidelines.
- 7.3 The P2Wk Main Alignment must have a posted speed limit of 100 km/h. The Contractor must be responsible for upgrading as necessary of all existing motorway signage located beyond the P2Wk Project extent.
- 7.4 The Contractor is responsible for the development and implementation of a strategy for the replacement of the adjacent route advisory and destination signage across the wider State highway and Local Road network affected by the P2Wk Project.

8. Intelligent Transport Systems and traffic monitoring stations

- 8.1 The Contractor must:
- (a) ensure that the Contractor's design and construction in respect of the Project does not jeopardise the continuous operation of all existing Johnstone's Hill Tunnel assets throughout, including but not limited to;
 - (i) the tunnel utilities building;
 - (ii) traffic signals;
 - (iii) barrier arms;
 - (iv) over height detection system; or
 - (v) traffic monitoring systems including, CCTV cameras, VMS signage, and other ITS infrastructure.
 - (b) provide Users with sufficient information throughout the extent of the Project Site to ensure Users are provided with suitable advance warning of any events that may impact their journey. In particular, the Contractor must provide:
 - (i) VMS at all interchanges and key decision points for traffic management purposes. All VMS signage must be a minimum of Regional 4 line (300mm character height) full matrix free text capable or Motorway standard as applicable and be operational from ATOC;
 - (ii) internet protocol (**IP**) web cameras at all interchanges and key decision points for traffic management purposes; and

- (iii) where appropriate, vehicle over-height detection and warning systems;
- (c) provide CCTV monitoring incorporating PTZ cameras providing full area wide coverage of the P2Wk Main Alignment and at all interchanges with a continuous (24/7) live connection (all digital and visual data) available to the ATOC, and a quality image that allows the ability to identify number plates of stationary vehicles;
- (d) provide continuous traffic monitoring stations:
 - (i) on SH1 between Kaipara Flats Road and the intersection of the P2Wk Main Alignment;
 - (ii) between the intersection of the P2Wk Main Alignment and Hudson Road; and
 - (iii) between the intersection of SH1 and the P2Wk Main Alignment; and Pūhoi interchange and on all Ramps on and off the P2Wk Main Alignment,

using technology that provides an equivalent or better level of accuracy in comparison with that usually achieved by dual loop continuous telemetry traffic monitoring stations. Each such monitoring station must:

- (iv) report back to the NZ Transport Agency Traffic Monitoring System and ATOC; and
- (v) be consistent with the Traffic Monitoring Method;
- (e) provide as either a standalone system or integrated within another system:
 - (i) a wrong way detection system at all P2Wk Main Alignment intersections, interchange Ramps and turnaround points; and
 - (ii) a pedestrian and cyclist detection system at all P2Wk Main Alignment entrances and interchange Ramps;
- (f) provide emergency telephones at regular intervals not greater than 1km apart. Emergency telephones must be located to avoid the need to cross any carriageway, incorporating safe access and be conspicuous both day and night.

9. Tolling

9.1 The Contractor must:

- (a) make provision for an electronic toll gantry to be installed at the Transport Agency's discretion, spanning both north and southbound carriageways of the P2Wk Main Alignment within its earthworks and roadside features design;
- (b) locate the toll gantry between the Pūhoi interchange and Wyllie Road; and
- (c) include sufficient space for a toll gantry utilities building and maintenance and operational access.

