Appendix G

Road Safety Audit

SA report recommendations – Decision-tracking form – PMM 6.5a

NZ TRANSPORT AGENCY
WAKA KOTAHI

Project title	M2PP Kapiti Coast Expressway	RSA stage	2: Scheme Design (11-SD)
Project manager	M2PP Alliance	Designer	M2PP Alliance
Road safety auditors	Jos Vroegop, Steve Reddish, Jon England		

Recommendation*	Report reference and severity*	Designer comments	Decision
Half interchanges a. *Provide full interchanges at Poplar Avenue and Peka Peka Road, or* b. *Make provision within the designation and current design for conversion to full interchanges in the future.*	2.1 Minor	The scheme requirements have been studied and the number, position and arrangements of the interchanges agreed to meet the stakeholder's requirements and provide traffic flow and capacity on the highway network. Half interchanges at Poplar Avenue and Peka Peka Road were chosen to manage the volume of through and local traffic using the Expressway, and better meet the stakeholder's requirements. There is no space available at Poplar Avenue to make provision for the future conversion of the half interchange to a full interchange. Provision for the future conversion of the half interchange at Peka Peka to a full interchange has not been discounted and could be considered at a later stage.	Agree with Designer, however consideration of the land ~~space~~ required for a full interchange at Peka Peka should be considered early enough to allow for designation at some future stage should growth take place and demand changes.
Design of roundabouts at interchanges a. *Reduce the entry radii of the various legs of the roundabouts through the limit lines to achieve entry speeds that are commensurate with circulating speeds.* b. *Ensure that the roundabouts are clearly visible to approaching motorists.* c. *Ensure that the road marking layout complies with Figure 3.17 (August 2010) of MOTSAM.* d. *Preferably eliminate any concrete apron, but if a concrete apron is necessary for*	2.2 Significant	The preliminary design for the various roundabouts has been indicated as schematic arrangements only at this stage. The detail design for each roundabout shall be carried out in accordance with the design requirements and shall include the following items; i) *Entry radii to achieve entry speeds that are commensurate with circulating speeds,* ii) *Clear visibility to approaching motorists,* iii) *Road marking layout to comply with Figure 3.17 (August 2010) of MOTSAM for single lane approaches,*	Agree with Designers response i-v

truck tracking, specify a maximum lip of 25 mm, preferably less. e. *Provide direct and not curvilinear approaches to the pedestrian/cyclist crossing points to encourage pedestrians/cyclists to cross roads on their desire lines at the designated safer locations (Refer also to Item 6.8).*		iv) *Concrete apron with a maximum lip of 25 mm,* v) *Provide direct, not curvilinear approaches to the pedestrian/cyclist crossing points to encourage pedestrians/cyclists to cross roads on their desire lines at designated safer locations.*	
Cyclists using the expressway a. *Prohibit the use of the expressway by cyclists through a local KCDC bylaw or by designating the expressway as motorway.* b. *Direct cyclists to use the old SH1 and the adjacent off-road facility.* c. *If prohibition of cyclists is not an option, ensure that the design is modified to maximise safety for cyclists, particularly at the on and off ramps.*	2.3 Serious	The project has been designed so as not to exclude its use by cyclists in accordance with the current designation of the road as an expressway. Two alternative routes for cyclists are proposed under this project, these being a separate shared cycle/walking facility and the former SH1. The separate shared cycle and walking path facility shall be made attractive to cyclists to encourage their use over the expressway by provision of a smooth surface, wide cross section, ease of access, signage and landscaping. Additionally, the option of utilising the former SH1 route will be enabled by the provision of marked cycle lanes and some sections of potential off road cycle path. The safety of cyclists who choose to use the expressway has been considered at the on and off ramp points, where safety can be compromised. The on and off ramp shoulders at the four interchanges will be signed and marked to communicate to drivers and cyclists where cycling will cross the ramps in accordance with Austroads, GRD, Part 4C, Figure 14.2.	Partly Aagree with the designers. NZTA has received similar views from National organisations about the safety of cyclists on Expressways and is considering its response to this issue. For this particular section as there is a suitable alternative, it may be desirable to prohibit.
Cycle network and cycle path design a. *Ensure that the proposed pedestrian/cycle facility has no discontinuity in terms of fitting into the overall local pedestrian/cyclist network.* b. *Ensure that the links to the local network do not introduce any unsafe tie-ins.* c. *Ensure that the alignment of the path is cycle friendly where turns are required.* d. *Provide good guidance signage.*	2.4 Minor	The separate shared cycle and walking path facility shall have connections with local pedestrian/cyclist network. The cycle and walkway has been designed in consultation with KCDC, with regard to school accessibility plans, and project local area movement surveys to assist understanding of the routes most commonly used. The links between the cycle and walking path and the local roads will be designed at the next stage to recognise the need for cycle movements, while also recognising that at local roads there are typically no off road cycle paths to tie into and it is important that	Agree – Designer to confirm that the low wall will not create a tunnel effect for cyclists approaching the local road.

