LINCOLN ROAD CORRIDOR IMPROVEMENTS

Assessment of Effects on Marine Ecological Values
Prepared for Auckland Transport

19 January 2016

Document Quality Assurance

Bibliographic reference for citation:
Boffa Miskell Limited 2016. *LINCOLN ROAD CORRIDOR IMPROVEMENTS: Assessment of Effects on Marine Ecological Values*. Report prepared by Boffa Miskell Limited for Auckland Transport.

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Status: FINAL	Revision / version: B	Issue date: 19 January 2016

Template revision: 20150330 0000

File ref:
C:\Users\leighb\Desktop\A15168_Marine_Ecological_Assessment_20150813_LB.docx

Cover photograph: Reserve at Daytona Reserve, © Georgia Cumming, 2015

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1.0 Introduction

This report forms part of Auckland Transport's (AT) Notice of Requirement (NOR) for the Lincoln Road Corridor Improvements (LCRI) project. The LRCI project aims to improve the efficiency of Lincoln Road, Henderson, improve public transport reliability in this area, and improve safety for all road users.

The LRCI project applies to a 1.3 km length of Lincoln Road, between its intersection with Te Pai Place / Pomaria Road to the south and the State Highway 16 (SH 16) on-ramp to the north. The project will upgrade Lincoln Road to maintain two lanes for general traffic in each direction, while also providing for a transit lane, dedicated cycle lane and footpath in each direction. Additional and/or longer turning lanes will be constructed at controlled intersections. A raised median will be installed in the centre of the road, and U-turns will be enabled at controlled intersections. The improvements will be integrated with the New Zealand Transport Agency's upgrades of SH 16 at the Lincoln Road interchange.

The LRCI project also involves the collection and treatment of stormwater generated from the new road surfaces at 312 Lincoln Road and discharge to a new coastal outfall at Daytona Reserve. Runoff from a small portion of the existing alignment will also be treated prior to discharge. There will be a new public road formed to the rear of 300-312 Lincoln Road, which will provide access to Daytona Reserve and existing properties that will be unable to be accessed directly from Lincoln Road.

Under the current preferred stormwater option, the runoff from all existing impervious areas of the Lincoln Road corridor which currently discharge to various locations will be collected and discharged at the new coastal outfall at Daytona Reserve, reducing the number of discharges to the estuary from ten to one.

In order to construct the improvements, the existing road reserve will be widened by varying amounts on each side (generally around 2-3 m, up to approximately 8 m) as a greater area of land is required in the vicinity of intersections.

A fuller description of the project is provided in the Assessment of Environmental Effects which supports the NOR.

The purpose of this report is to provide an assessment of the effects of the preferred stormwater management approach for the LRCI project on marine ecological values; those effects being primarily around the construction of a new discharge point to the estuary and discharge of treated stormwater from the new roading alignment, along with the discharge of untreated and treated stormwater from the existing part of Lincoln Road within the project area. As resource consents for the discharges are not being sought at the current time, the potential effects of the proposed stormwater discharges on the coastal marine area have been assessed for the purpose of determining whether there are feasible options available for the discharge of stormwater, and to ensure that sufficient space is incorporated into the project to accommodate likely required mitigation devices.

This report does not specifically assess the effects of the widening of Lincoln Road on terrestrial ecological values. However, based on the arborist's assessment, the proposed widening of Lincoln Road only affects a small number of individual exotic trees that are likely to have limited ecological value.

2.0 Methodology

2.1 Existing Information

Existing data regarding the marine ecological values was collated from the Proposed Auckland Unitary Plan (PAUP) and relevant Auckland Council Technical Reports.

2.2 Field Survey

A survey of the estuarine receiving environment adjacent to Daytona Reserve was carried out at low tide on 11 August 2015. Three sites were surveyed (Figure 1). The survey comprised the following:

- Inventory of coastal fringe vegetation;
- Survey of benthic invertebrates (infaunal and epifaunal);
- Survey of surface sediment grain size and concentration of common stormwater contaminants;
- Visual assessment of the depth of oxygenated sediment overlying anoxic sediment;
- Observation of birds present within the wider site; and
- Observations of modifications to the estuary.

At each of the three sites a 13cm diameter core was used to survey benthic infaunal invertebrates. The core was pushed into the estuarine sediment to a depth of approximately 10 cm and extracted. Sediment contained within the core was washed through a 0.5 mm mesh sieve. All of the retained material and organisms were placed in a jar and preserved in 70% ethanol for later extraction and identification of the organisms.

Epifaunal invertebrates were surveyed at each site using a 0.25 m^2 quadrat randomly position on the estuarine sediment. Epifauna within the quadrat was identified and counted and any other features noted e.g. presence of mangrove pneumatophores, crab holes, algae.

Surface sediment (top 2-3 cm) was collected at each site and sent on ice to University of Waikato and Hill laboratories for the analysis of sediment grain size and contaminants respectively. Contaminants analysed include copper, lead, zinc, polycyclic aromatic hydrocarbons and total organic carbon.

2.3 Assessment of Ecological Value and Effects

Assessment of estuarine benthic ecological values is guided by the following characteristics and determining on balance which of the low, medium or high ecological characteristics apply to a specific soft sediment habitat or marine area (Table 1).

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Legend

AC Benthic Invertebrate Survey Site

AC Sediment Quality Survey Site

Sample Location

0 600 m

1:20,000 @ A3

Data Sources: Auckland Council, LINZ

Projection: NZGD 2000 New Zealand Transverse Mercator

LINCOLN ROAD ECOLOGY

Figure 1: Location Plan

Date: 14 August 2015
Revision: 0

Plan prepared by Boffa Miskell Limited

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Table 1: Marine ecological value characteristics

ECOLOGICAL VALUE	CHARACTERISTICS
Low	• Benthic invertebrate community degraded with low species richness, diversity and abundance. • Benthic invertebrate community dominated by organic enrichment tolerant and mud tolerant organisms with few/no sensitive taxa present. • Marine sediments dominated by silt and clay grain sizes. • Surface sediment predominantly anoxic (lacking oxygen). • Elevated contaminant concentrations in surface sediment, above ISQG-high or ARC-red effects threshold concentrations[1]. • Invasive, opportunistic or disturbance tolerant species dominant. • Estuarine vegetation provides minimal/limited habitat for native fauna. • Habitat highly modified.
Medium	• Benthic invertebrate community typically has moderate species richness, diversity and abundance. • Benthic invertebrate community has both (organic enrichment and mud) tolerant and sensitive taxa present. • Marine sediments typically comprise less than 50-70% silt and clay grain sizes. • Shallow depth of oxygenated surface sediment. • Contaminant concentrations in surface sediment generally below ISQG-high or ARC-red effects threshold concentrations. • Few invasive, opportunistic or disturbance tolerant species present. • Estuarine vegetation provides moderate habitat for native fauna. • Habitat modification limited.
High	• Benthic invertebrate community typically has high diversity, species richness and abundance. • Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and mud. • Marine sediments typically comprise <50% smaller grain sizes. • Surface sediment oxygenated.

[1] ANZECC (2000) Interim Sediment Quality Guideline (ISQG) High contaminant threshold concentrations or Auckland Regional Council's Environmental Response Criteria Red contaminant threshold concentrations (Auckland Regional Council, 2004).

ECOLOGICAL VALUE	CHARACTERISTICS
	• Contaminant concentrations in surface sediment rarely exceed low effects threshold concentrations. • Invasive, opportunistic or disturbance tolerant species largely absent. • Estuarine vegetation provides significant habitat for native fauna. • Habitat largely unmodified.

2.4 Assessment of Ecological Effect

2.4.1 Magnitude of ecological effect

The magnitude of ecological effects was assessed using the following criteria[2]:

Table 2: Criteria for describing effect magnitude.

MAGNITUDE	DESCRIPTION
Very High	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether.
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the “no change” situation.

2.4.2 Significance of ecological effects

The significance of ecological effects was then assessed using ecological value (determined in Table 1) and effect magnitude (Table 2) as shown in the following matrix (Table 3):

[2] Adapted from EIANZ (2015), Ecological Impact Assessment Guidelines. http://www.eianz.org/document/item/2827

Table 3: Matrix combining magnitude and value for determining the significance of ecological impacts.

