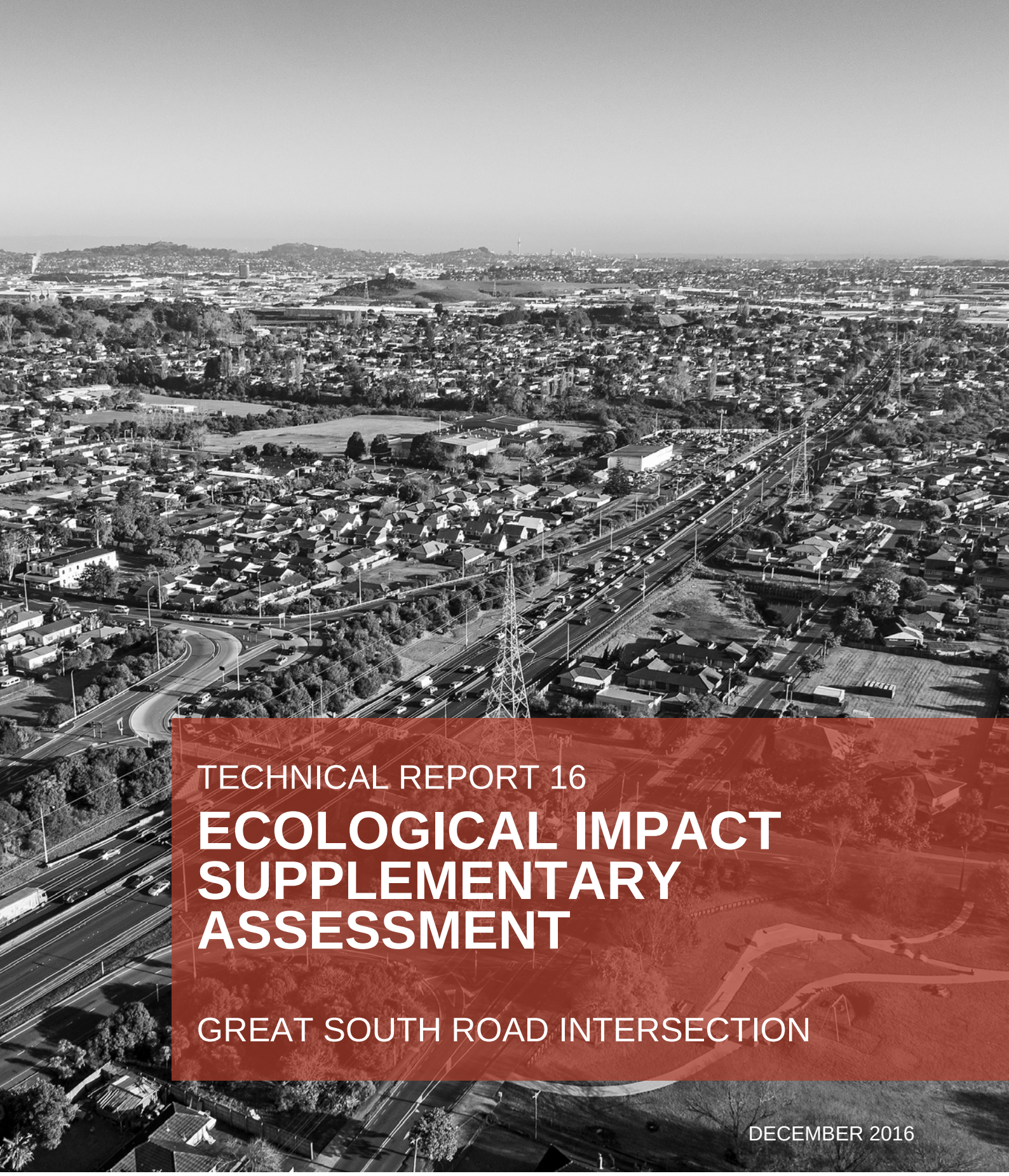

TECHNICAL REPORT 16

ECOLOGICAL IMPACT SUPPLEMENTARY ASSESSMENT

GREAT SOUTH ROAD INTERSECTION

DECEMBER 2016

NZ TRANSPORT AGENCY WAKA KOTAHI

East West Link

Myersecology

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Revision schedule					
Rev. N°	**Date**	**Description**	**Prepared by**	**Reviewed by**	**Approved by**
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Executive Summary

This report assesses the terrestrial ecological effects of a revised design of the Great South Road Intersection that includes impacts on the northern edge of Anns Creek East. The revised design is a grade separated intersection of EWL/ Great South Road/ Sylvia Park Road and viaducts through Anns Creek East.

