

41-43 Brigham Creek Road, Auckland

Ecological Effects Assessment for resource consent

Report prepared for

41-43 Brigham Creek Road JV Ltd

Prepared by

RMA Ecology Ltd

Report number and date

Job 2112

August 2021

BETTER ECOLOGICAL OUTCOMES

PREPARED FOR:

41-43 Brigham Creek Road JV Ltd

C/- The Property Group

Level 4

55 Shortland Street

Auckland 1010

Prepared by:	Graham Ussher Principal Ecologist
Reviewed and Authorised by:	Graham Ussher Principal Ecologist

Project No. 2112

Version date: August 2021

Version status: Final

Citation:

RMA Ecology Ltd. August 2021. 41-43 Brigham Creek Road JV, Auckland: ecological effects assessment for resource consent. Report prepared for 41-43 Brigham Creek Road JV Ltd, Auckland. 25 pages.



This report has been prepared for the benefit of our Client with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement. Any use or reliance by a third party is at that party's own risk. Where information has been supplied by the Client or obtained from other external sources, it has been assumed that it is accurate, without independent verification, unless otherwise indicated. No liability or responsibility is accepted by RMA Ecology Limited for any errors or omissions to the extent that they arise from inaccurate information provided by the Client or any external source.

Executive Summary

41-43 Brigham Creek Road JV Ltd has engaged RMA Ecology Ltd to undertake an assessment of the ecological values and potential ecological effects of earthworks proposed for 41-43 Brigham Creek Road, Auckland, for the purpose of applying for resource consents.

Desktop analyses and field/site visits were used to determine the ecological values of terrestrial and freshwater areas within and surrounding the development footprint, as well as the significance of those values.

The site is located within a typical Auckland rural environment. The landform slopes gently to the south, with catchment watercourses in the general area discharging to the upper part of the Waitemata Harbour. The site supports one dwelling with substantial amenity gardens, and surrounding paddocks and fields that are used for stock grazing. Several appear to have been retired for several years with rank grasses and weedland establishing.

The site has been heavily modified by past farming activities, which have influenced the state and quality of indigenous communities and habitat for indigenous species on the site.

There are no streams on the site. There are also no wetlands, no indigenous vegetation, no SEAs and no plant or animal species of conservation significance. There is a potential wetland to the south of the site (off site), and the development design has taken this into account.

One native animal that could be present is the native copper skink, within the rough pasture and weedland areas of the eastern gully. This species is listed as Not Threatened, and this location (if it is present) would not constitute important or core habitat. All native lizards are protected under the Wildlife Act 1953. Where consent is granted under the RMA for the development of native lizard habitat, the salvage and relocation of lizards is required.

There is no remnant or secondary regenerating native forest on the site and the vegetation present does not meet any of the qualifying criteria for ecological significance. Mature exotic trees and dense exotic scrub provide limited and low-quality nesting and food resources for birds, and at most benefit a few native birds that are neither threatened nor rare.

The engineering design proposes to retain generally the same catchment sizes pre versus post-development and the same flow rates. Surface water flows from the site into the southern gully off the site where the potential wetland is located will remain generally the same (there may be a small increase). There is no risk of complete or partial drainage of the potential wetland to the south of the site.

Potential adverse effects on copper skinks within the eastern gully system are assessed as very low, and will be minimised by the salvage and relocation of lizards prior to the commencement of vegetation clearance.

Recommendations:

1. An ecologist should undertake a physical mark out on site to ensure that potential habitat for copper skinks is clearly delineated on the ground, that proposed works avoid these features, and that a salvage for native lizards within this potential habitat is undertaken prior to (as part of) vegetation clearance.

CONTENTS

1.0	Introduction	3
1.1	Background	3
1.2	Purpose and scope	3
2.0	Methods	5
2.1	Desktop assessment	5
2.2	Field assessment	5
2.3	Aquatic ecology	5
2.4	Terrestrial ecology	6
2.5	Wetlands	6
3.0	Results	8
3.1	Ecological context	8
3.2	Aquatic ecology	8
3.3	Wetlands	12
3.4	Terrestrial ecology	15
3.5	Summary of ecological values	17
4.0	Proposed earthworks and management of potential adverse effects	17
4.1	Earthworks & development programme	17
4.2	Management of potential adverse effects	17
5.0	Recommendations	23
6.0	References	24

1.0 Introduction

1.1 Background

This report provides an assessment of the ecological values and potential ecological effects of earthworks proposed for 41-43 Brigham Creek Road, Auckland (hereafter, 'the site').

The site is proposed to be developed as housing, with bulk earthworks proposed over the entire site (Figure 1). This report is for the purpose of applying for resource consents.

1.2 Purpose and scope

41-43 Brigham Creek Road JV Ltd has engaged RMA Ecology Ltd to undertake an assessment of the values of the site in terms of aquatic and terrestrial ecology¹ and an assessment of potential adverse effects arising from the proposed earthworks.