10. Utilities

10.1 Utilities

- (a) The Contractor must ensure that suitable provision is made for utilities for current and future use, for both roading requirements and commercial requirements.
- (b) In addition to making suitable provision for utilities that the Contractor considers necessary for performance of the Service Requirements, the Contractor must also provide:
 - (i) dedicated for traffic monitoring services provided by ATOC and for the Transport Agency's use at its sole discretion:
 - (A) four continuous 100mm diameter ducts and two continuous 150mm diameter ducts along the full length of the P2Wk Main Alignment and extending to Kaipara Flats Road. One of the ducts is to be sub-ducted in accordance with NZTA Specification ITS-02. Each duct must contain an appropriate draw cable. At the southern end of the project the ducts must connect to the existing NZTA ITS ducting at Johnstone's Hill Tunnel; and
 - (B) continuous fibre optic cabling capable of transmitting ultra fast broadband. The fibre optic cable must be installed in accordance with NZTA Specification ITS-02-03, and must be located within 10m of the P2Wk Main Alignment carriageway. At the northern end of the project the fibre optic cable must connect with the existing Chorus fibre optic network at Hudson Road to allow diverse routing of ITS data. At the southern end of the project the fibre optic cable must connect to the existing NZTA fibre optic cable at the Tunnel's utility building and into the OptaSense power head at the Tunnel's utility building;
 - (ii) the Transport Agency with access to each such Transport Agency-dedicated duct, through concrete duct utility chambers not less than every 500m, with all primary chambers (being no more than 1000m apart) being of sufficient size to draw and splice cables and having removable man-hole covers.
- (c) The Contractor must provide the Transport Agency with safe access to the Transport Agency-dedicated ducts at the utility chambers without any Lane closures being required.
- (d) The Contractor must ensure all utilities are suitably protected in situ or relocated.
- (e) The Contractor must provide for Chorus the following provisions to relocate their existing infrastructure:
 - (i) on SH1 between Kaipara Flats Road and Hudson Road, 2 x 100mm diameter ducts;
 - (ii) on Wyllie Road, 1 x 100mm diameter duct either buried or within any Bridge structure crossing over the P2Wk Main Alignment and for the full length of any road upgrade; and
 - (iii) on Moir Hill Road, 1 x 100mm diameter duct across the Bridge structure.

Each new duct must contain an appropriate draw cable.

- (f) The Contractor must provide for Vector the following provisions to relocate their existing electrical infrastructure:
- (i) on Wyllie Road, 1 x 100mm diameter duct either buried or within a Bridge structure crossing over the P2Wk Main Alignment and for the full length of any road upgrade; and
 - (ii) on Moir Hill Road, 1 x 100mm diameter duct across the Bridge structure.

Each new duct must contain an appropriate draw cable.

- (g) The Contractor must at all times comply with the requirements set out in the National Code of Practice for Utility Operators' Access to Transport Corridors.
- (h) The Contractor must provide for the benefit of Vodafone New Zealand Limited the following additional infrastructure:
- (i) one continuous 100mm diameter duct from Pūhoi Road, continuing along the P2Wk Main Alignment extending to Kaipara Flats Road. The duct must contain an appropriate draw cable;
 - (ii) access to the Vodafone-dedicated duct, through concrete duct utility chambers not less than every 500m, with all primary chambers (being no more than 1000m apart) being of sufficient size to draw and splice cables and having removable man-hole covers; and
 - (iii) the Contractor must provide Vodafone with safe access to the Vodafone-dedicated duct at the utility chambers without any Lane closures being required.
- (i) The Contractor must provide for the benefit of Chorus the following additional infrastructure:
- (i) one continuous 100mm diameter duct along existing SH1 between Kaipara Flats Road and Hudson Road. The duct must contain an appropriate draw cable; and
 - (ii) access to the Chorus-dedicated duct, through concrete duct utility chambers not less than every 500m, with all primary chambers (being no more than 1000m apart) being of sufficient size to draw and splice cables and having removable man-hole covers.

11. Shared use paths, pedestrians and cyclists

11.1 The Contractor must:

- (a) ensure no pedestrians or cyclists are permitted on the P2Wk Main Alignment; and
- (b) construct an off-road cycle path, including crossings as necessary, no less than 3m wide, within the channelised extent of the P2Wk northern intersection with SH1 between Kaipara Flats Road and Hudson Road in order to permit safe use by cyclists travelling north and south.

11.2 **Moirs Hill Walkway:** If required by the Transport Agency, the Contractor shall prepare a design for a suitable walking track which lies wholly within the designation and connects the lengths of the walkway to the west and east of the designation which would otherwise be severed, in accordance with Designation Condition D70AA and the subsequent agreement dated 17 February 2015 between The Director-General of Conservation and the Transport

Agency and shall construct such walking track connection if approved by the Transport Agency.