		cyclists come to a stop where they are joining back into on road traffic or crossing footpaths. Low walls are proposed on either side of the cycle path where it joins to the back of the local road footpath to provide clear thresholds for these crossing points. At each local road threshold, signage and marked symbols will delineate the cycle path from walking path.	
Lighting of the off-road cyclist/pedestrian path *Provide lighting of the shared use pedestrian/cycle path between Poplar Avenue and Te Moana Road*	2.5 Significant	The pedestrian/cyclist path is lit over the urban section between Raumati Road and Mazengarb Road. This section is expected to have the most demand for use by the community for movements (cycling and walking) made between local destinations at night time. Consultation with the KCDC CWB (cycle, walking, and bridleway) reference group did not identify any need for lighting, except possibly in the urban section. The wider network and areas north beyond Mazengarb Road are expected to be used for day time commuting (e.g. working hours) and to and from school movements (e.g. between Waikanae and Paraparaumu) which will typically be within daylight hours. The wider network may also be used for longer recreational or cycle touring by tourists making inter-regional cycle movements which are also typically day time movements. It is anticipated that the former SH1 cycle path option will also be available and this will be lit to the extent the current road is lit. The possibility of lighting the pedestrian/cyclist path running parallel to Poplar Avenue to link with the former SH1 and extending the lighting to cover the section between Poplar Avenue and Te Moana Road is to be investigated at the detail design stage. Alternative methods of lighting will also be investigated to include solar studs and/or posts.	Agree with the designers to investigate further the use of alternative methods of providing illumination along the shared pathway during the design phase.
Transition lighting on the expressway *Provide lighting for transition zones between the well-lit interchanges and the unlit expressway to enable drivers' eyes to adjust to the change in environment*	2.6 Minor	The lighting for the expressway will be designed in accordance with AS/NZS1158 requirements to avoid providing excessive lighting and control glare, which can lead to drivers having difficulty in adapting to the darker section of road immediately beyond the intersections. Lead in/out lighting is provided in the current design with one luminaire at the end of each section being 150W, not the 250W used along the sections. Detail design will cover transition lighting.	Agree with the designers with the proviso that the detailed design phase consider fully transition lighting.