The approach included survey of terrestrial and freshwater areas and provides the following:

- Identification of sites of particular ecological significance (Significant Ecological Areas; SEA);
- Review of databases to identify the likelihood of species of conservation significance being present, with an emphasis on freshwater fish, native lizards, and plants and birds;
- Walkover survey to identify or validate the presence of native vegetation, especially areas that meet criteria for assessing ecological significance under the Auckland Unitary Plan (AUP);
- Walkover and stream-specific sampling (where access is feasible and flow exists) to:
 - Determine stream values, using qualitative scoring methods along multiple reaches of all accessible, flowing streams;
 - Map the boundaries of stream types (permanent, intermittent and ephemeral);
 - Map wetlands, ponds, and potential barriers to stream functioning (e.g. culverts);

This report contains the following:

- An overview of the methods used to assess the ecological values and the ecological significance of areas potentially affected by the development;
- A description of ecological values within the development footprint and immediate surrounds;
- An assessment of ecological significance of the development footprint and immediate surrounds, based on assessing the ecological values of the development area against:
 - significance criteria in the AUP; and
 - based on the presence of listed Significant Ecological Areas and/or Natural Stream Management Areas (NSMAs) in the AUP;
 - An assessment of the type and magnitude of potential effects associated with the development, construction and operational activities, including potential habitat loss and degradation, and direct mortality or injury of indigenous fauna where the rules of the AUP, for example E3, E15, E16 or E38 are triggered by development; and
 - Recommendations to address adverse effects.

¹ This report has been prepared in accordance with our letter of engagement dated 11 February 2021.



Figure 1. The investigations area (turquoise boundary), with location of wetland investigation soil cores and vegetation plot, and potential wetland (off-site).

2.0 Methods

Desktop analyses and field/site visits were used to determine the ecological values of terrestrial, and freshwater areas within and surrounding the development footprint, as well as the significance of those values. This section of the report describes the methods used for desktop and field investigation locations.

2.1 Desktop assessment

A desktop assessment of the development footprint and surrounding area was undertaken to identify sites assessed as potentially having ecological values, as well as sites already listed as being ecologically significant based on a review of the AUP. Legacy District and Regional Plans were reviewed for completeness and to cross-verify against the descriptions and extents of features identified in the AUP.

These resources were also used, where available, to provide insight as to the reasons why areas were significant, and the ecological values they comprise. Areas with ecological values that were not identified or which were not listed as ecologically significant in the various reviewed documents were assessed against the significance criteria of the AUP (Schedule 3 – Significant Ecological Areas: Terrestrial Schedule).

The Auckland Council GIS was reviewed to identify existing vegetation, streams and overland flow paths present on the site and to establish an understanding of the ecological status of the waterways present. Maps of these existing features (streams and overland flow paths (categories 4000 m² to 3 ha and > 3 ha)) were then ground-truthed.

The following documents and databases were reviewed for the ecological assessment:

- New Zealand Freshwater Fish Database;
- NIWA Freshwater Biodiversity Database;
- National Amphibian and Reptile Database System (Herpetofauna) to gather information on lizard species that have been recorded in proximity to the project site; and
- Auckland Unitary Plan.

Any threatened species found were recorded and their threat status checked against the relevant national threatened species classification lists (Hitchmough et al. 2016, Robertson et al. 2016 and Dunn et al. 2018).

2.2 Field assessment

A site visit was undertaken on 11 March 2021 to assess the variety of ecosystems and the ecological values present within the development footprint.

2.3 Aquatic ecology

The site walkover was carried out to assess and map all streams and wetlands within the site.

All waterways and flow paths were mapped as being permanent, intermittent or ephemeral based on the definitions in the AUP (see below). Photographs were taken and a general description of the waterway was undertaken to note characteristics including riparian species and cover, and connectivity to other waterways.

A general characterisation assessment of the mapped stream reaches and wetlands was also undertaken with key ecological features recorded.

The definitions of stream types within the AUP are listed below in italics.

Permanent river or stream

The continually flowing reaches of any river or stream.

Intermittent stream

Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria:

- a) it has natural pools;
- b) it has a well-defined channel, such that the bed and banks can be distinguished;
- c) it contains surface water more than 48 hours after a rain event which results in stream flow;
- d) rooted terrestrial vegetation is not established across the entire cross-sectional width of the
- e) channel;
- f) organic debris resulting from flood can be seen on the floodplain; or
- g) there is evidence of substrate sorting process, including scour and deposition.

Ephemeral stream

Stream reaches with a bed above the water table at all times, with water only flowing during and shortly after rain events. This category is defined as those stream reaches that do not meet the definition of permanent river or stream or intermittent stream.

2.4 Terrestrial ecology

Vegetation was assessed across the site with a focus on the presence of indigenous species. Birds identified visually and audibly were recorded across the site, including native and introduced species. Potential food sources and nesting habitat were noted for the purpose of estimating the potential loss of resources associated with the planned development. The field survey included identification of habitats potentially occupied by native lizards. The ecological investigation used the AUP SEA criteria (Sawyer & Stanley, 2012) to assess the significance of ecology values recorded from the site.