The proposed viaducts have been designed to be located within the more modified northern edge of the creek which contains weed species, native plantings and areas of fill. However, construction of the viaducts, including access for temporary staging and location of construction works in the eastern end of Anns Creek will result in significant ecological effects, including loss of potential lizard habitat. Anns Creek East contains sensitive and unique ecological values with lava shrubland habitats, threatened plant habitats and gradients between mangroves to saltmarsh to freshwater wetland. Construction of the viaducts, as well as the temporary staging structures, and construction works, will result in direct loss of habitats across the northern and eastern sections of Anns Creek East.

The construction footprint of the revised design will adversely affect a total of approximately 2,340m^2 of lava shrubland, 21% of the shrubland ecosystem in Anns Creek East. It will also adversely affect 95% of the raupo reedland (1,160m^2), 37% of the glasswort - bachelors button herbfield (1,140m^2), 9% of mangrove scrub and forest (2,070m^2), and 0.3% of marsh clubrush habitat (4m^2). Native plantings and exotic dominated areas will also be affected. A total of 9,599m^2 (18%) of vegetation communities in Anns Creek East will be adversely affected by the Great South Road intersection and the viaducts.

The construction footprint of the Project will adversely affect a total of approximately 15,910m^2 of moderate quality lizard habitat in Anns Creek East, comprising 7,520m^2 permanent habitat loss (under the road footprint) and 8,380m^2 temporary habitat loss (areas that will be cleared and then replanted as ecological mitigation).

The revised design of viaduct structures have a much wider footprint through Anns Creek East compared to the single viaduct structure associated with the previous at grade design of the Great South Road intersection. Once completed the structures will shade the remaining vegetation beneath and near them. While there are gaps between the bridge structures which will allow moisture through, the overall footprint is wider than a single structure and will shade significantly more vegetation.

In order to mitigate for these adverse effects it is recommended that:

- The long term permanent protection of Anns Creek East should be provided for;
- A management plan should be developed detailing a programme of conservation management and weed control to be undertaken in Anns Creek East; and
- Restoration of existing lava shrubland ecosystems and weed control should be undertaken in Anns Creek West and Anns Creek Estuary.

The revised design will result in the loss of a greater proportion of moderate quality lizard habitat compared to the single viaduct structure associated with the previous at grade design of the Great South Road intersection.

Mitigation for the potential effects on lizards are described in Section 2.7.2 of Technical Report 16. Proposed mitigation includes lizard salvage and relocation, identifying opportunities to create, enhance and connect lizard habitats and development of a site suitable to release lizards salvaged during vegetation clearance within the mitigation and landscape planting areas. The proposed mitigation is sufficient to address the permanent and temporary loss of potential lizard habitat. The nature and quantum of mitigation will be reviewed following an intensive survey for lizards in January 2017.

Contents

1 Introduction

1.1 Purpose and scope of supplementary assessment

The purpose of this Technical Report 16 – Terrestrial Ecology Supplementary Assessment is to assess the terrestrial and herpetofauna effects associated with the revised design of the East West Link (EWL)/Great South Road/Sylvia Park Road intersection and viaducts through Anns Creek East.

The original Technical Report 16 – Ecological Impact Assessment was completed in November 2016. Engagement with stakeholders and the wider community has continued in parallel, including design review in response to matters raised.

As a progression of the work to date, the design of the EWL/Great South Road/Sylvia Park Road intersection has been revised from the at grade design originally proposed, to a grade separated design. Grade separation of the east west through movements at this intersection will provide improved reliability and future resilience.