Barrier protection at CCTV sites a. *Provide barrier protection for CCTV infrastructure, service vehicles and service personnel.* b. *Ensure that any access to CCTV sites via the expressway is designed to allow safe entry/egress via the expressway shoulder.*	2.7 Significant	CCTV sites on the Expressway shall be designed to incorporate vehicle access where access from adjacent land is not possible. In these situations, access will be made from the 2.5m wide shoulder to allow safe entry and egress. Where the CCTV facility is assessed to be a hazard, appropriate barrier protection will be designed at the detail design stage to provide mitigation.	Agree but note that it is ~~un~~likely that the CCTV poles within the clear zone will ~~not~~ be a hazard.
Visibility of Advance Destination Signs (ADS) *Ensure that all ADS and VMS signage are located so that each can be clearly read in advance for safe decision making.*	2.8 Minor	ADS and VMS signage design shall be developed as part of the detail design and located where they can be clearly read in advance to give sufficient time to make a decision and safe manoeuvre.	Agree with the designers.
Use of bridge kerbs *Do not specify bridge kerbs for use on bridges (or anywhere else).*	2.9 Significant	Bridge kerbs are designed in accordance with the NZ Bridge Manual which allows kerb heights between 150 - 200mm high on bridges to protect pedestrians where the footpath is wider than 1.3m and there is no barrier between the footpath and carriageway. The kerbs are specifically designed to reduce the possibility of vehicles vaulting the kerb and subsequently the barrier. The detail design shall consider the future update to the Bridge Manual relevant at that time, which may cover this subject.	Bridge kerb is not to be used.
Provision for over-dimension loads *Ensure that an appropriate route is available for over-dimension loads between the old SH1 corridor and the coastal communities which also takes account of any local road issues*	2.10 Significant	An over-dimension route has been incorporated in the design to provide east-west connectivity across the Expressway for communities located to the south of the Waikanae River, at Raumati Road. Bridges will be designed for a minimum vertical clearance of 6.0m and carriageway width of 10.0m. Over-dimension loads north of the Waikanae River will be sign posted on Peka Peka Road.	Agree – ensure that the over-dimension route is adequately signed and that consultation with roading freight groups takes place during the design stage.
Future form and function of current SH1	2.11 Comment	The form, function and treatment of the existing SH1 after construction of the Expressway is being considered separately. The design shall be developed with consideration for safety in terms of the balance of the route and speed environment and will be subject to a separate safety audit.	Agree – there is a separate safety audit due for the SH1 revocation project.

Alignment north of Poplar Avenue a. *Improve sight distance to the change in direction over the crest vertical curve for northbound traffic immediately north of the Poplar Avenue interchange by increasing the K value of the crest.* b. *If this is not possible at least (and in addition) improve definition of the reverse curves immediately north of the Poplar Avenue interchange by extending the expressway lighting through the curves. Refer also to Item 4.1.* c. *Increase the radius of the 720 mR horizontal curve.*	3.1 Significant	a) The Expressway and interchange at Poplar Avenue has been designed to comply with Austroads, GRD and NZ SHGDM requirements for the geometric alignment and provision for high speed roads. Drivers travelling northbound on the Expressway pass over a crest curve at Poplar Avenue interchange on a 3500m RH horizontal radius curve, which is followed by an 820m LH horizontal radius curve. The vertical crest curve at Poplar Avenue has a K value of 100.7 taking the alignment over the intersection. The sight distance available on the curve, to an object height of 0.2m, is 210m for a design speed of 110 km/h in accordance with NZ SHGDM with RT = 2.5 sec and d = 0.37. However, there is a requirement to see pavement markings to assist motorists to perceive the curve ahead, using an eye height of 1.1m and an object height of 0.0m. The design gives a minimum sight distance of 160m, which is equivalent to a design speed of 95 km/h at this location, which is enhanced by the provision of a sag curve prior to the LH horizontal radius curve. Full sight distance for curve perception at 110 km/h requires a K value of 210. To achieve this requires a longer embankment with a greater environmental impact and higher cost and was not considered to be a practical approach. It is proposed to adopt additional measures during the detail design to improve the curve definition, as noted below. b) The edge definition of the curves immediately north of Poplar Avenue will be enhanced at detail design with reflective markers installed on the edge and median barriers. It is envisaged that this should provide sufficient definition to perceive the road ahead. c) A 720m radius horizontal curve has been used in accordance with the RoNS design standard for the higher 110km/h design speed. The curve is sufficiently large enough for use in the context of an Expressway and should not be considered a safety issue. However, for consistency with the whole scheme, increasing the radius of this curve to 820m will be considered at the detail design stage.	a) Agree with the designer. The median barrier will help drivers read the curve. b) Agree c) Curve to be increased to 820m radius.
Short distance between interchanges with no lighting *Make provision for future lighting of the Raumati*	3.2 Minor	Street lighting is not proposed over the 1.8km section between MacKay's Crossing and Poplar Avenue interchanges. Existing street lighting for MacKay's crossing terminates at the start of the	Agree with designer.