- 11.3 **Te Araroa Walkway:** The Te Araroa Walkway commencing from Domain Road, Pūhoi in part follows the route of the unformed Cook Road. If the Contractor uses any part of Cook Road adjacent to the walkway for any purpose then the Contractor must first:
- (a) construct a 7 wire stock fence along the walkway and within the Cook Road boundaries to separate the walkway from construction activities; and
 - (b) provide a minimum walkway width of 2.0m between fences and ensure that such access is maintained.

12. Emergency Services and Maintenance Access Facilities

12.1 The Contractor must provide:

- (a) a gated, sealed connection between both the northbound and southbound carriageways of the P2Wk Main Alignment and the Hibiscus Coast Highway suitable for use under a temporary traffic management plan for the purpose of diverting traffic around the Johnstone's Hill Tunnels and for use by emergency services. Gate systems will be continuously monitored by ATOC, and must be equipped with CCTV and remote activation systems (for use by, and connected to, ATOC);
- (b) a gated, sealed connection to the northbound carriageway of the P2Wk Main Alignment near Pūhoi Road suitable for use by emergency services. Gate systems will be continuously monitored by ATOC, and must be equipped with CCTV and remote activation systems (for use by, and connected to, ATOC);
- (c) safe cross-carriageway connections for use by emergency services at regular intervals of 4 – 6 km along the P2Wk Main Alignment and at the northern portal of the Johnstone's Hill Tunnels maintain the existing median cross over facility;
- (d) details of how the Contractor intends to manage fire risk arising as a result of its design and construction of the Project in consultation with the NZ Fire Service;
- (e) traffic enforcement bays on the P2Wk Main Alignment in both directions for use by the New Zealand Police. The locations must be ascertained by the Contractor through discussion with the Transport Agency and the New Zealand Police. The layout must be such that police personnel and any vehicle occupants are protected by a safety barrier from the live traffic lanes of the P2Wk Main Alignment; and
- (f) for other emergency services requirements following consultation with the appropriate emergency services.

13. Overweight and over-dimension motor vehicles

13.1 The Contractor must:

- (a) allow for Overweight Loads and Over-dimension Loads in its design and construction of:
 - (i) the P2Wk Main Alignment; and
 - (ii) the existing SH1 (including all Bridges, Culverts, interchanges and intersections) and all associated facilities between:

- (A) Kaipara Flats Road and Hudson Road; and
 - (B) the Hibiscus Coast Highway connections to SH1 between Titfords Bridge and Fowler Access Road;
- (b) provide an envelope for Over-dimension Loads of not less than 6.0m vertical clearance and not less than 10m horizontal clearance along:
- (i) each P2Wk Main Alignment carriageway;
 - (ii) all interchange Ramps;
 - (iii) SH1 between Kaipara Flats Road and Hudson Road intersection; and
 - (iv) the Hibiscus Cost Highway connections to SH1 between Titfords Bridge and Fowler Access Road.

14. Location referencing

- 14.1 The Contractor must comply with the requirements of the Location Referencing Management System Manual in all respects (including Bridge information system structure numbering for all Bridges, Major Culverts and with respect to location referencing).

15. Drainage / Stormwater Management

- 15.1 The Contractor must:
- a) design and construct a total operational water system including the collection and conveyance network, treatment devices, Culverts, stream diversions and consideration of the flood plain;
 - b) ensure that all pipes, Culverts and other drainage hardware have a working design life and durability performance of not less than 100 years from the Service Commencement Date;
 - c) ensure that all works meet or exceed the requirements of Resource Consent Conditions RC49 to RC68D;
 - d) ensure that permanent Culverts crossing the P2Wk Main Alignment and interchange Ramps:
 - (i) accommodate a 100 year ARI storm event taking into account climate change with 'Headwater Depth ÷ Culvert Diameter < 2' (assume no blockage); and
 - (ii) incorporate measures to mitigate the risk of significant or complete blockage of the primary intake;
 - e) ensure that all new permanent Culverts servicing the Local Road and the existing SH1 accommodate a 100 year ARI storm event taking into account climate change with 'Headwater Depth ÷ Culvert Diameter < 2' (assume no blockage);
 - f) where the hydraulic performance of any existing permanent Culverts servicing the Local Road or existing SH1 is affected by the Project, ensure that those Culverts accommodate a 100 year ARI storm event taking into account climate change with 'Headwater Depth ÷ Culvert Diameter < 2' (assume no blockage);

- g) ensure that water from batters or verges does not flow across the road surface;
- h) ensure that the drainage design does not compromise the strength and stability of any structure, and/or surrounding slopes;
- i) adopt water sensitive designs that utilise natural water management and treatment systems where practicable;
- j) incorporate measures to minimise and control the potential for erosion and / or generation of sediment load at cut and fill faces (batters); and
- k) ensure that water retaining structures (i.e. permanent retention and temporary detention structures, including road embankments and embankments for stormwater management) meet the requirements of the Dam Safety Guidelines.