This supplementary assessment describes the potential and actual ecological effects associated with construction and operation of the revised intersection design at Great South Road. The assessment considers whether the type or scale of effects on the existing environment have changed as a result of the revised design and where necessary recommends additional management and mitigation measures.

This supplementary assessment should be read in conjunction with Technical Report 16. Where this assessment supersedes and/or updates information in Technical Report 16, this has been expressly noted.

This supplementary assessment forms part of the suite of technical reports that inform the Assessment of Effects on the Environment (AEE) and supports the Notice of Requirement for a new designation, alteration to an existing designation, and resource consent applications for the Project.

1.2 Revised Great South Road Intersection

The revised intersection design at Great South Road is described in Section 6 of the AEE. Key features of the revised intersection design include:

- Extending the Anns Creek viaduct by about 330m over Great South Road. The viaduct would grade down to Sylvia Park Road, approximately 200m east of Great South Road.
- Altered through movements and connections to local roads at the intersection –
  - Through movements on EWL would occur on the elevated structure above Great South Road
  - Movements to and from EWL to Sylvia Park Road and Great South Road would be at grade providing connectivity to the local street network
  - North and south movements on Great South Road would remain unchanged, passing under the elevated EWL structure.
- A grade separated pedestrian and cycle crossing for east west movements on the southern side of the Anns Creek viaduct.
- Changes to the EWL/Hugo Johnston Drive intersection.
- Associated urban design and landscape treatments.

The revised intersection design is hereafter referred to in this supplementary assessment as "the revised intersection design at Great South Road", or "the revised design". The previously proposed layout (as assessed in Technical Report 16) is referred to as the "at grade intersection design at Great South Road", or "the at grade design".

The geographical extent of the Project assessed in this supplementary assessment report is from Hugo Johnston Drive to Mt Wellington Highway.

2 Assessment Methodology and Existing Environment

2.1 Assessment Methodology

The assessment methodology for the assessment of ecological values and effects on lizard habitat are set out in Technical Report 16. In addition two further actions have been undertaken to prepare this supplementary assessment.

Additional site visits were undertaken in November 2016 to map with greater accuracy, using GPS technology, the location of the highest value lava and lava shrubland areas. The resulting plan will be used to guide location of piers during detailed design.

In addition two 10 x 10 metre permanent shrubland vegetation plots were placed in the lava shrubland ecosystems in Anns Creek East to measure vegetation structure and composition. One was placed in the central lava flow and one in the north western lava flow shrubland vegetation. They are each marked with a GPS point. These plots will enable monitoring of vegetation changes over time, and of mitigation including weed control.

2.2 Existing Environment

The existing environment, in particular in relation to the ecological values in Anns Creek East, is outlined in detail in Technical Report 16.

3 Assessment of Effects

3.1 Predicted Project Terrestrial Ecology Effects

3.1.1 Terrestrial Ecology

Terrestrial ecology effects within each sector

Sector 3 - Anns Creek

This report assesses the terrestrial ecological effects of a revised design of the Great South Road intersection that includes impacts on the northern edge of Anns Creek East. This revised design is a grade separated intersection of EWL/Great South Road/Sylvia Park Road and viaducts through Anns Creek East.

A single structure raised viaduct will be constructed across the mangroves in Anns Creek Estuary (SEA-M1 and M2), and across the northern edge of Anns Creek West (through the Southdown Co-Generation Plant).

The single structure is approximately 30 metres wide. The terrestrial ecological effects of this part of the route are described in Technical Report 16.

The revised viaduct design at Anns Creek East is wider and incorporates three bridge structures across the northern edge of Anns Creek East (SEA-T-5309) through to Great South Road/Sylvia Park Road. The total footprint of the proposed viaducts across the northern part of Anns Creek East varies from over 40 metres wide (at the western end of Anns Creek East) to over 65 metres wide at the widest point (at the eastern end). The majority of the footprint of the proposed viaducts through the area of Anns Creek East containing lava shrubland and saltmarsh communities is between 55 metres wide to over 60 metres wide. There are gaps (approx. 5m) between the three viaduct structures. Pier structures adversely affecting vegetation in Anns Creek East, include eight piers within the main viaduct structure, four in the southern off ramp structure, and four within the northern off ramp bridge structure (Drawing Number AEE-C-207 to 209 and AEE-C-285,286,287,288). Significantly more pier structures are needed for construction of the grade separated design than the previously proposed at grade design of the Great South Road intersection. There is a pedestrian walkway and cycleway on the southern edge of the grade separated bridge design.