straight section of the expressway between the MacKay's Crossing and Poplar Avenue interchanges.		expressway and will require the northbound on-ramp lighting to be assimilated in to the design. Poplar Avenue interchange will be designed with transition lighting to avoid providing excessive lighting and control glare so that drivers can adapt to the darker section of road between the intersections.	
Alignment north and south of Otaihanga Road a. *Straighten the horizontal curves ch 8360-8900 and ch 9620-10100,* ***or*** b. *Flatten the crest curve of the bridge over Otaihanga Road so that the K value = 210.*	3.3 Minor	a) Drivers travelling on the Expressway will pass over a crest curve at Otaihanga Road on an 820m LH horizontal radius curve. The crest curve occurs over a similar length to horizontal curve alignment, which means drivers should reasonably expect to perceive the road ahead. Increasing the horizontal curve radius each side of the 820m curve will be considered at the detail design stage to further enhance the alignment. b) The vertical crest curve at Otaihanga Road has a K value of 100, which produces a long flat curve with maximum approach gradients of less than 3.5%. This alignment will provide sight distance for 110km/h to an object height of 0.2m as noted at Poplar Avenue, see item 3.1. No changes are proposed to the vertical alignment where the curve ahead can be perceived.	a) Agree with designer b) Agree with designer - as above the median barrier will provide guidance to motorists.
Lighting at Poplar Avenue interchange a. *Provide lighting for the expressway carriageway at the Poplar Avenue interchange. (Refer also to Item 3.1).* b. *Provide additional under-bridge lighting to minimise the contrast between daylight and shadow under the bridge.*	4.1 Minor	a) The Expressway carriageway shall be lit over the extent of the interchange at Poplar Avenue. Lighting will terminate at a point approx. 150m north of the crest curve at Poplar Avenue. This arrangement will reduce glare from motorists from ramp light, reduce contrast between the unlit carriageway and the surrounding lighting, and improve motorist's ability to clearly see the interchange. b) A minimum of two under-bridge lights shall be provided at the detail design stage, where the local roads pass under the Expressway alignment to minimise the contrast between daylight and shadow under the bridge, where the bridge is more than 50m wide.	a) Consider lighting only the conflict area from chainage 1800 to 2400. Continuing lighting to the end of the crest curve may affect drivers ability to read the following horizontal curve. b) Agree
Kapiti Rd interchange southbound on-ramp merge a. *Lengthen the Kapiti Road southbound on-ramp prior to the merge to provide a longer*	4.2 Significant	The southbound on-ramp merge occurs immediately south of a straight section through Kapiti interchange, on a 1450m left hand radius curve. At detail design stage the possibility of reducing the ramp length so that the merge is generally on the straight will be	a)Consideration should be given to extending the merge given that it is on a curve to ensure an acceptable merge rate is attained. Merge is not to

length of parallel lane to give entering drivers more time to assess gaps in the mainline traffic. b. *Ensure that drivers on the southbound on-ramp from Kapiti Road have forward sight distance of the full length of the merge taper.*		considered at this location. However, the 1450m curve is reasonably large and is not thought to present a major safety hazard requiring changes to the geometry. During the detail design stage a check of the design and edge treatment will be undertaken for this arrangement to ensure drivers on the southbound on-ramp have forward sight distance for the full length of the merge taper.	be shortened. b) Designers response is acceptable as long as this there is room in the designation to make changes.
Kapiti Rd interchange northbound off-ramp diverge *Provide stepped out marking for the left lane diverge to the northbound off-ramp at Kapiti Road.*	4.3 Minor	The northbound off-ramp diverge is designed in accordance with the Austroads diverge arrangement, which suggests a parallel lane should be considered for curves at least 1500m radius. With appropriate signage and visibility provided, the potential for drivers to confuse the ramp with a through lane is considered low. The use of parallel lane in advance of the ramp can also cause drivers to confuse the ramp with a through lane. In this situation we do not consider the ramp warrants a parallel lane.	Agree with designer.
Sight distance along Kapiti Road interchange off-ramps *Check that the Austroads criterion of being able to see a minimum of 60m along the ramp from the diverge nose is achieved for both off-ramps at the Kapiti Road interchange.*	4.4 Minor	The current design meets the sight distance requirement for the off-ramps. Austroads, GRD, Part 4C, Table 7.1 criterion also states that it is desirable to provide sight distance to a point 60m along the off-ramp beyond the physical diverge nose. However, the combination of curves used prior to the nose to minimise the footprint of the interchange and the ramp lengths, will only allow drivers additional sight distance to see the pavement a short distance further along the off-ramp. The Expressway geometry determines the sight distance available up to the nose. At Kapiti Road interchange the Expressway geometry in advance of the off-ramps gives adequate sight distance for 110km/h to the pavement level. Beyond the nose, the off-ramp geometry for north and south bound lanes, has a crest curve with a K value of approx. 29 at the start of each ramp. The crest curves are 120m & 100m long respectively and designed to give sight distance for 80km/h to 0.2m object height. The proposed design will provide adequate signage to give drivers sufficient indication of the exit ahead. In this situation it is considered	Agree with Designer