15.2 For the purpose of paragraph 15.1, 'taking into account climate change' means taking into account mid-range climate change in accordance with the Ministry for the Environment "Climate Change Effects and Impacts Assessment: A Guidance Manual for Local Government in New Zealand", 2nd Edition, May 2008.

Part 3 – Geotechnical

16. Site geotechnical engineering

16.1 The Contractor must apply:

- a) the Bridge Manual to the design and construction of all Geotechnical Elements (whether related to an item in the Bridge Manual or to any other Geotechnical Element not expressly stated to be covered in the Bridge Manual);
- b) subject to the constraints imposed by the Bridge Manual, the Site Specific Seismic Hazard Assessment (GNS Science Consultancy Report 2015/115, Seismic Hazard Spectra Pūhoi-Warkworth Expressway, R. Buxton, June 2015) to the design and construction of all Geotechnical Elements; and
- c) route “Importance Level” values (as that term is defined in the Bridge Manual) in accordance with the requirements of the Bridge Manual.

16.2 The Contractor must ensure that:

- a) the design working life for all Geotechnical Elements is not less than 100 years;
- b) the design acknowledges and makes allowance for all geotechnical constraints of the P2Wk Project Site and immediately surrounding areas;
- c) each Geotechnical Element is designed to remain in equilibrium, both local and global, so that the intended function and specific performance of each Geotechnical Element remains unimpaired, except in so far as displacement during seismic events is acceptable under the Bridge Manual, to satisfy the operational, maintenance and design life requirements;
- d) the design of all Geotechnical Elements seeks to minimise the impact on any adjacent infrastructure, the structure they provide support to, highway design features, road users, waterways or private property;
- e) the geotechnical design makes due allowance for:
 - (i) the effects of inherent uncertainties related to the properties of soil and rock, hydrological variations, hydrogeological variations, climate variations and seismicity; and
 - (ii) the limitations inherent with investigation techniques, sampling, design methods and design approaches;
- f) Geotechnical Elements are designed to be resilient when subjected to design Limit State events as set out in the Bridge Manual or AS/NZS 1170 and NZS 1170.5 such as those associated with earthquakes, rainfall and flooding;
- g) durability, robustness, resilience and the control of deformations are inherent in geotechnical design so as to meet the Service Requirement for the expected service life of the relevant highway feature; and
- h) deformations associated with engineered cut and fill construction, embankments, earth retaining systems, ground improvement and with natural slopes affecting the P2Wk Project are controlled so that the intended function and performance of the P2Wk Project are achieved.

Part 4 - Structures

17. General requirements

- 17.1 The Contractor must:
- a) ensure all Structures are designed in accordance with the Bridge Manual;
 - b) ensure that, to the extent not covered by specific Works Requirements, all Structures have a design life that meets the requirements of the New Zealand Building Code at a minimum;
 - c) adopt best value for money, whole of life solutions for all Structures, fences, walls, gantries, signs, lighting columns and CCTV masts;
 - d) ensure all Structures, fences, walls, gantries, signs, lighting columns and CCTV masts are safe, functional and durable and require no more than a normal level of maintenance;
 - e) balance sound engineering and good aesthetics (including the design principles set out in the ULDF) in a cost effective manner in its design and construction of all Structures, fences, walls, gantries, signs, lighting columns and CCTV masts; and
 - f) incorporate the Crime Prevention through Environmental Design (**CPTED**) principles and the design principles included in the ULDF.