The construction of the viaducts will be undertaken using a temporary staging structure with bored pile supports. The temporary staging structure will provide access for pile and pier construction. Access for temporary staging will be required from the northern edges of Anns Creek East.

The eastern end of Anns Creek East is consented for reclamation by TR Group. This area is identified as being within the limit of construction works for the project (Drawing Number AEE-AL-108). A pedestrian walkway structure is proposed for this area of Anns Creek East, beside Great South Road. The adverse ecological effects of construction works in the eastern end of Anns Creek are outlined in detail in Technical Report 16.

Ecological effects

Anns Creek East

Construction of the revised design, including access for temporary staging and location of construction works in the eastern end of Anns Creek will result in significant ecological effects. Anns Creek East contains sensitive and unique ecological values with lava shrubland habitats, threatened plant habitats and gradients between mangroves to saltmarsh to freshwater wetland. Construction of the proposed viaduct, as well as the temporary staging structures, and construction works, will result in direct loss of habitats across the northern and eastern sections of Anns Creek East.

The viaduct structures have a much wider footprint through Anns Creek East compared to the single viaduct structure associated with the previous at grade design of the Great South Road intersection. Once completed the structures will shade the remaining vegetation beneath and near them. While there are gaps between the bridge structures which will allow moisture through, the overall footprint is wider than a single structure and will shade significantly more vegetation.

The proposed viaducts have been designed to be located within the more modified northern edges of the creek which contain weed species, native plantings and areas of fill. Effects on the lava flows in the southern and central section of the creek will be avoided and minimised. This central lava flow which contains intact areas of natural lava shrubland habitat has been avoided. We recommend later in this report that construction activity within this southern and central portion of Anns Creek is expressly restricted as a formal mitigation measure.

The viaducts, however, will result in significant adverse effects and loss of the lava shrubland ecosystems on the north-eastern lava flow. The structures will also result in loss of raupo wetland and saltmarsh ecosystems. The location of the construction works will destroy saline and freshwater ecosystems in the eastern end of the creek.

The effects of construction of the viaducts will be significant. Over the years Anns Creek East has been subject to the impacts of existing infrastructure and industrial development and the Project will add further cumulative effects to these historic effects.

Vegetation types within the construction footprint of the revised design that will be adversely affected are identified in Table 1.

Table 1: Vegetation Types in Anns Creek East Adversely Affected by Great South Rd Intersection and Viaducts

Vegetation Types	Total area of vegetation type within Anns Creek East (m^2)	Area of vegetation type in Anns Creek East affected by Great South Road intersection design and designation boundary to north[11]	Percentage of total area of vegetation type in Anns Creek East affected by Great South Road intersection design
Brush wattle pampas shrubland	1049	367	35.0%
Marsh clubrush - tall fescue reedland	1,333	0	0
Marsh clubrush reedland	1,456	4	0.3%
Tall fescue grassland	1,448	0	0
Pampas tussockland	3,196	0	0
Mangrove scrub and forest	22,803	2,070	9.1%
Glasswort - bachelors button herbfield	3,088	1,140	37.0%
Raupo reedland	1,215	1,160	95.5%
Oioi saltmarsh	332	0	0
Lava shrubland	11,176	2,340	20.9%
Native Plantings	1,603	1,509	94.1%
Brush wattle - gorse weedfield	2,787	1,010	36.2%

[1] We have assumed that all vegetation from the northern extent of the alignment to the northern extent of the designation, including the vegetation underneath the viaducts, is removed during construction. We have also assumed that all vegetation from the southern extent of the alignment to the southern boundary of the designation is retained (within Anns Creek East only). It is likely that with careful placement of piers and construction works not all of the vegetation will be removed from underneath the viaducts, however, there will be fragmentation and shading of this vegetation which will adversely affect its viability.