			it would be beneficial to maintain the current design without having a detrimental impact on safety and review again in detail design stage. The preliminary design for the signalised intersections and local road facilities has been indicated as schematic arrangements only at this stage. The detail design for the local road intersections and facilities shall be in accordance with the design requirements in coordination with KCDC and shall include; a) *Cycle facilities on Kapiti Road through the interchange and continuity with adjacent intersections is to be detailed at the next stage to include Arawhata Rd intersection arrangement,* b) *A 2.5m wide flush median is to be provided on Kapiti Road between the interchange and Arawhata Rd to facilitate safe turns into and out of properties on the north side of Kapiti Road,* c) *The intersections either side of the Kapiti Road interchange will be affected by the new interchange arrangement. The safety of the existing layout, control and the needs of vulnerable road users will be assessed during the detail design process to identify any problems which may need to be addressed by KCDC,* d) *The detail design for Kapiti Road interchange road marking drawings are to show the correct lane arrow configurations with left turn arrows onto the on-ramps.*	
Issues on Kapiti Road a. *Ensure that there is continuity of cycle facility provision on Kapiti Road through the interchange and adjacent intersections given the number of cyclists who access the Paraparaumu railway station.* b. *Provide an adequate width of flush median on Kapiti Road between the interchange and Arawhata Road to facilitate safe turns into and out of properties on the north side of Kapiti Road.* c. *Review the layouts and controls at the intersections either side of the Kapiti Road interchange having regard to existing safety problems and the needs of vulnerable road users.* d. *Ensure that the Kapiti Road interchange road marking drawings show the correct lane arrow configurations.*		4.5 Minor		Agree with a to d.
Visibility of roundabout Westbound on Te Moana Road a. *Move the roundabout serving the southbound ramps at Te Moana Road further east.* b. *If unable to achieve a. above, extend the median splitter island on Te Moana Road further around the 125mR curve so that it*		4.6 Minor	The visibility to the eastern roundabout serving the southbound ramps at Te Moana Road is restricted by the approach geometry, which is determined by the existing road and property constraints. The potential to move the roundabout further east will be considered at detail design Alternatively, extending the median splitter island on Te Moana Road around the 125mR curve, so that it is clearly visible to westbound drivers on the preceding 375mR curve, will be	Designer to confirm sight triangle for westbound traffic and that sufficient land is available to achieve this. Extending the splitter island is to be avoided.