18. Bridges and Major Culverts

- 18.1 For the P2Wk Main Alignment, a viaduct must be constructed over Okahu Estuary in accordance with Resource Consent Condition RC69AA.
- 18.2 For the P2Wk Main Alignment, a viaduct must be constructed over Pūhoi Road and the Pūhoi River. The location of the viaduct must comply with Designation Condition D2B. No piers or other structures associated with the viaduct must be located in the bed of the Pūhoi River. All abutment foundations and any spill through batters must be located outside of the Pūhoi River 100 year ARI flood event.
- 18.3 For the P2Wk Main Alignment, a viaduct must be constructed to comply with Designation Condition D2A to minimise the effects on kauri in the area shown on Appendix A to the Designation 408 Conditions.
- 18.4 The Contractor must ensure that all Bridges and Major Culverts:
- a) have a design working life of not less than:
 - (i) 100 years for 'primary' elements (such as piles, foundations, settlement slabs, piers, abutments, walls, beams, deck slabs, barriers, fixings for maintenance and service supports and cast-in items);
 - (ii) 50 years for 'secondary' elements (such as access supports, non-cast-in items);
 - (iii) 40 years for 'replaceable elements' (such as expansion joints, bearings, seismic restraints and base isolation hardware) on structures, with each to be replaceable without the need for major modification to adjacent elements;

- b) have a life to first maintenance of not less than 30 years for all replaceable components of the Bridge deck drainage systems;
 - c) have a period to first major maintenance of any corrosion protection system of not less than 40 years for all structural steelwork items;
 - d) are classified with Importance Level values (as that term is defined in the Bridge Manual) in accordance with the requirements of the Bridge Manual;
 - e) are designed to be consistent with the ULDF and relevant ULDSP;
 - f) have shoulder widths between the edge line and the face of the safety barrier of not less than 3.0m on the left hand side and 1m on the right hand (median) side, except:
 - (i) for Bridges longer than 50m, where a left hand shoulder width of not less than 2.5m is acceptable;
 - (ii) in the case of Bridges, adjacent to crawler or climbing lanes where a shoulder width of not less than 1.0m is acceptable;
 - (iii) on Ramp Bridges, where the shoulder widths must not be less than the matching distance between the edge line and the face of the safety barrier upstream and downstream of the Bridges; and
 - (iv) for local bridges Section 3.3 Local Road specific requirements apply.
 - g) where a wider shoulder width is necessary to provide appropriate stopping sight distance, the shoulder width must be increased accordingly;
 - h) have vertical and horizontal clearances based on the "Preferred Minimums" listed in Figure A2 of the Bridge Manual, but extended with respect to the P2Wk Main Alignment to the extent required to allow for the requirements of paragraph 13 of this Schedule 11 (Overweight and Over-dimension motor vehicles). Horizontal clearances must make allowance for 'Vehicle roll allowance' of 1.1m where the hazard is protected by a rigid concrete barrier. 'Vehicle roll allowance' as defined in Table 6.8 of Austroads GRD Part 6 must only be used where the hazard is protected by a semi-rigid or flexible barrier system. Vertical clearances must allow appropriate provision for settlement and road surfacing overlays;
 - i) have surface finishes that fully meet the Service Requirements; and
 - j) satisfy utility authority requirements.
- 18.5 Modelling of river flows must be undertaken to ensure that design of Bridge abutments and piers is adequate with regards to scour in the ultimate Limit State design, in accordance with Section 2.3.6 of the Bridge Manual.
- 18.6 The Contractor must ensure that:
- a) the edge barriers of Bridges carrying the P2Wk Main Alignment are TL5 HT type barriers (either Penn DoT PA HT or Texas DoT T80HT configuration) with the front face being an F-shape profile; and
 - b) the edge barriers of Bridges carrying Local Roads over the P2Wk Main Alignment are rigid concrete barriers of full TL5 HT configuration (either Penn Dot PA HT or Texas DoT T80HT configuration) with the front face being an F-shape profile. Where Test Level 4 performance level barriers are required in accordance with Bridge Manual requirements, the TL5 HT configuration (either Penn Dot PA HT or Texas DoT T80HT

configuration) must be used but the capacity of the connection between the barrier and the Bridge deck may be reduced to the appropriate Test Level 4 requirement).