The construction footprint for the revised design will adversely affect a total of approximately 2,340m^2 of lava shrubland, 21% of the shrubland ecosystem in Anns Creek East. It will also adversely affect 95% of the raupo reedland (1,160m^2), 37% of the glasswort - bachelors button herbfield (1,140m^2), 9% of mangrove scrub and forest (2,070m^2), and 0.3% of marsh clubrush habitat (4m^2) (Table 1). Native plantings and exotic dominated areas will also be affected.

In comparison with a single at-grade viaduct structure associated with the previous at grade design of the Great South Road intersection, the revised design will adversely affect additional areas of vegetation due to the extra width. The revised structure will adversely affect approximately 19% (370m^2) more lava shrubland, 29.7% (260m^2) more glasswort-bachelors button herbfield, and 47% (660m^2) more mangrove scrub and forest, than a single viaduct structure.

A total of 9,600m^2 (18%) of vegetation communities in Anns Creek East will be adversely affected by the Great South Road intersection design and viaducts through Anns Creek East.

In addition construction works proposed within the eastern end of the creek (described in Technical Report 16) will result in the loss of approximately 16% of vegetation communities in Anns Creek East.

The Great South Road intersection design and viaducts, together with the construction works in the eastern end of Anns Creek, will adversely affect a total of 34% of the vegetation communities in Anns Creek East. Adverse effects will include the following:

- Disturbance and loss of lava shrubland ecosystems;
- Loss of freshwater raupo wetland, mangrove and saltmeadow communities;
- Disturbance and loss of ecological sequences from terrestrial to saline to freshwater;
- Loss of and impacts on a naturally uncommon ecosystem type.

Staging and construction of the bridge piers will result in direct loss of vegetation and habitats within the immediate area of disturbance. An exclusion plan delineating the highest value lava and lava shrubland areas is being developed to guide location of piers during detailed design. As a result of this work the location of piers will be designed to avoid the most sensitive areas of lava shrubland.

3.1.2 Terrestrial ecology effects of the project

Effects on terrestrial ecology in Anns Creek and Mangere Inlet include fragmentation, reduction in the size and extent of ecosystems, disruption of connections, potential loss of rare or threatened species, loss or degradation of originally rare ecosystems, cumulative loss, and damage to ecological mosaics or sequences. The revised design will result in a wider footprint and greater adverse ecological effects on Anns Creek East in comparison with the at grade design.

The revised design will result in loss of a greater proportion of moderate quality lizard habitat in comparison with the at grade design. The lizard habitats in Anns Creek East comprise native plantings, brush wattle-pampas shrubland, and brush wattle-gorse weedfield with basalt outcrops and scattered debris. Lizard habitats are described in Sections 2.4.2.3 and 2.4.2.4 of Technical Report 16.

Fragmentation, reduction in size and extent of ecosystems

In Sector 3, the grade separated design through Anns Creek East will result in loss and adverse impacts on much of the north-eastern lava flow. It will also result in loss of the raupo wetland and loss in extent and fragmentation of the mosaic of vegetation communities (lava shrubland, saltmarsh and freshwater wetland).

Fragmentation, disruption of ecological connections, loss or damage to ecological mosaics and sequences

Construction of the Anns Creek viaducts and the construction yard in Anns Creek East will result in adverse effects on lava shrubland, mangrove, saltmarsh and freshwater wetland communities, and fragmentation and disturbance of the ecological sequences and connections and the mosaic of habitats in Anns Creek East.

Changes resulting in increase in pests

There are significant weed issues throughout many parts of the project area. There has been restoration planting undertaken on the edges of Anns Creek East within the TR Group land, however, weed species are invading this area. There are several weed species including moth plant, pampas, smilax, gorse, and Chinese privet that are common on the lava flows of Anns Creek East. Further disturbance in this area will result in the spread of weeds. There is a significant opportunity to undertake ecological restoration and rehabilitation through weed control and ongoing maintenance in Anns Creek East.