is clearly visible to westbound drivers on the preceding 375mR curve.		incorporated.	
Right turn into Hadfield Road a. *Separate southbound off-ramp and Hadfield Road traffic,* ***or*** b. *Design a safer intersection at Hadfield Road that eliminates the potential for high severity crashes, takes account of the proximity of the rail crossing and provides a definitive threshold between the one way/one lane operation and the two way/two lane operation (eg roundabout). Sufficient forward visibility must be provided between approaching motorists and any approaching trains at this location.*	4.7 Significant	The proposed intersection arrangement at Hadfield Road and the southbound off-ramp provides a right turn facility for traffic travelling north wishing to turn into Hadfield Road at which point the northbound lane is terminated. The intersection at Hadfield Road will be refined during the next stage to provide a safe arrangement that eliminates the potential for high severity crashes, takes account of the proximity of the existing rail level crossing and provides a threshold between the one way/one lane operation and the two way/two lane operation in the form of a physical splitter island and signage. The safety of the rail crossing will need to consider forward visibility to alert approaching motorists of any approaching trains at this location. Issues to be discussed with KiwiRail include vehicle stacking length and future dual tracking requirements.	Designers solution is acceptable provided the flows on Hadfield Rd are low and discussion with KiwiRail over the safety of the rail crossing takes place.
Roundabout east of expressway at Peka Peka a. *Ensure that there is sufficient forward sight distance to see the roundabout and the limit line on the eastbound approach over the expressway.* b. *Design the roundabout with more equidistant spacing between the entry points whilst having regard to the advance visibility of the roundabout on the individual approaches.*	4.8 Significant	Forward visibility is provided for east bound traffic over the Expressway approaching the roundabout to the east of Peka Peka interchange to cater for 135m sight distance for a design speed of 80km/h with allowance for 4% downhill grade. The roundabout design will be refined at detail design stage to improve entry geometry and check visibility requirements.	Agree with designer
Peka Peka Road approach to roundabout a. *Ensure that the design of the Peka Peka Road approach to the roundabout provides sufficient advance visibility of the roundabout.* b. *Ensure that there is sufficient sight distance from the garden centre access(es) to allow safe egress.*	4.9 Minor	The roundabout design and approach arrangements will be refined at detail design stage to improve approach visibility and sight distance from the garden centre to provide safe ingress & egress.	Agree with designer but ensure sufficient land is designated ~~available~~ to allow changes to be made at the detail design stage.

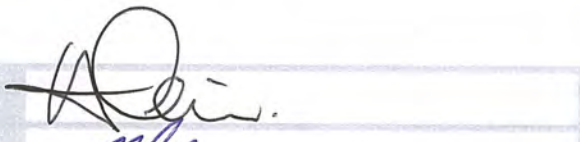
Merge and diverge of Peka Peka Rd interchange ramps *Provide drawings for safety audit of the Peka Peka Road interchange on-ramp merge and off-ramp diverge.*	4.10 Minor	The Peka Peka Road interchange on-ramp merge and off-ramp diverge design will be developed at detail design stage and be made available for safety audit.	Designer to provide drawings to audit team for review at the detailed ~~scheme~~ design stage.
Provide protection per safe system principles a. *Assess all hazards for protection including those outside clear zones.* b. *Where protection is considered necessary for hazards outside the clear zone, review the adjacent clear zone design*	5.1 Significant	The roadside environment has been assessed and protection measures developed for the protection of motorists from hazards. Safety barrier measures adopted have been developed in accordance with the RoNS standards for a 9m clear zone width and a maximum 4H:1V traversable slope with 3.0m minimum run-out length. The safe system principles shall be further addressed at the detail design stage and shall assess all hazards for protection including those outside clear zones (trees, noise walls, culvert walls, ponds, etc.). Where appropriate the installation of forgiving safety barriers shall be considered including the use of wire rope barriers over a steel barrier in the verge.	Designer to consider wide use of roadside wire rope barrier in accordance with the latest RoNS guidelines from NZTA National Office. Also note that the new guidelines recommend that any slopes be limited to 6H:1V
Median barrier offset from drain a. *Position the wire rope median barrier central between the carriageways and as close to the median drain as possible without compromising its performance.* b. *In achieving a. above, check that the forward sight distance on curves is not compromised by the barrier and relocate the drain rather than the barrier if necessary.*	5.2 Minor	Typically the Expressway wire rope median barrier shall be off-set no more than 350mm from the median drain so that the suspension movements do not affect an errant vehicle prior to striking the barrier. However, the location of the barrier is designed to vary from the centre of the median to give sight distance on curves. The median drain is located to provide channel capacity and cannot be relocated. Where the barrier is to be located more than 350mm from the median drain the sight distance requirements , visibility over the barrier and performance of the barrier in these circumstances will be assessed at the detail design stage.	Agree
Barrier type used on approach to point of need *Undertake a risk analysis to assess how far any given hazard's barrier protection should be maintained along the length of need before reducing the barrier test level.*	5.3 Significant	The transition between the different types of barriers used and the different test levels shall be designed in accordance with the level of protection required. A TL-4 barrier is typically provided over the length of need for the protection of hazards with the exception of the TL-5 rigid concrete barriers on Otaihanga Road and Te Moana Road structures. TL-5	Agree