SIGNIFICANCE		ECOLOGICAL &/OR CONSERVATION VALUE			
		VERY HIGH	HIGH	MEDIUM	LOW
MAGNITUDE	Very High	Very High	Very High	High	Medium
	High	Very High	Very High	Medium	Low
	Medium	Very High	High	Low	Very Low
	Low	Medium	Low	Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low

3.0 Existing Ecological Values

The estuary at Daytona Reserve is within Significant Ecological Area SEA-M2 55a (Henderson Creek and Te Atatu) which is recognised in the Proposed Auckland Unitary Plan (and the operative Auckland Council Regional Plan: Coastal) for the complex habitat formed by saltmarsh, mangroves, shellbanks, estuarine and harbour intertidal banks, all of which support a variety of plant and animal communities. The entire upper and central Waitemata Harbour is also within an area of “high ecological value susceptible to degradation” that require greater emphasis for the avoidance and mitigation of adverse effects on water quality (Auckland Regional Policy Statement, Map 5, Sheet 3).

Auckland Council has survey sites located downstream from the estuary at Daytona Reserve where sediment contaminants and benthic invertebrate assemblages are monitored. These background data are incorporated in the assessment of ecological values below.

3.1 Coastal Fringe Vegetation

Vegetation around the estuarine margin is dominated by exotic and weed species and rank grass, with little indigenous saltmarsh or shrubs present (Table 4). Mangroves dominate the estuary core.

Table 4: Coastal fringe and saline vegetation recorded around the estuarine margin.

INDIGENOUS VEGETATION	SITE 1	SITE 2	SITE 3
Coprosma robusta (karamu)	✓		
Myrsine australis (mapau)	✓		
Phormium tenax (flax)			✓

INDIGENOUS VEGETATION	SITE 1	SITE 2	SITE 3
Juncus krausii (marine rush)	✓	✓	✓
Typha orientalis (raupo)	✓		
Avicennia marina (mangrove)	✓	✓	✓
Austrostipa stipoides (spear grass)	✓		
EXOTIC VEGETATION	**SITE 1**	**SITE 2**	**SITE 3**
Ligustrum lucidum (tree privet)	✓		✓
Cortaderia selloana (pampas)	✓		✓
Ulex europaeus (gorse)	✓	✓	
Allium triquetum (onion weed)	✓		
Isolepis cernua va *cernua* (slender clubrush)	✓	✓	
Watsonia sp.		✓	
Conyza sumatrensis (Broad-leaved fleabane)			✓

3.2 Benthic Invertebrate Community Composition

3.2.1 Infauna

The benthic invertebrate community was found to be dominated by the estuarine snail *Potamopyrgus estuarinus*, oligochaete worms and Corophid amphipods, which is typical of estuarine sites located in the uppermost parts of waterbodies, where freshwater influence is quite high. These organisms are tolerant of changes in environmental conditions, including time exposed at low tide, temperature and freshwater inflow. No particularly sensitive species were detected, apart from the polychaete worm Boccardia sp., which is reported[3] to have a reduced feeding rate after exposure to greater than 80 mg/m^3 of suspended sediment in water after nine days exposure in a laboratory. Non-biting midges were also present in the core samples.

The most common species were detected in high abundance, with a moderate to low number of individual taxa. Shannon-Wiener diversity index comprises an assessment of the number of taxa and the relatively abundance within each taxa. At the three sites surveyed, the index indicated moderate diversity (1-1.5) (Table 5).

[3] Nicholls, P., Hewitt, J., Halliday, J., 2003. Effects of suspended sediment concentrations on suspension and deposit feeding marine macrofauna. Prepared for Auckland Regional Council. Auckland Regional Council Technical Report No. 211.

Table 5: Benthic invertebrate community composition metrics

METRICS	SITE 1	SITE 2	SITE 3
Total abundance of invertebrates	199	205	294
Number of invertebrate taxa	8	8	11
Shannon-Wiener Diversity Index	1.3	1.3	1.2

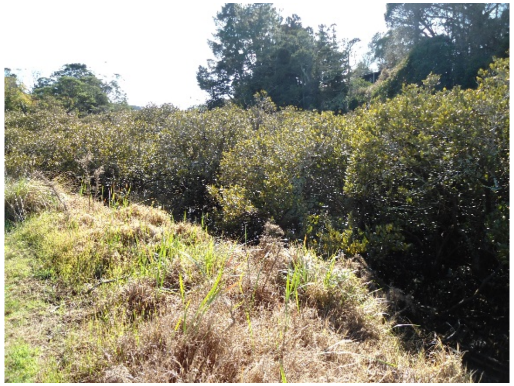
Auckland Council monitor benthic invertebrate assemblages some distance downstream of the area surveyed for this project (Figure 1). At that location, the benthic surface sediment composition is significantly more sandy than that at Daytona Reserve (see Section 3.3 below) which strongly influences the benthic community composition. The invertebrate assemblage at the downstream site has an entirely different composition to that at Daytona Reserve, being dominated by the bivalves *Nucula hartvigiana* (nut shell) and *Austrovenus stutchburyi* (cockle) and a small limpet (*Notoacmea* sp.)[4].

3.2.2 Epifauna

The only epifauna detected within the quadrats was the small estuarine snail *Potamopyrgus estuarinus*, which was abundant at all three sites. Slender clubrush (*Isolepis cernua*) was present at the upper most site (Site 1) (Table 6).

[4] Data from 2006 survey (TP314)

Table 6: Epifauna and macroalgae

Site	Typical Intertidal Habitat	Quadrat Photo	Data
1			• Macroalgae – *Isolepis cernua* • Macrofauna – *Potamopyrgus estuarinus* abundant
2			• Macroalgae - nil • Macrofauna – *Potamopyrgus estuarinus* abundant

Site	Typical Intertidal Habitat	Quadrat Photo	Data
3			• Macroalgae - nil • Macrofauna – *Potamopyrgus estuarinus* abundant

3.3 Sediment Quality and Sediment Grain Size

The former Auckland Regional Council developed environmental response criteria (ERC) for the coastal marine area that provide thresholds for assessing environmental quality in relation to stormwater and wastewater discharges[5]. These criteria are conservative, as the aim was to provide an early warning signal which would allow time for action before significant adverse effects on ecological values occur. Sediment quality within the green threshold are considered to be low impact sites, whereas amber sites show signs of degradation and red sites are those where significant degradation has already occurred and where remedial opportunities are more limited.

Surface sediment quality downstream of the estuary at Daytona Reserve is monitored by Auckland Council at two sites (Henderson Upper and Henderson Lower). This data is included in Table 7 below along with the contaminant data for the samples collected adjacent to Daytona Reserve specifically for this project. At these two Auckland Council monitoring sites, the concentration of copper, lead and zinc is within the AC ERC[8] amber concentrations, indicating a potentially emerging issue for benthic invertebrates.

Sediment contaminant data indicate high concentrations of metals within the estuary adjacent to Daytona Reserve (Table 7). The concentrations of copper, lead and zinc at all three sites exceeds AC ERC Red threshold (except zinc at Site 3), and most exceed ISQG-low threshold. Lead and zinc at Site 1 exceed the ISQG-high concentration, indicating that adverse effects on organisms are likely to be occurring at this site.

Table 7: Concentration of common stormwater contaminants in surface sediment (total recoverable, mg/kg)

CONTAMINANT	SITE 1	SITE 2	SITE 3	HENDERSON UPPER[6]	HENDERSON LOWER[7]	AC ERC AMBER[8]	AC ERC RED	ISQG LOW[9]	ISQG HIGH
Copper	70	48	90	28	28	19	34	65	270
Lead	230	58	60	33	33	30	50	50	220
Zinc	450	240	147	150	149	124	150	200	410
HMW-PAHs	0.13	0.02	0.02	NA	NA	0.66	1.7	1.7	9.6

Sediment at Sites 1-3 is dominated by silt and clay grain sizes (approximately 55-65%), which is typical of upper estuary sites that receive and retain runoff from the land. The AC benthic invertebrate monitoring site downstream is characterised by only 9.5% silt and clay, 77% fine sand, 11% medium sand and the remainder is coarse sand (Figure 2).