Loss of rare, Threatened species, population, habitat

The position of the grade separation structures through Anns Creek East has been designed to minimise effects on the lava shrublands. The location has been designed to concentrate effects on the degraded edges dominated by weed species and native plantings. The central lava flow that contains significant native lava shrubland communities and habitat for threatened fern and *Geranium* spp. is avoided. Construction of the viaducts through Anns Creek East however will result in the loss of 2,340m^2 of lava shrubland habitat, and the footprint is within the lava flows that provide habitat for native shrubs such as akeake, *Astelia banksii*, *Coprosma crassifolia, Coprosma propinqua (*regionally vulnerable*)* and *Threatened* herb and fern species including *Pellaea falcata (*at risk, declining*),* and *Geranium solanderi (*at risk declining*)*. Construction will result in loss of lava shrubland ecosystems.

Loss or degradation of originally rare ecosystems

The lava shrublands in Anns Creek and in Mangere Inlet are an originally rare/naturally uncommon ecosystem type (Williams *et al.* 2007). Construction of the viaducts will result in a reduction in the extent of lava shrublands in Anns Creek through shading from the three viaduct structures, location of the piers and construction staging. While gaps between structures will allow light and moisture through, the width of structures and shading will have significant adverse effects on vegetation communities.

The viaducts have been designed to avoid and minimise adverse effects on the lava flows characterised by native shrubs, grasses, ferns and herbs. Construction, however, will result in loss of lava shrublands on the north-eastern lava flow and 2,340m^2 of the high value lava shrublands in Anns Creek will be adversely affected by the footprint of the alignment. This north-eastern lava flow contains gorse and native plantings however there are native dominated plant communities with akeake, *Coprosma crassifolia* and *Astelia banksii* and native ferns present on the lava flow which will be affected by construction and ongoing shading.

Cumulative loss or degradation of ecosystems

Construction of the viaducts, together with works in the eastern end of Anns Creek East, will result in cumulative loss and degradation of lava shrubland, mangrove, saltmarsh and freshwater habitats by adding to the effects of past reclamation and development in Anns Creek East.

Modification of the viability or value of indigenous vegetation or habitats

Construction through Anns Creek East will damage ecological communities and modify the value and viability of the mosaic of ecosystem types in Anns Creek East. The revised design, as well as works in the eastern corner, will result in a significant proportion of Anns Creek East being lost to development. This will impact on the viability and ecological value of the area. Construction will open areas to weed invasion. Shading from the viaduct structures will impact on shrubland ecosystems adapted to high light conditions. There are a significant number of weed species on the edges of the lava flows in Anns Creek East and these have the potential to spread. There is an opportunity for restoration and better conservation management in the area if it was provided permanent protection, and an ongoing conservation management programme.

3.1.3 Herpetofauna effects

The potential construction and operational effects on lizards include direct loss of lizard habitat within the project area; displacement to unsuitable surrounding habitat; and lizard mortality during vegetation clearance and site works. The works within Anns Creek East will include clearance of vegetation within parts of the construction area in Anns Creek East but outside the lava shrubland. We understand that conditions will be proposed so that within the lava shrubland there will be no permanent or temporary piers and intensive construction activities and vegetation clearance will be minimised. The remaining area, outside of the construction footprint will be revegetated and will include species and habitat elements suitable for lizard fauna. As such, this assessment of effects on lizards includes both permanent (under the road footprint, comprising 7,520 m^2) and temporary habitat loss (comprising 8,380 m^2 areas that will be cleared and then replanted as ecological mitigation).

The assessment of ecological effects on lizards as a result of the Project, with the revised design of the Great South Road intersection, remains the same as outlined in Sections 2.5.3 and 2.6.2 of Technical Report 16.

An assessment of effects in the specific location of Anns Creek East is not possible at this stage because of insufficient information about lizard presence and/or distribution and final construction footprints. Notwithstanding those constraints an assessment of potential effects was undertaken at the local population level. The magnitude of effect and the level of effect outlined in Technical Report 16 are the same for the revised design of the Great South Road intersection. An intensive survey for lizards will be undertaken in January 2017.