		barriers should be maintained in these instances along the length of need before reducing the remaining barrier test level. The full barrier design including a risk analysis to assess a given hazard's barrier the length of need shall be carried out at the detail design stage.	
Barrier height for cyclists *Ensure that barriers on the edge of structures which will be used by cyclists have a rail on the top of the barrier that extends the overall height to a minimum of 1.4m.*	5.4 Significant	The Expressway design does not to exclude its use by cyclists. However, there is more than one alternative route more attractive for cyclists proposed as part of the scheme, as noted in Item 2.3 above. With the alternative routes the number of cyclists on the Expressway is expected to be low and with the lack of a formal cycleway in the shoulder it is not considered necessary for 1.4m high barriers on the edge of Expressway structures passing over roads and waterways. The detail design shall consider the future update to the Bridge Manual relevant at that time, which may cover this subject. Waikanae River bridge has the separate shared cycle/walking facility running along the bridge and will require the higher 1.4m protection rail.	Road cyclist are likely to use the expressway irrespective of the quality of the off road facility. Designer to investigate options to provide protection to a height of 1.4m on all bridges including those with a dedicated off road path.
Exposed rear of barrier on Poplar Avenue on-ramp *Review the length of barrier on the east side of the southbound expressway carriageway at the Poplar Avenue on-ramp.*	5.5 Significant	The length of the barrier on the east side of the southbound Expressway carriageway at the Poplar Avenue on-ramp shall be reduced at detail design to remove exposure to an errant vehicle on the on-ramp.	Agree with Auditors that this is a hazard. Designer to consider providing back to back guardrail to prevent vehicles that lose control on the off ramp entering the expressway rather than shortening.
No protection for noise bund embankment *Provide barrier protection for the noise bund over ch 7880 and ch 7430.*	5.6 Significant	Barrier protection is not required in front of the noise bund on the southbound Expressway carriageway between Ch 7880 and 7430m where the steep slope is beyond the clear zone. This shall be re-assessed as part of the safe system approach at the detail design stage.	The noise bund in likely to be a hazard to motorists and needs to be protected. Refer 5.1 for notes on roadside barrier.
No protection for stormwater storage pond *Provide protection for pedestrians and cyclists using the shared use path from the stormwater storage pond over ch 7430 and ch 7630 and ensure that pedestrians / cyclists are protected*	5.7 Significant	Fencing of the scheme shall be considered at the detail design stage for the protection of pedestrians and cyclists using the shared use path in coordination with KCDC. The fencing provision shall consider pedestrians / cyclists protection from the stormwater storage pond between Ch 7430 - 7630m and other similar hazards	Agree