Due to the dense barrier presented by mangrove pneumatophores, it was not possible to collect a redox sample. Depth of oxygenated sediment overlying anoxic sediment was visually estimated at less than 1cm.

[5] Auckland Council, TP168.

[6] Data from 2009 survey (TR2012/041)

[7] Data from 2010 (TR2012/041)

[8] Auckland Council Environmental Response Criteria Amber Threshold Concentration (TP168).

[9] ANZECC Guidelines, Interim Sediment Quality Guidelines, Low Threshold.

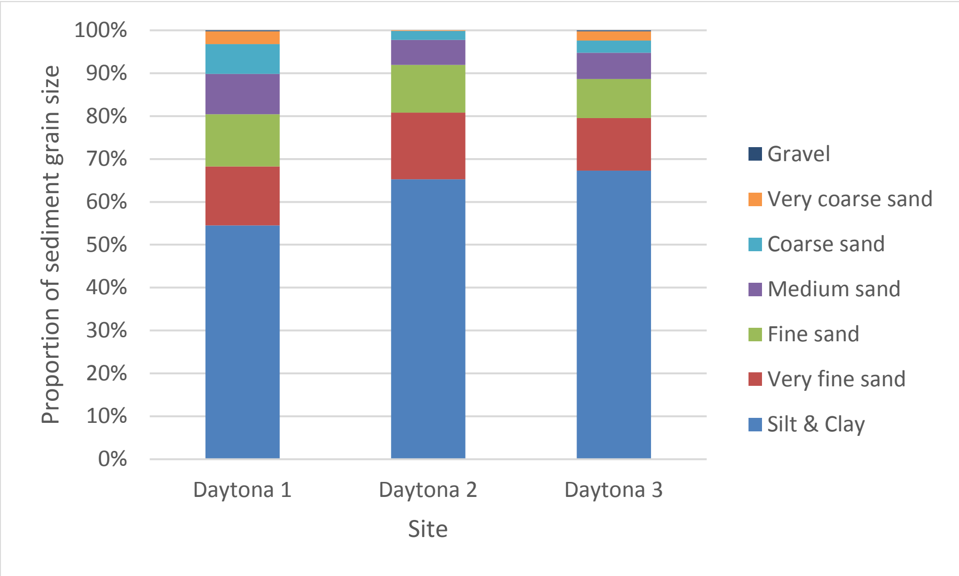


Figure 2: Proportion of sediment grain size within each of the project survey sites

3.4 Avifauna

The only birds observed during the survey were native tui (*Prosthemadera novaeseelandiae novaeseelandie*), and introduced house sparrow (*Passer domesticus*), blackbird (*Turdus merula*), myna (*Acridotheres tristis*) and chaffinch (*Fringilla coelabs*). None of these species are Threatened or At Risk.

Given the presence of small areas of raupo and saltmarsh vegetation and vast mangrove stands, it is possible that cryptic marsh birds, including species such as banded rail (*Gallirallus philippensis*[10]) or bittern (*Botaurus poiciloptius*[11]), may also use the habitat at times[12].

3.5 Other Habitat Observations

The reserve grass area is mown to the edge of estuary, with a narrow band of primarily exotic vegetation along the coastal margin. Mature wattle and pine trees are present along the eastern side of the estuary inlet. Rubbish, garden debris and ashes from domestic fires were also present along the coastal fringe and within the mangrove stands.

3.6 Summary of Ecological Values

The marine benthic habitat adjacent to Daytona Reserve comprises:

- benthic sediment which is dominated by mud;

[10] At risk – declining (Robertson et al., 2013)

[11] Threatened – nationally endangered (Robertson et al., 2013)

[12] Wading/marsh bird surveys were not carried out as part of this assessment.

- moderate benthic invertebrate diversity and abundance;
- tolerant invertebrate taxa dominate;
- the depth of oxygenated sediment is shallow;
- metal concentrations in sediment are above high effects threshold concentrations;
- invasive species do not dominate;
- coastal fringe and saline vegetation sequences[13] largely absent; and
- overall, estuarine habitat modification is moderate, with evidence of domestic garden waste and fireplace ash being deposited on the edge of the estuary and weed/exotic vegetation dominating the coastal fringe.

Thus, based on the criteria in Table 2 above and the ecological information available, it is considered, on balance, that the estuarine benthic habitat adjacent to Daytona Reserve has low ecological values, even though it occurs within a SEA-M area. This apparent disconnect between significance and ecological value is not uncommon. The previous Coastal Protection Areas (CPAs) in the operative Regional Coastal Plan and the SEA- marine areas in the Proposed Unitary Plan have typically been based on broad scale features that are readily visible e.g. presence of birds or saline vegetation. Those features may not be as relevant or accurate at a much finer scale of site assessment. In addition, for a site to be assessed as significant often only a single criterion needs to be met, and there can be other aspects of ecology within the site that reduce the overall ecological value i.e. significance and ecological values are not necessarily aligned.

Currently runoff from other existing parts of Lincoln Road discharges to the CMA at other upper estuary locations and directly into Henderson Creek. Whilst we have not surveyed these other discharge points, based on current aerial photography and other background data sources, it is likely that the receiving environment at these locations has similar values to those at Daytona Reserve.

Whilst this report does not cover terrestrial ecology specifically, based on our review of the arborist's assessment, the proposed widening of Lincoln Road only affects a small number of individual exotic trees that are likely to have limited ecological value.

4.0 Assessment of Effects on Ecological Values

The preferred stormwater proposal is to construct a new stormwater outlet and discharge treated stormwater from an equivalent area of the new impervious surface area of Lincoln Road to the Henderson Creek estuary adjacent to Daytona Reserve. In addition, a small portion of the existing alignment will be treated. Ten existing stormwater drainage paths from Lincoln Road may be consolidated into a single discharge path which may also discharge to the new stormwater outlet.

The primary potential effects on ecological values from this stormwater proposal are discussed below and include:

[13] However, the small stand of raupo may provide habitat for wading/coastal birds

- sediment runoff from open earthworks during construction;
- habitat disturbance during construction;
- the discharge of stormwater (and associated contaminants);
- erosion and scour at the outlet.

4.1 Sediment Runoff

During construction, sediment runoff from open earthworks may enter the estuary. This will be minimised through the use of best practice erosion and sediment control techniques in accordance with Auckland Council Technical Publication 90 (TP90). An erosion and sediment control plan will be prepared, approved by Auckland Council and implemented prior to construction.

With robust TP90 measures in place and the work area well managed, the effects of sediment discharge to the estuarine will be minimised appropriately. As such, the magnitude of the effect of sediment runoff on the marine ecological values is determined to be negligible (refer to Table 2).

4.2 Habitat Disturbance

Threatened or At Risk wading and marsh birds may use the estuarine habitat for nesting and foraging adjacent to the discharge point during the breeding season. Construction of the stormwater outlet and associated pipework may disturb breeding birds and potentially result in abandonment of nests/chicks. In order to avoid adverse effects on these birds, it is recommended that construction of the outlet structure and other works adjacent to the estuary is undertaken outside of the main wading / marshbird breeding season (i.e. not between 1 August and end of February). If it is not possible to avoid construction adjacent to the estuary during these times, an alternative approach would be for an appropriately experienced and qualified avifauna expert to search the upper estuary area for signs of breeding activity (i.e. nests or chicks). If no breeding activity is detected, then construction could continue. However, if nests or chicks of Threatened or At Risk wading / marshbirds were detected, then construction would need to wait until after the chicks have fledged.

The outlet structure will be located outside of the CMA and will occupy and area of approximately $9m^2$. If the coastal fringe vegetation is disturbed during construction, revegetation with appropriate indigenous species would mitigate such vegetation disturbance. Once the detailed design of the outlet structure is available, the area of coastal fringe vegetation to be removed can be calculated and appropriate mitigation in the form of revegetation can be developed.