- 18.7 The Contractor must make due allowance for mid-range climate change in accordance with the Ministry for the Environment “Climate Change Effects and Impacts Assessment: A Guidance Manual for Local Government in New Zealand”, 2nd Edition, May 2008 when determining waterway areas.
- 18.8 Subject to the constraints imposed by the Bridge Manual, the Contractor must apply the Site Specific Seismic Hazard Assessment (GNS Science Consultancy Report 2015/115, Seismic Hazard Spectra Pūhoi-Warkworth Expressway, R. Buxton, June 2015) to the design and construction of all Structures.
- 18.9 The Contractor must identify and quantify the risk of landslides affecting Structures and must implement a design and construction approach to ensure that all Bridge substructures either resist the effects of landslides and / or associated ground movement or are suitably and adequately protected from those effects.
- 18.10 The Contractor must use corrosion protection systems that permit the Transport Agency to re-apply such corrosion protection systems at major maintenance intervals after the Expiry Date.

19. Retaining Walls

- 19.1 The Contractor must ensure that all retaining walls, including retaining walls associated with Bridges:
- a) are classified with ‘Importance Level’ values (as that term is defined in the Bridge Manual) in accordance with the requirements of the Bridge Manual;
 - b) are consistent with the ULDF and relevant ULDSP;
 - c) have horizontal clearances based on the “Preferred Minimums” listed in Figure A2 of the Bridge Manual, but extended with respect to the P2Wk Main Alignment to the extent required to allow for the requirements of paragraph 13 of this Schedule 11 (Overweight and Over-dimension motor vehicles). Horizontal clearances must make allowance for ‘Vehicle roll allowance’ of 1.1m where the hazard is protected by a rigid concrete barrier. ‘Vehicle roll allowance’ as defined in Table 6.8 of Austroads GRD Part 6 must only be used where the Hazard is protected by a semi-rigid or flexible barrier system;
 - d) have surface finishes that fully meet the Service Requirements; and
 - e) either:
 - (i) are designed so that they remain elastic and do not suffer any permanent displacement due to the full design earthquake load, as per the Bridge Manual clause 6.6.9(b) first paragraph; or
 - (ii) are designed to sustain permanent displacement in an earthquake no greater than the maximum displacement permitted elsewhere in Bridge Manual clause 6.6.9 for hazard factors greater than those applicable for this project location, provided that:
 - (A) displacement is demonstrated to be limited to values that can be tolerated by the Structure;

- (B) Bridge performance criteria defined by the Bridge Manual clause 5.1.2 are demonstrated to be achieved;
- (C) clearance requirements (as defined herein) are satisfied subsequent to such displacements occurring;
- (D) all other Bridge Manual requirements are observed;
- (E) earthquake loads used to determine the displacement values are based upon the requirements of the Bridge Manual (Section 6), considered with all concurrent gravity and inertial loads imposed by the supported Structure on the soil retained by the wall;
- (F) predicted seismic displacements are assessed at 84th percentile confidence limits using methods acceptable to the Transport Agency; and
- (G) the limits on seismic displacements defined in Bridge Manual Table 6.4 and clause 6.6.9 are to be regarded as absolute maximum permitted values, irrespective of whether supported Structures can be justified as competent to accommodate greater displacements.

20. Gantries

20.1 The Contractor must ensure that all gantries:

- a) are classified with 'Importance Level' values (as that term is defined in the Bridge Manual) in accordance with the requirements of the Bridge Manual;
- b) are consistent with the ULDF and the relevant ULDSP;
- c) have vertical and horizontal clearances based on the "Preferred Minimums" listed in Figure A2 of the Bridge Manual, but extended with respect to the P2Wk Main Alignment to the extent required to allow for the requirements of paragraph 13 of this Schedule 11 (Overweight and Over-dimension motor vehicles). Horizontal clearances must make allowance for 'Vehicle roll allowance' of 1.1m where the hazard is protected by a rigid concrete barrier. 'Vehicle roll allowance' as defined Table 6.8 of Austroads GRD Part 6 must only be used where the Hazard is protected by a semi-rigid or flexible barrier system. Vertical clearances must allow appropriate provision for settlement and road surfacing overlays; and
- d) have surface finishes that fully meet the Service Requirements.

Appendix A: Technical Departures

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