APPENDIX I e DESIGN PHILOSOPHY STATEMENT

PRELIMINARY DESIGN PHILOSPHY STATEMENT

SCOPE

Although the initial form of the offline highway may be a two lane highway with at grade intersections, it is important that the design is future proofed to allow conversion into a four lane expressway at some point in the future to accommodate growth.

When the four lane expressway standard alignment has been determined, a scaled back option for an initial two lane highway will then be developed. This will investigate providing a two lane option prior to a future four lane solution.

Accordingly, the design philosophy in the IBC stage has been to design for the larger scheme in the first instance and therefore the elements below primarily relate to a four lane solution. A new design philosophy for the two lane option will be developed at the start of the DBC stage.

In order to prepare an appropriate estimate for the IBC, some items (e.g. structures, geotechnical, etc), have been compiled using sound engineering knowledge, based on experience (generally) and familiarity with the project extent gleaned from prior investigation and experience with like projects.

STATE HIGHWAY STANDARDS AND LOCAL ROADS

All highway standards are in accordance with the latest version of the Austroads Guidelines. Refer to 6, Austroads Part 3 Geometric Design, Part 4A Unsignalised and Signalised Intersections, Part 4C Interchanges and Austroads Part 6: Intersections, Interchanges and Crossings. A more recent requirement NZTA has as a standard is to include safety barrier on both the centreline and edge lines – applies to 4 lane and 2 lane carriageways. Refer to Technical Memorandum TM-2503.

For the local road network associated with the wider project, it has been assumed for this investigation that the standards will be in accordance with the respective Local Authorities (KCDC and HDC) based on an appropriate local speed limit which will vary by location. In some situations reduced speed limits may be warranted and which would by extension require reduced standards consistent with this speed limit (eg vertical profile over interchange structures, where the local road is above the highway).

SPEED ENVIRONMENT AND SIDE FRICTION

For the 4 lane highway the speed environment has been assessed to be a minimum of 110km/h.

There is no direct access to the 4 lane highway (side roads and property), with all access via grade separated interchanges.

For a 2 lane highway (i.e. a first stage option), the speed environment has been assessed to be a minimum of 110km/h (TBC during the DBC phase).

For a 2 lane highway appropriate access will need to be determined during the DBC phase but is expected to be limited to either grade separated access or via roundabouts to comply with Safe System requirements. No direct access from side roads or accessways is expected to be permitted as this could compromise the future 4 lane highway and desired highway standard.

4 LANE HIGHWAY HORIZONTAL ALIGNMENT

The horizontal alignment has minimum radii of 800 metres, with Design Speed a minimum of 110km/h. Superelevation is a maximum of 6%.

4 LANE VERTICAL ALIGNMENT

A minimum vertical crest K value of 98 has been utilised to meet safe stopping sight distance requirements for 110 km/h design speed (2.5 s reaction time and deceleration rate of 0.36 g).

A minimum vertical sag curve K value of 51 has been used. In sections with passing lanes (relevant if the project is staged with 2 lanes initially), minimum k values have been increased to 151 and 84 for crest and sag respectively. For right turn bays associated with interchanges the sight distance will meet the limit line zero object height criteria.

4 LANE HIGHWAY CROSS SECTION

The 4 lane cross section consists of;

- 4 x 3.5m sealed traffic lanes
- Generally 6m sealed median, with centrally placed safety barrier (unless offset is required to meet horizontal sight distance). Minimum 4m sealed median where site constraints require a reduction.
- 2 x 2.5m or 3m striped sealed shoulders with safety barrier offset 3m from the edge line
- 2 x 1m unsealed width behind the safety barrier
- Feather edge slope of 5:1 until the top surface of the subgrade is encountered (ie bottom of the basecourse and sub basecourse layers)
- Cut and fill batters will be determined as part of a geotechnical investigation (next phase of the project) – for the purposes of this IBC both have been sloped at 3:1, including within swale drains. Given the side protection offered by safety barrier (ie clear zone not required), the earthworks quantities can be significantly influenced by batter slopes which are steeper than 3:1. Robust geotechnical investigation is recommended to ensure batter slopes portray a well-balanced outcome

The 2 lane cross section differs from the 4 lane cross section and will require further assessment during the DBC to consider future proofing to allow future conversion to a dual carriageway with two extra (opposing) lanes constructed alongside. Key considerations will be seal width to ensure in the 2 lane only situation that median and edge barrier protection is adequately provided including required barrier deflections and shoulder widths.