As such, the magnitude of the effect of habitat disturbance on the marine ecological values is determined to be low / medium (refer to Table 2).

4.3 Discharge of Stormwater

Stormwater contains contaminants that can cause adverse effects on marine organisms when present in high concentrations. Common urban and road runoff contaminants include copper, lead, zinc and petroleum hydrocarbons.

Runoff from an area at the northern end of the Lincoln Road Corridor catchment that is a greater area than the equivalent new impervious area (0.62 ha) will be collected via catchpits and conveyed to a treatment device prior to discharge at Daytona Reserve. Stormwater treatment, to assist with water and sediment quality, is to be provided by means of a structural filtration device, namely Stormfilter cartridges, designed to remove on average 75% of total suspended solids and associated contaminants. It is estimated that 20 full height cartridges will be required to be installed in a 6m x 2.5m chamber. As part of routine maintenance, catch pits will be checked and cleaned, the reticulation system and the discharge structure inspected and the Stormfilter cartridges replaced when required.

Runoff from the remainder of the widened Lincoln Road corridor (catchment area 2.57 ha) will be collected and also discharged at Daytona Reserve. Currently there are ten discharge points for runoff from the Lincoln Road corridor, one of which already discharges to Daytona Reserve (with a catchment of 1.76 ha). These discharge points include other branches of Henderson Creek, areas to the east, sites near Trusts Stadium, and other freshwater environments. The preferred design indicates that these discharge points will no longer be used for runoff from the Lincoln Road corridor, with all runoff converging at the Daytona Reserve discharge point.

Existing sediment within the estuary near the Daytona Reserve discharge point has concentrations of urban stormwater heavy metals above the AC’s ERC red concentration. Zinc and lead concentrations at Site 1 are also in excess of ANZECC Interim Sediment Quality Guidelines high threshold.

In addition to one existing road runoff discharge at Daytona Reserve (225 mm pipe), there are four other stormwater discharge points (not taking runoff from Lincoln Road) in the immediate vicinity (pipe diameters of 150mm, 2 x 300mm, and 225mm) and two more a short distance downstream (pipes are both 50mm). These discharges are generated from residential landuse, are unlikely to be treated prior to discharge and will contain sediment and associated contaminants that are currently adding to the contaminant load received at Daytona Reserve.

The residual contaminants in the treated stormwater to be discharged at Daytona Reserve are unlikely to cause adverse effects on marine ecological values over and above the existing background concentrations of contaminants in sediment and in other untreated stormwater discharges to the estuary. However, adding the consolidated existing untreated road runoff to this site from the ten other existing discharge points, if untreated, will significantly add to the contaminant load burden in the immediate receiving environment. The consolidated discharges could be treated prior to discharge using a StormFilter or similar device, which would significantly reduce the contaminant load to the estuary at Daytona Reserve.

MWH have calculated (see Technical Notes in Appendix 1 and Table 8 below) the contaminant load under the following scenarios:

1. Runoff from the existing impervious areas of the Lincoln Road corridor that currently discharge to the CMA at Daytona Reserve.
2. Runoff from imperious areas of the upgraded road corridor, with treatment provided to the new imperious areas only.
3. Runoff from all existing impervious areas of the Lincoln Road corridor, which currently discharge to various locations. All discharges are untreated currently, other than subcatchments C and E which are currently treated via a wet pond.
4. Runoff from impervious areas of the upgraded road corridor (all of which are proposed to be discharged to the CMA at Daytona Reserve), with treatment provided to all runoff.

Treatment of the proposed new impervious area increases the annual contaminant loads discharged at Daytona Reserve as follows; sediment 15%, zinc 22%, copper 15% and petroleum hydrocarbons by 8% (Table 8). With the additional consolidation of the other stormwater discharges arising from Lincoln Road to the discharge point at Daytona Reserve, the contaminant loads increase by approximately 250-270%[14]. Increasing the contaminant discharges in this location from Lincoln Road by more than two and half times is likely to result in higher contaminant concentrations in benthic marine sediment.

Table 8: Contaminant Load Assessment (outfall loads kg/annum)

	Scenario 1: Existing Lincoln Road discharges at Daytona Reserve	Treated runoff from new imperious area	Scenario 2: Discharge of runoff from new imperious area (treated) and all other consolidated runoff from Lincoln Road untreated.	Scenario 3: Existing runoff from Lincoln Road at various locations (all untreated)	Scenario 4: Discharge of runoff from new and existing areas of Lincoln Road (all treated)
Total Suspended Solids	1,345	207	3,390	3,183	947
Zinc	4.0	0.9	10.7	9.8	6.8
Copper	1.28	0.19	3.28	3.09	1.26
Petroleum Hydrocarbons	29.1	2.23	73.4	71.17	20.5

Based on the increase in contaminant load outlined in Table 8, it is likely that adjacent to, and downstream from, the discharge point sediment contaminant concentrations will increase above the existing. Given the elevated existing contaminant concentrations in benthic sediment, the consolidation of existing untreated road runoff to this site is likely to further degrade the ecological values of the estuary in the immediate receiving environment. Currently, at all three of the upper estuary sites at Daytona Reserve the concentration of zinc and lead are above the ERC red concentration and at the uppermost site these concentrations exceed the ISQG-high threshold, indicating that adverse effects on biology are likely to be currently occurring. With the additional contaminant load, adverse effects are likely to occur in a greater range of species[15], existing adverse effects are likely to increase in intensity and the area of estuary where contaminants are above effects thresholds is also likely to increase.

The estuarine and freshwater habitats that receive stormwater discharges (nine locations) that will no longer receive road runoff from the Lincoln Road corridor will benefit from the proposal through reduced contaminant load burden. Sediment contaminant concentrations at these sites may decrease over time and there may be positive benefits for the ecological values at these sites. Overall, with the proposed treatment of the new impervious road area, the total

[14] Without consideration of the contaminant load arising from residential stormwater which also discharges into the estuary at Daytona Reserve.

[15] Including potential for bioaccumulation within the food chain.

contaminant load discharged from the Lincoln Road corridor to the CMA is not significantly higher (see scenarios 2 and 3 in Table 8 above).

The contaminant load assessment for scenario 4, where all of the new and existing stormwater discharges from Lincoln Road are treated prior to discharge reduces the contaminant load significantly, with a 70% reduction in sediment and petroleum hydrocarbons, a 60% reduction in copper and a 35% reduction in zinc (Table 8). The contaminant load in scenario 4 is similar to that in scenario 1 which is the existing discharges from Lincoln Road into Daytona Reserve.

The magnitude of effect of the discharge of treated stormwater (and associated contaminants) from the new impervious area on the marine ecological values is determined to be low / negligible (refer to Table 2). The magnitude of effect of the discharge of existing untreated road runoff to receiving environment at Daytona Reserve on marine ecological values is considered to be high to very high (refer to Table 2).

At the NOR stage, the preferred design is to treat an equivalent area of new alignment and to consolidate the existing untreated discharges to a single point at Daytona Reserve. Given the concentration of contaminants at a site that is already under stress, adverse effects from the consolidated discharges are likely and would require mitigation to be developed at the resource consent phase of the project. Valid options could include treatment of some or all of the existing stormwater discharges from Lincoln Road. With full treatment provided to the consolidated existing discharges (scenario 4), the magnitude of effect reduces to low/negligible.

4.4 Erosion and Scour

The discharge structure will consist of a reinforced concrete wingwall unit located within the existing embankment outside of the CMA boundary. The provision of energy dissipation and erosion protection measures will minimise the velocity of the stormwater discharges and potential scour at the outlet. Stormwater will discharge into an existing low tide channel in the CMA.

As such, the magnitude of the effect of erosion and scouring on the marine ecological values is determined to be negligible (refer to Table 2).

4.5 Summary of Effects on Ecological Values

With reference to Table 2 and Table 3, we set out below (Table 9) the magnitude and significance of adverse effects on marine ecological values (determined in Section 3.6 to be low) of the Project, assuming the avoidance and mitigation measures detailed in Sections **4.1**-4.4 above are in place.