from other similar hazards throughout the shared use pathways.		throughout the shared use pathways.	
Protection for non-traversable embankments *Where it is proposed that 1 in 3 embankments less than 2.5m high are not barrier protected, flatten the embankments to at least 1 in 4, assuming there are no other hazards that would justify barrier protection.*	5.8 Significant	Barrier protection is provided where all 3H:1V embankments are proposed. At locations where embankments less than 2.5m high are proposed which are not barrier protected the side slopes shall be flattened to 4H:1V, assuming there are no other hazards that would warrant barrier protection.	Refer latest RoNS guidelines – unprotected slopes should be limited to 6H:1V. At 4H:1V the slope will still need protecting.
Cyclist & pedestrian provision on Poplar Avenue *Provide safe connectivity for cyclists and pedestrians between the end of the shared use path at Leinster Avenue and the path through Queen Elizabeth Park.*	6.1 Minor	How vulnerable road users (cyclists and pedestrians) connect between the end of the shared use path at Leinster Avenue and the path through Queen Elizabeth Park will need to be considered with KCDC at the detail design stage.	Agree but consider likely impact on designation so that future options are not limited.
Use of Raumati Road as part of shared use path a. *Use the expressway bridge to connect the sections of the cyclist/pedestrian path either side of Raumati Road.* b. *Assuming that there will still be a shared use path link to Raumati Road, take it to a point near the Raumati Road/Matai Road intersection where cyclists/pedestrians can see and be seen when crossing the road.*	6.2 Significant	Updates to the latest scheme include taking the shared cyclist and pedestrian path over the Expressway bridge to connect the sections of the path on the north side of Raumati Road. Cyclist and pedestrian crossing facilities for the shared path at Raumati Road will be designed in the next stage to give a safe crossing arrangement.	Agree but consider likely impact on designation so that future options are not limited.
Alignment of Otaihanga Road *Realign Otaihanga Road to overcome the various visibility issues raised above. (NB this could be done in conjunction with flattening the bridge crest curve for the expressway alignment per recommendation b. in Item 3.3).*	6.3 Significant	The realignment of Otaihanga Road was considered at an early stage in the design and discounted as KCDC have stipulated that they wish to maintain the existing rural road alignment. The location of the Expressway bridge has been designed to avoid restricting sight distances on Otaihanga Road, to enable motorists to read the curves. The existing road environment will be dealt with as part of KCDC's local roading works. Cyclist and pedestrian crossing facilities for the shared path at Otaihanga Road will be designed in the next stage to give a safe crossing arrangement.	Agree with designer but ensure that KCDC provide written confirmation of this stipulation.

Shared use path connection via Ngarara Road *Provide a facility and crossing point on Ngarara Road for cyclists and pedestrians to move safely between the sections of the shared use path.*	6.4 Significant	The cross section of Ngarara Road bridge has been designed to cater for a 12.0m road corridor width, which will allow for a separate cyclist and pedestrian path to be provided adjacent to the traffic lanes. The cross section configuration with be determined at the detail design stage. As with Otaihanga Road, cyclist and pedestrian crossing facilities for the shared path at Ngarara Road will be designed in the next stage to give a safe crossing arrangement.	Agree but consider likely impact on designation so that future options are not limited.
Otaihanga access road intersection *Ensure that the Otaihanga Road/Otaihanga access road intersection is designed to provide adequate intervisibility plus widened shoulder for passing any waiting right turn vehicle on Otaihanga Road.*	6.5 Minor	The intersection between Otaihanga Road and Otaihanga access road shall be designed at detail design stage to provide adequate intersection visibility plus widened shoulder for passing any vehicle waiting on Otaihanga Road to turn right.	Agree but consider likely impact on designation so that future options are not limited.
Under-bridge lighting *Specify sufficient under-bridge lighting for all those bridges under which pedestrians and cyclists will pass.*	6.6 Minor	Under-bridge lighting shall be assessed during the detail design stage at locations where pedestrians and cyclists will pass.	Agree
Centre line on El Rancho access road	6.7 Comment	Where the local access road carriageway provided is less than 5.0m wide no centre line road marking will be provided.	Agree
Footpaths not on desire lines at Te Moana Road *Ensure that the footpaths throughout the project are provided on the pedestrian desire lines.*	6.8 Minor	The footpaths throughout the project shall be re-assessed during the detail design stage so that they are provided on the pedestrian desire lines and do not necessary follow the alignment of the adjacent carriageway at roundabouts and other intersections.	Agree but consider likely impact on designation so that future options are not limited.

* Audit team leader to complete, attach to the report, and send electronically to the project manager.

Signed by project manager		Date: 28/2/12	*For additional rows, click in the bottom right cell of the table above, choose Table from the menu toolbar > Insert > Rows Above or Rows Below.*
Signed by traffic and safety engineer		Date: 9/3/12	*To delete a row, right-click anywhere in the row and then choose delete cells, delete entire row from the table menu.*
Project manager to send completed decision-tracking form to: designer, Audit team leader, traffic and safety engineer (NZTA), project file.		Date 13/3/12	