Superelevation, including on the approach and departures of intersections and interchanges will need to be carefully considered to ensure that the 2 lane staged option (one lane in each direction) can be converted to 2 lane same direction (with two further opposing lanes constructed alongside) to minimise rework (noting some rework will have to occur at intersections/ interchanges).

4 LANE PAVEMENT AND SURFACING DESIGN

The pavement and surfacing design is not part of the IBC scope, but it is noted that the following has been assumed (based on knowledge of the area and prior investigation work);

- 170mm basecourse
- 380mm sub basecourse
- Removal of substandard material below the subgrade to ensure a consistent minimum subgrade CBR – i.e. undercut and backfilled with selected material.
- Chip seal membrane seal
- OGPA or asphaltic concrete wearing course (layer make up and depth TBD)
- Structural asphaltic concrete in high wear areas, such as at interchange intersections

INTERCHANGES & INTERSECTIONS

A system interchange is expected at the point where SH1 and SH57 split north of Levin, but this will need to be determined during the DBC phase.

Service interchanges are expected for the 4 lane highway. Locating an interchange is not straightforward and requires further assessment, modelling, community input and subsequent design. Fundamentally, the spacing between interchange, should be at least 5 to 8 kms in rural locations.

No decisions have been made in respect of the form of interchanges and will depend on performance requirements. The starting point will be to consider at grade roundabout options. Should grade separated options become necessary then the starting point for these types of service interchange will

be Spread Diamond type (recommended by Austroads as the preferred rural diamond solution), and ideally the local road passing over the highway. This has benefits such noise, cost, visual and gravity support for entering or exiting ramp traffic, but can be challenging for constructability and keeping local roads open during new highway construction. The ramps are offset from the structure by a distance which allows for safe stopping sight distance (to the right turn bay limit line) and has give way control. The layout does require more land than other interchange layouts, but it is noted that the land between the ramps and the highway can be developed as wetlands/stormwater ponds.

For a 2 lane highway appropriate access (on and off and across the highway) will need to be determined during the DBC phase. Even as an initial 2 lane solution, the highway must be designed to a high design standard. This will ensure safety and efficiency requirements are met and also allow for the future upgrade to 4 lane expressway standard.

Specific layouts for 2 lane intersections or interchanges will be considered during the DBC and are expected to take the form of either grade separated interchanges or via roundabouts to comply with Safe System requirements, ensuring project safety outcomes are delivered.

The issue of Local Network Connectivity requires more investigation at the DBC stage. An important fundamental is that the trips affected road users currently make should not be unreasonably longer when their current access is altered by the 4 lane access restricted highway. Thinking to date (based on traffic modelling and IBC investigation) is that intersection and interchange layouts will be a key DBC consideration.

LOCAL ROAD AND PROPERTY CONNECTIVITY

As mentioned above the standard of local road connections will be more fully investigated at the DBC stage, in conjunction with KCDC and HDC.

For the IBC investigation very limited consideration has been given to local road connections. At the south end of the project connectivity will be an outcome of the PP2O and O2NL interface.

Throughout the wider project length there will be some roads that can connect to the 4 lane highway via a grade separated interchange structure. This will generally be the more major arterial or collector type local roads. There will also be several roads which will need to be stopped either side of the 4 lane highway. This will be discussed with the relevant Local Authority as part of the DBC stage. At key crossings consideration will be given to whether flyover connections (no ramps) should be considered versus road stopping to maintain local access.

Property access provision has not been investigated at this stage – it is a more appropriate action for the DBC stage.