Table 9: Summary of effects on the marine ecological values

POTENTIAL ADVERSE EFFECTS	MAGNITUDE OF EFFECT	SIGNIFICANCE OF ADVERSE EFFECT
Runoff during construction	Negligible	Very Low
Habitat disturbance during construction	Low / Medium	Very Low

Stormwater discharge – new impervious area	Low / Negligible	Very Low
Stormwater discharge – consolidated existing discharges if untreated	High / Very High	Moderate
Stormwater discharge – consolidated existing discharges if treated	Low / Negligible	Very Low
Erosion and Scour	Negligible	Very Low

5.0 Conclusions

The upper estuary environment adjacent to Daytona Reserve has low ecological values. With avoidance and mitigation measures in place, construction of a new stormwater discharge point is likely to have less than minor adverse effects on marine ecological values. Post-construction, the discharge of treated stormwater to the estuary is likely to have less than minor adverse effects on marine ecological values.

The consolidation of untreated discharges to the estuary at Daytona Reserve has the potential to result in adverse effects on ecological values of medium significance at the local scale. However, the overall contaminant load discharged to the CMA is not significantly higher.

A more detailed assessment of effects of the discharges on the marine environment will need to be quantified once the design for the Lincoln Road Project has been developed and when the resource consent applications for the discharges to the coastal marine environment are lodged. At that point, the benefits of removing the existing discharges from Lincoln Road from their current locations will also be quantified and assessed. Modelling has shown that mitigation of the effects of the construction and operation of stormwater discharges from Lincoln Road can be adequately managed and mitigated.

Potential mitigation options to manage any residual effects arising from the discharge of untreated contaminants at Daytona Reserve include partial (or full) treatment of existing discharges to the CMA at Daytona Reserve or at existing discharge points.

The availability of these mitigation options mean that there are practical and feasible options available to manage any potential effects associated with the discharge of untreated stormwater to the coastal marine area if necessary.

6.0 References

EIANZ, 2015. Ecological Impact Assessment (EcIA). Environment Institute of Australia and New Zealand.

Robertson, H.A., Dowding, J.E., Elliott, G.P., Hitchmough, R.A., Miskelly, C.M., O'Donnell, C.F.J., Powlesland, R.G., Sagar, P.M., Scofield, R.P., Taylor, G.A., 2013. Conservation Status of New Zealand Birds, 2012. Department of Conservation, Wellington.

Appendix 1: Technical Notes – Contaminant Load Assessment

MWH
BUILDING A BETTER WORLD

TECHNICAL NOTE

TO:	Keri Davis-Miller (Auckland Transport)	DATE:	20 November 2015
CC:	Sharon Deluca (Boffa Miskell), Zaid Essa (Auckland Transport), Graeme Stanton (MWH)	REF:	80507651
FROM:	James Peveril REVIEWED BY: Allan Leahy	MWH New Zealand Ltd	
SUBJECT:	Lincoln Road Corridor Improvements Project – Contaminant Load Assessment		

Purpose

This technical note documents the Contaminant Load Assessment (CLA) completed as part of the Lincoln Road Corridor Improvements project (LRCI). The CLA has been undertaken to provide an understanding of likely contaminant levels in stormwater runoff from the road corridor. The following scenarios have been assessed:

1. Runoff from the existing impervious areas of the Lincoln Road corridor that currently discharge to the Coastal Marine Area (CLA) at Daytona Strand.
2. Runoff from impervious areas of the upgraded road corridor (all of which are proposed to be discharged to the CMA at Daytona Strand).
3. Runoff from all existing impervious areas of the Lincoln Road corridor (which currently discharge to various locations, including the CMA at Daytona Strand).

Scenarios 1 and 2 have been included in the assessment at the request of Auckland Transport / Boffa Miskell. Scenario 3 data is provided ‘for information’.

MWH have not been asked to consider a scenario that calculates contaminant load from the full catchment area (residential area, plus road) that currently discharges to Daytona Strand, at this time. Significantly more effort is required to develop this scenario given the level of assessment required to determine the areas associated with the variety of pervious and impervious surface types within the catchment. MWH recommend that this scenario is considered in order to allow assessment of the effects of the proposed discharge scenario within the context of the existing situation.

Method

The CLA has been completed using Auckland Council’s ‘Contaminant Load Model’ (CLM) Version 2, created in 2010. The CLM is the tool used by Council to assess contaminant loading in stormwater runoff. It is the only publically available and tested tool currently available in New Zealand.

The CLM calculates contaminant loads from a variety of sources (types of surfaces), including road corridors, which are assessed based on the number of vehicles per day (in specified ranges) that use the road.

The contaminants that are assessed in the CLM include:

- Total Suspended Solids (TSS)
- Total Zinc (TZn)
- Total Copper (TCu)
- Total Petroleum Hydrocarbons (TTPH)

The CLM includes an allowance for contaminant load reduction due to the presence of contaminant management treatment trains, with built in Load Reduction Factors for various treatment devices.

Limitations

The CLM has been developed and used by Auckland Council for assessment of contaminant loads and is a relatively 'high-level' assessment tool.

The following limitations have been identified with regard to how the contaminant source areas are represented in the CLM:

- The level of contaminant yield from a road area is calculated based on the number of 'vehicles per day' (vpd) that use the road. The tool has a number of vpd bands to choose from, e.g. 20,000-50,000. This banding is necessarily coarse, as yield values will vary significantly depending on various factors that are specific to each road.
- The 'source area' used to calculate contaminant load from roads is based on the length of the road and a pre-populated typical road width (based on the number of vpd). The width of the road cannot be manually adjusted. In order to represent the widening of the road corridor for the LRCI project (which does not change in length), and after discussion with Auckland Council technical staff, the 'road length' has been manipulated to produce a source area that matches the impervious area for each scenario.

Inputs

Inputs to the CLM for the modelled scenarios include: impervious area; contaminant management treatment trains; and load reduction factors (to over-ride the default values, where required).

The impervious areas used for the modelling are based on the initial catchment analysis competed by GHD (as documented in MWH's Stormwater Assessment Report for the LRCI project). The areas are:

- Scenario 1: 1.76 ha - subcatchment D only (subcatchments H and J currently discharge to a different inlet (not Daytona Strand) on the same estuary and have not been included as contributing area for Scenario 1).
- Scenario 2: 4.95 ha
- Scenario 3: 4.33 ha

Contaminant management treatment trains are included in the modelling as follows:

- Scenario 1: Catchpits only
- Scenario 2: Catchpits; StormFilter structural filtration device (treating runoff from new impervious areas only).
- Scenario 3: Catchpits; wet stormwater treatment pond (sub-catchments C & E only).

The sub-catchments referred to above are illustrated on the 'Existing Drainage Paths and Discharge Points Plan' in Attachment A.

Default load reduction factors included in the CLM have generally been retained. Factors have been manually entered for Suspended Solids, Zinc and Copper removal by the StormFilter device in Scenarios 2b and 2c, based on advice received from the supplier (Stormwater 360). Assessment using the lower and upper end of the removal efficiency range for these contaminants, as noted in SW360 general performance claim (see Figure 1 below), have been considered for comparison with results using default values.

Constituent	Removal Efficiency Range (Percent)
Total suspended solids (TSS)	50 – 85
Total zinc (T Zn)	30 – 60
Dissolved zinc	20 – 40
Total copper (T Cu)	30 – 60
Dissolved copper	20 – 40

Figure 1: StormFilter Removal Efficiency Range (Supplied by SW360)

Results

CLM results for the three scenarios that have been modelled are summarised in Figure 2 below.

Three sets of results are included for Scenario 2 – one for each set of load reduction factor values illustrated in Figure 3 below.

The outputs from the CLM are expressed as:

- Bottom of catchment outfall loads (kg per annum).
- Average yields (kg per hectare per annum).

The cells in the results tables have been colour coded, as follows:

- Green cells – results based on default load reduction factors.
- Blue cells – results based on manual load reduction factors.