4 Recommended Mitigation

Recommendations to avoid and minimise the effects of the revised design (including viaducts and grade separated structures at Great South Road) in Anns Creek East on terrestrial ecological values include the following:

- Construction of the Anns Creek East viaduct should be located as close as possible to the northern edges of Anns Creek East;
- Reduce the width of the project footprint by reducing the separation distance between bridge structures;
- Bridge piers have been placed to avoid and minimise adverse effects on sensitive lava shrubland vegetation. However, conditions should require that further refinement of this should be undertaken at the time of detailed design to avoid and minimise adverse effects on threatened or uncommon species;

- Minimise to the greatest extent practicable construction activities and vegetation removal within the lava shrubland area underneath the proposed viaduct;
- Avoid construction activities and vegetation removal in the central and southern parts of Anns Creek East outside the construction footprint;
- Avoid construction works in the eastern end of Anns Creek (the area consented for development by TR Group);
- Provide for permanent protection for Anns Creek East and an ongoing conservation management programme for the area. Inclusion of the area in the eastern corner which is consented for development would result in a much more significant area of Anns Creek being protected. It would reduce cumulative effects on this area and prevent further loss;
- Develop a management plan and implement a conservation management programme, including weed control, threatened plant protection, and restoration of lava shrubland ecosystems (where these habitats are dominated by weed species) in Anns Creek East, Anns Creek Estuary and Anns Creek West. This could include removing fill on the northern edges of Anns Creek East to uncover lava flows;
- Monitoring of the effectiveness of lava shrubland restoration, threatened plant protection and weed control should be undertaken.

Mitigation measures relating to the potential effects on lizards are described in Section 2.7.2 and Chapter 16 of Technical Report 16. Proposed mitigation includes lizard salvage and relocation, identifying oportunitues to create, enhance and connect lizard habitats (through both the ecological restoration / mitigation areas and the landscape revegetation proposed) and development of a site suitable to release lizards salvaged during vegetation clearance within the mitigation and landscape planting areas. Of these mitigation measures, salvage and relocation of lizards is the most important to reduce and mitigate effects on lizards.

The proposed mitigation is sufficient to address the permanent and temporary loss of potential habitat for lizards, but the nature and quantum of mitigation will be reviewed following an intensive survey for lizards in January 2017. The habitats within Anns Creek East are dry and exposed and the only native species likely to be present are copper skinks (not threatened). Given that, the mitigation proposed (lizard salvage and habitat creation) is likely to exceed what would be required to mitigate habitat loss for copper skinks within Anns Creek East due to the revised design of the Great South Road intersection.

5 Conclusion

The revised design through Anns Creek East will result in a wider structure than a single viaduct structure, more shading of vegetation, and significantly more pier structures.

The proposed viaducts have been designed to be located within the more modified northern edges of the creek which contain weed species, native plantings and areas of fill. Pier structures will be designed to avoid high value lava shrubland. Effects on the lava flows in the southern and central section of the creek will be avoided and minimised.

The viaducts will result in significant adverse effects and loss of the lava shrubland ecosystems on the north-eastern lava flow, and loss of raupo wetland and saltmarsh ecosystems. A total of 9,600m^2 (18%) of vegetation communities in Anns Creek East will be adversely affected by the Great South Road intersection design. In comparison with a single at grade viaduct structure associated with the previous at grade design of the Great South Road intersection, the revised design will result in significantly greater loss of mangrove scrub and forest (47% more), lava shrubland (19.1% more), and glasswort – bachelors button herbfield (29.7% more).

In order to mitigate for these adverse effects the long term permanent protection of Anns Creek East (including the area consented for development by TR Group) should be provided for. A management plan should be developed detailing a programme of conservation management and weed control to be undertaken. In addition restoration of existing lava shrubland ecosystems and weed control should be undertaken in Anns Creek West and Anns Creek Estuary.

The assessment of effects on lizards and proposed mitigation as outlined in Technical Report 16 does not change with the revised design of the Great South Road intersection and mitigation is at least sufficient, if not providing an overall net benefit for lizard fauna by the provision of a larger, higher quality habitat.