Scenario		Bottom of catchment out-fall Loads (kg / annum)				Average yields (kg / hectare / annum)			
		TSS	TZn	TCu	TPH	TSS	TZn	TCu	TPH
1	Existing (sub-catchment D)	1345	4.0	1.28	29.1	764.82	2.29	0.73	16.55
2a	Proposed - Tool Default	3390	10.7	3.28	73.4	684.52	2.16	0.66	14.82
2b	Proposed - Low Removal	3523	10.9	3.46	73.4	711.29	2.19	0.70	14.82
2c	Proposed - High Removal	3337	10.4	3.31	73.4	673.81	2.10	0.67	14.82
3	Existing (all sub-catchments)	3183	9.8	3.09	71.17	734.42	2.25	0.71	16.42

Figure 2: CLA Results

Default LRFs

Load reduction factors (LRF)		
Contaminant	Default LRF	Manual LRF
TSS	0.75	
TZn	0.40	
TCu	0.65	
TTPH	0.75	

Manual LRFs (Metals) – Low

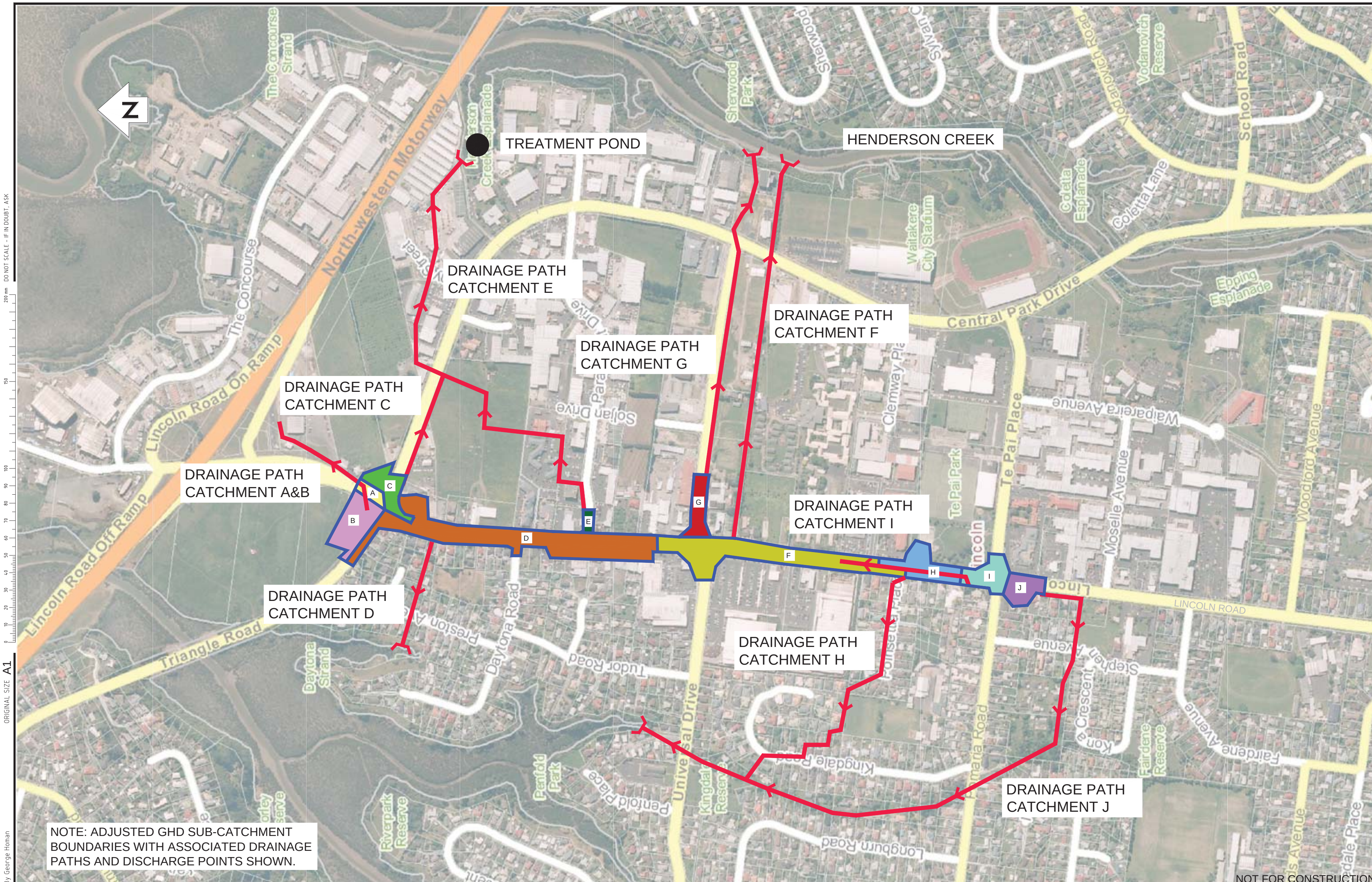
Load reduction factors (LRF)		
Contaminant	Default LRF	Manual LRF
TSS	0.75	0.50
TZn	0.40	0.30
TCu	0.65	0.30
TTPH	0.75	

Manual LRFs (Metals) - High

Load reduction factors (LRF)		
Contaminant	Default LRF	Manual LRF
TSS	0.75	0.85
TZn	0.40	0.60
TCu	0.65	0.60
TTPH	0.75	

Figure 3: Load Reduction Factors used for the StormFilter Treatment Device

ATTACHMENT A: Existing Drainage Paths and Discharge Points Plan



REV	REVISIONS	DRN	CHK	APP	DATE
01	FOR STORMWATER ASSESSMENT REPORT	GM	JP	GS	08/15

SURVEYED	-	-
DESIGNED	M WILLIAMS	08/15
DRAWN	G MURRAY	08/15
CAD REVIEW	J. PETTIGREW	08/15
DESIGN CHECK	J. PEVERIL	08/2015
DESIGN REVIEW	A. LEAHY	08/15
APPROVED	G. STANTON	08/15
PROF REGISTRATION:		

MWH

Client:

AUCKLAND TRANSPORT
LINCOLN ROAD CORRIDOR IMPROVEMENTS

EXISTING STORMWATER DRAINAGE PATH AND DISCHARGE POINTS PLAN

Status Stamp: WORKING PLOT
Date Stamp: 25/08/2015
Scales: NTS
Datum: NZTM
Drawing No.: 80507651 - SK05
Rev.: 01

ORIGINAL SIZE A1

DO NOT SCALE - IF IN DOUBT, ASK

Last modified: Jun 26 2014 By George Homan

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MWH.

BUILDING A BETTER WORLD

TECHNICAL NOTE

TO:	Keri Davis-Miller (Auckland Transport)	DATE:	17 December 2015
CC:	Sharon Deluca (Boffa Miskell), Zaid Essa (Auckland Transport), Graeme Stanton (MWH)	REF:	80507651
FROM:	James Peveril REVIEWED BY: Allan Leahy	MWH New Zealand Ltd	
SUBJECT:	Lincoln Road Corridor Improvements Project – Contaminant Load Assessment REVISION 2		

Purpose

This technical note documents the Contaminant Load Assessment (CLA) completed as part of the Lincoln Road Corridor Improvements project (LRCI). The CLA has been undertaken to provide an understanding of likely contaminant levels in stormwater runoff from the road corridor. The following scenarios have been assessed:

1. Runoff from the existing impervious areas of the Lincoln Road corridor that currently discharge to the Coastal Marine Area (CLA) at Daytona Strand.
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Scenarios 1 and 2 have been included in the assessment at the request of Auckland Transport / Boffa Miskell. Scenario 3 data is provided 'for information'. Auckland Transport / / Boffa Miskell have requested the inclusion of Scenario 4 following review of the first issue of this technical note.

MWH have not been asked to consider a scenario that calculates contaminant load from the full catchment area (residential area, plus road) that currently discharges to Daytona Strand, at this time. Significantly more effort is required to develop this scenario given the level of assessment required to determine the areas associated with the variety of pervious and impervious surface types within the catchment. MWH recommend that this scenario is considered in order to allow assessment of the effects of the proposed discharge scenario within the context of the existing situation.

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The sub-catchments referred to above are illustrated on the 'Existing Drainage Paths and Discharge Points Plan' in Attachment A.

Default load reduction factors included in the CLM have generally been retained. Factors have been manually entered for Suspended Solids, Zinc and Copper removal by the StormFilter device in Scenarios 2b and 2c, based on advice received from the supplier (Stormwater 360). Assessment using the lower and upper end of the removal efficiency range for these contaminants, as noted in SW360 general performance claim (see Figure 1 below), have been considered for comparison with results using default values.

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3	Existing (all sub-catchments)	3183	9.8	3.09	71.17	734.42	2.25	0.71	16.42
4a	Proposed (all road runoff treated) - Tool Default LRFs	947	6.8	1.26	20.5	191.21	1.37	0.26	4.14
4b	Proposed (all road runoff treated) - Low LRFs	1894	7.9	2.53	20.5	382.41	1.60	0.51	4.14
4c	Proposed (all road runoff treated) - High LRFs	568	4.5	1.44	20.5	114.72	0.92	0.29	4.14

Figure 2: CLA Results

Default LRFs

Load reduction factors (LRF)		
Contaminant	Default LRF	Manual LRF
TSS	0.75	
TZn	0.40	
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Manual LRFs (Metals) – Low

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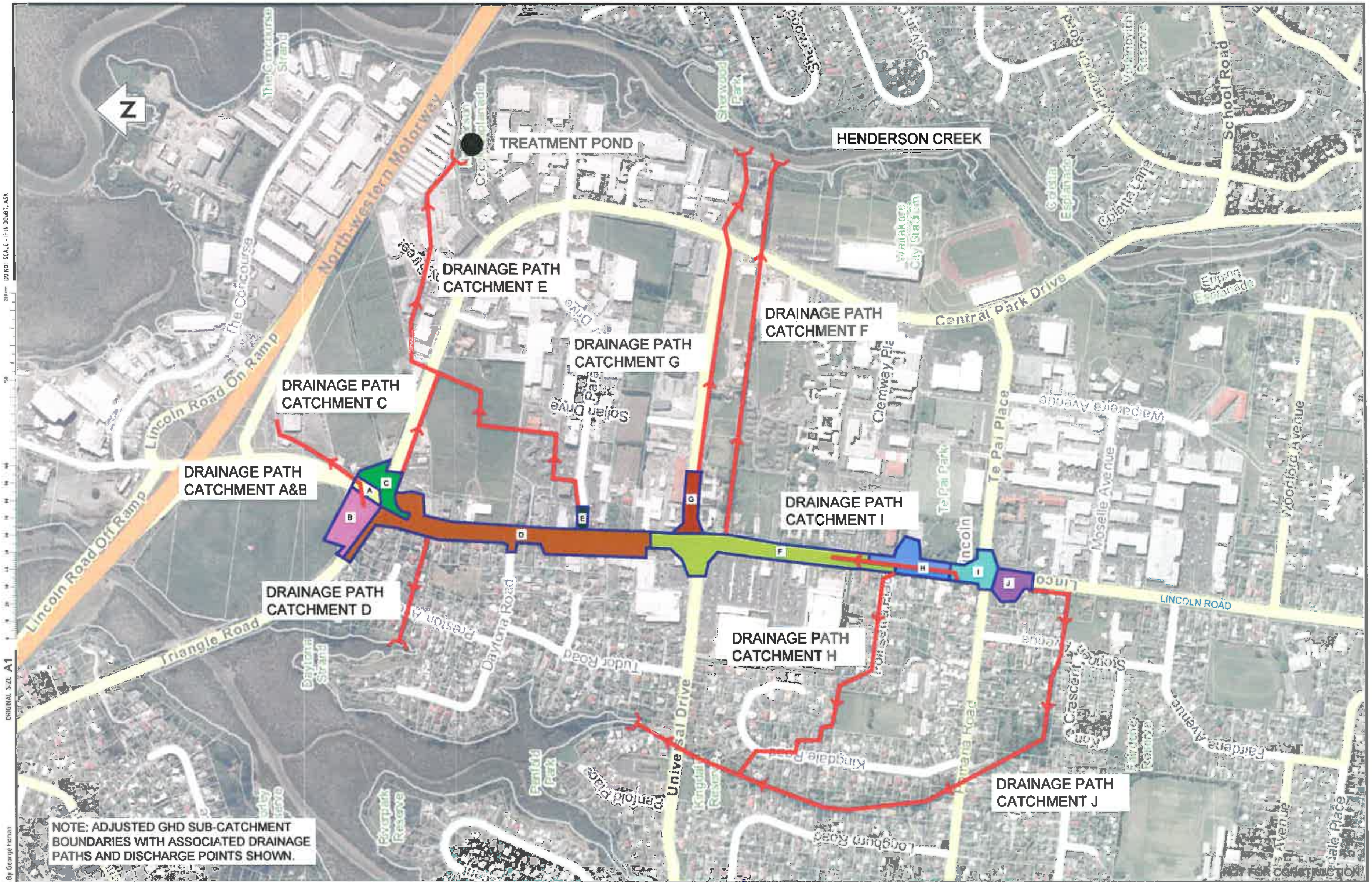
Figure 3: Load Reduction Factors used for the StormFilter Treatment Device

ATTACHMENT A: Existing Drainage Paths and Discharge Points Plan



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DESIGN REVIEW	A LEAHY	08/15
APPROVED	G STANTON	08/15
PROF REGISTRATION		

MWH.

AUCKLAND TRANSPORT
LINCOLN ROAD CORRIDOR IMPROVEMENTS

EXISTING STORMWATER DRAINAGE PATH AND DISCHARGE POINTS
PLAN

WORKING PLOT
25/08/2015
Scale NTS Datum NZTM
Drawing No 80507651 - SK05 Rev 01

Last modified: Jun 26 2014 By George Honan
ORIGINAL SIZE A1
DO NOT SCALE - IF IN DOUBT, ASK

Appendix 2: Objectives and policies

New Zealand Coastal Policy Statement

NZCPS Policy 11	Indigenous biological diversity (biodiversity) To protect indigenous biological diversity in the coastal environment: (a) avoid adverse effects of activities on: (i) indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists; (ii) taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened; (iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare; (iv) habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare; (v) areas containing nationally significant examples of indigenous community types; and (vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation; and (b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on: (i) areas of predominantly indigenous vegetation in the coastal environment; (ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species; (iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh; (iv) habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes; (v) habitats, including areas and routes, important to migratory species; and (vi) ecological corridors, and areas important for linking or maintaining biological values identified under this policy
NZCPS Policy 23	Discharge of contaminants (1) In managing discharges to water in the coastal environment, have particular regard to: (a) the sensitivity of the receiving environment;

	(b) the nature of the contaminants to be discharged, the particular concentration of contaminants needed to achieve the required water quality in the receiving environment, and the risks if that concentration of contaminants is exceeded; and (c) the capacity of the receiving environment to assimilate the contaminants; and: (d) avoid significant adverse effects on ecosystems and habitats after reasonable mixing; (e) use the smallest mixing zone necessary to achieve the required water quality in the receiving environment; and (f) minimise adverse effects on the life-supporting capacity of water within a mixing zone. ... (4) In managing discharges of stormwater take steps to avoid adverse effects of stormwater discharge to water in the coastal environment, on a catchment by catchment basis, by: (a) avoiding where practicable and otherwise remedying cross contamination of sewage and stormwater systems; (b) reducing contaminant and sediment loadings in stormwater at source, through contaminant treatment and by controls on land use activities; (c) promoting integrated management of catchments and stormwater networks; and (d) promoting design options that reduce flows to stormwater reticulation systems at source.

Auckland Council Regional Policy Statement

8.4.1 Policies – General	1. Adverse effects on water quality caused by the discharge of contaminants (including non-point source discharges) shall be avoided, particularly the discharge of potentially toxic, persistent or bioaccumulative contaminants. Where it is not practicable to avoid discharges, they shall be adequately remedied or mitigated.
8.4.7. Policies – Stormwater and Sediment Discharges	1. All new developments discharging stormwater, whether allowed as a permitted activity or by a resource consent, shall adopt appropriate methods to avoid or mitigate the adverse effects of urban stormwater runoff on aquatic receiving environments. ... 3. All land disturbance activities which may result in elevated levels of sediment discharge shall be carried out so that the adverse effects of such discharges are avoided, remedied, or mitigated.
8.4.21 Policies – Areas that are already degraded	3. Priority shall be given to maintaining, and where possible improving, water quality in areas which are susceptible to degradation and/or have significant values (as listed in Tables 8.1 and 8.2 and shown in Map Series 5 – Sheets 1-4).

Auckland Council Regional Plan: Air, Land and Water

Policy 2.2.4.12 Use and Development	Use and development shall be undertaken at times of the day, week or year which will avoid, remedy or mitigate adverse effects on:

	(a) The growth and reproduction of terrestrial and aquatic vegetation and the feeding, breeding and migratory patterns of fauna, including bird roosting, nesting and feeding; and/or (b) Lawful recreational use of air, land and freshwater bodies; and/or (c) Other lawful established activities in the locality that are likely to be adversely affected by any proposal
Policy 5.4.4B Stormwater Diversions and Discharges	In addition to the matters listed in Policy 5.4.4, consent applications for non network stormwater diversions and discharges under Rules 5.5.2 to 5.5.5 will also be assessed against the following matters: (f) If an ICMP has not been prepared, the assessment criteria will include the extent to which stormwater quality management: (i) adopts the Best Practicable Option; (ii) adopts methods (source control, traditional or innovative) to prevent or minimise the adverse effects of contaminants on the receiving environment, including total suspended solids (TSS) loads anticipated to arise on a long term basis from the proposed impervious area; ... (h) The extent to which there is the potential for local scour and downstream channel erosion, particularly for Natural Stream Management Areas and Type 2 Urban Streams and that this is managed to prevent or minimise adverse effects; ...

Auckland Council Regional Plan: Coastal

Objective 5.3.3	To protect from inappropriate subdivision, use and development and where appropriate, preserve the ecological and physical values and processes of Coastal Protection Areas, in recognition of their intrinsic values, their regional, national and international significance, and their high vulnerability to adverse environmental effects.
Policy 5.4.3	The values of, and ecological and physical processes functioning in, Coastal Protection Areas 2 shall be protected by avoiding inappropriate subdivision, use and development which will have significant adverse effects on, or will result in the destruction of, these values and processes.
Objective 20.3.1	To maintain appropriate water quality and sediment quality and quantity in the coastal marine area and to enhance water and sediment quality where practicable in the parts of the coastal marine area where water and sediment quality is degraded.

Policy 20.4.3	Any proposal to discharge contaminants or water into the coastal marine area (unless the discharge is prohibited) shall be considered appropriate only if it can be demonstrated that it is the Best Practicable Option in terms of preventing or minimising the adverse effects on the environment having considered whether: a it is practicable or appropriate to discharge to land above Mean High Water Springs; ... c the receiving environment is able to assimilate the discharged contaminants and water after reasonable mixing, with any adverse effects being avoided where practicable, or remedied or mitigated particularly within: i the areas identified in Tables 8.1 and 8.2 and Map Series 5, Sheets 1-4 (Degraded and Susceptible Areas and Areas of High Ecological Value Susceptible to Degradation) of the Auckland Council Regional Policy Statement; ii those Coastal Protection Areas, set out in this Plan, which are based upon ecological rather than geological values; ... g the discharge after reasonable mixing, does not either by itself or in combination with other discharges, give rise to any or all of the following effects: i the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; ii any conspicuous change in the colour or visual clarity; iii any emission of objectionable odour; iv any significant adverse effects on aquatic life; v any significant adverse effects on aesthetics and amenity value; h the discharge complies with relevant, appropriate and accepted codes of practice and environmental guidelines.

Proposed Auckland Unitary Plan

B6.3 Freshwater Objectives	5. The adverse effects of stormwater runoff and wastewater discharges on communities, freshwater systems and coastal waters are minimised and existing adverse effects are progressively reduced.
B6.3 Freshwater Policy 3	3. Manage use and development, discharges and other activities to avoid where practicable, and otherwise minimise and reduce: ... e. the adverse effects of discharges on the quality of freshwater and coastal waters by: i. reducing the potential for contaminants generated on or discharged to land at both point source and nonpoint sources to enter surface water and groundwater ii. requiring management and treatment of discharges and contaminants iii. managing land use activities that generate and discharge contaminants iv. adopting the best practicable option for managing stormwater and wastewater network diversions and discharges

C5.15.1 Water quality and integrated management Objectives	3. The water quality, life supporting capacity and ecosystems of the CMA are protected from further degradation and enhanced where practicable. 4. Development is undertaken in a way that minimises adverse effects on freshwater and coastal marine ecosystems.
D5.1.10 General Coastal Marine zone Discharges Objective 4	4. Stormwater and wastewater networks protect public health and safety and manage the adverse effects of contaminants on coastal water quality.
D5.1.10 General Coastal Marine zone Discharges Policy 1	1.Allow discharges that are consistent with the best practicable option (BPO) approach for preventing or minimising the adverse effects from stormwater and wastewater discharges in the coastal environment.
D5.1.10 General Coastal Marine zone Discharges Policy 4	4.Require any proposal to discharge contaminants or water into the CMA to adopt the BPO to prevent or minimise adverse effects on the environment, having regard to whether: a.it is practicable or appropriate to discharge to land above MHWS b.there is a reticulated wastewater system in place that should be used c.contaminants in the discharge are minimised d.the receiving environment has the capacity to assimilate the discharged contaminants after reasonable mixing, particularly within areas identified as having significant ecological value ... g.the discharge after reasonable mixing results in any of the following effects: i.oil or grease films, scums or foams, or floatable or suspended materials ii.conspicuous change in the colour or visual clarity iii.any emission of objectionable odour iv.any significant adverse effects on aquatic life v.any significant effects of aesthetic or amenity values. h.the discharge complies with relevant, appropriate and accepted codes of practice and environmental guidelines.

<table>
<tr>
<td>D5.1.10
General
Coastal Marine zone
Discharges
Policy 10</td>
<td>10.Require discharges to the CMA from stormwater, wastewater and non-network sources to be managed within a BPO framework, having regard to:

a.policies 3.1.3.16.1.1 to 3.1.3.16.1.4 in Part 3.1.3.16.1 Water Quality

b.the sediment quality indicators in Table 1 below, and to:

i.maintaining existing sediment concentrations where they are below the threshold effects levels

ii.reducing contaminant levels and the spread of contaminants outside the discharge zone where existing sediment concentrations are above the threshold effects level

iii.taking into account trends in the sediment quality identified by monitoring, or modelling of how each option will affect those trends

iv.protecting existing benthic ecology.

Table 1: Sediment Quality Indicators-primary contaminants (mg/kg) in surficial sediments (to a depth of 20mm)

<table>
<tr><th>Monitoring method guideline</th><th>Parameter</th><th>Threshold effects level (TEL)</th></tr>
<tr><td rowspan="4">'Blueprint for environmental monitoring of urban coastal receiving environments' ARC TP 168 i</td><td>Zn</td><td>124</td></tr>
<tr><td>Cu</td><td>19</td></tr>
<tr><td>Pb</td><td>30</td></tr>
<tr><td>HMW PAHa,b</td><td>0.66</td></tr>
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Assessment criteria - stormwater discharge consent

Auckland Council Regional Plan: Air, Land and Water

5.5.3A (d) The effects of the discharge of contaminants after reasonable mixing in the relevant receiving environment;

Proposed Auckland Unitary Plan

H4.14 (3.4.2)

3.b.the sensitivity of the receiving environment, including coastal waters, and its susceptibility to the adverse effects of stormwater contaminants

3.c.the extent to which incremental and cumulative adverse effects of stormwater contaminants on receiving environments including on natural character, biodiversity, community and Mana Whenua uses and values can be avoided, or if not avoided then otherwise adequately mitigated;

3.e.the extent to which the water quality matters for stormwater networks and roads in Auckland wide water quality and integrated management policy 10 and Table 1.

3.f.the effects on marine sediment quality, in accordance with Coastal Zones discharges policy 10 and Table 1.