2.5 Wetlands

Wetlands were assessed using the definition within the Resource Management Act 1991:

- Wetland: permanently or intermittently wet areas, shallow water, and land/water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions, including within the coastal marine area.

Wetlands on site were also assessed using the definition within the National Policy Statement on Freshwater Management 2020 (NPS-FM):

- Natural inland wetland: means a wetland (as defined in the Act) that is not:
 - (a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or
 - (b) a geothermal wetland; or
 - (c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain-derived water pooling.

The NPS-FM requires that any effects on natural inland wetlands are avoided, including a restriction on activities within a 10 m buffer around those wetlands, and controls on the level of potential adverse effects (from, for example, discharge of water or diversion of water) within a 100 m buffer around the wetland.

The methodology applied for the assessment of wetlands at this site was as follows:

1. Apply the Clarkson (et al. 2013)² method cited in the NPS-FM 2020 Wetland Assessment Protocol;
2. Assess soils by applying the criteria outlined in Fraser (2018)³ for identifying hydric (wetland) soils. This involved excavating a hole ca. 400 mm deep to assess and photograph soil moisture, topsoil structure, subsoil structure and presence of gleyed soils and mottling; and
3. When analysing data from the field plots, plots with a vegetation community that met the definition of improved pasture and were >50 % exotic pasture species dominant were excluded from being NPS-FM-level wetlands; the Clarkson method for the Rapid Test and/or Dominance Test/ Prevalence Test was then followed to assess whether an RMA-level wetland was present or not.

Assessment of plant indicator status was undertaken in accordance with Clarkson et al. 2021⁴.

² Clarkson BR, Champion PD, Johnson PN, Bodmin KA, Forester I, Gerbeaux P, Reeves PN 2013. Wetland indicator status ratings for New Zealand species. Landcare Research, Hamilton.

³ Fraser S, Singleton P, Clarkson B 2018. Hydric soils – field identification guide. Envirolink Tools Contract C09X1702. Manaaki Whenua – Landcare Research Contract Report LC3233 for Tasman District Council.

⁴ Clarkson BR, Fitzgerald NB, Champion PD, Forester L, Rance BD 2021. New Zealand wetland plant indicator status ratings 2021: Data associated with Manaaki Whenua - Landcare Research contract report LC3975 for Hawke's Bay Regional Council.

3.0 Results

3.1 Ecological context

The site is located within a typical Auckland rural environment. The original natural ecology has been heavily modified or removed through past farming activities, and the general area around the development site, for the large part, supports exotic-dominated ecosystems, production farmland or recently converted farmland to residential developments.

The landform slopes gently to the south, with catchment watercourses in the general area discharging to the upper part of the Waitemata Harbour.

The site supports one dwelling with substantial amenity gardens, and surrounding paddocks and fields that are used for stock grazing. Several appear to have been retired for several years with rank grasses and weedland establishing.

Table 1 summarises the extent of stream and wetland within the site.

Table 1. Summary of stream lengths and wetland areas within the site.

Watercourse type	Length (m) or Area (m ²) within the site	Notes
Stream	nil	There is no feature on the site that meets the definition of a stream
Wetland	nil	There is no feature on the site that meets the definition of a wetland

3.2 Aquatic ecology

There are no streams on the site.

The land form is gently sloping, and the land use is currently in stock grazing, amenity gardens and retired agriculture/ horticulture.

The AUP predicted overland flow path model shows flow paths arising in the northern part of the site and discharging to the north, as well as several flow paths originating from the central and southern areas of the site and discharging to the south.

The northern part of the site has been extensively landscaped and no flow path is discernible. There is no stream in this location.

The southern part of the site supports two small, headwater slopes in the central and western portions that discharge overland flow into shallow gullies off the site to the south. There is no stream in these locations on the site (Plates 1-3).

The far eastern part of the site discharges overland flow to the south as well. At that location, there is a broad shallow flow path that discharges to the southern boundary, where it is impounded by a shallow excavated pond and bund created by plantings on the next-door property (see Plates 4-6). The flow path does not support a stream – there is no indication of a channel, sediment sorting, pools or floodplain, and the entire extent of the basin floor is well colonised by terrestrial plants.

The pond at the boundary has been created (if not through deliberate excavation), by a combination of cattle or animal trampling, and a row of planting across the boundary creating a bund that impounds surface flows behind it (see next section).



Plate 1. Western part of the site looking to the north (slightly upslope). The vegetation comprises exotic blackberry, inkweed, cocksfoot, ryegrass and kikuyu grass – all dryland terrestrial species.



Plate 2. Central part of the site looking to the north (upslope).



Plate 3. Central part of the site, looking south (downslope). Pasture is mainly Paspalum, cocksfoot and kikuyu.



Plate 4. Gully head of the eastern gully showing broad shallow bowl and weedy pasture grassland with privet, gorse, pampas, woolly nightshade and macrocarpa pine over kikuyu, cocksfoot, sweet vernal and ryegrass.



Plate 5. Mid-section of eastern gully.



Plate 6. Lower part of eastern gully just above the ponded section formed by the boundary bund.

3.3 Wetlands

As part of the entire site walkover, the Clarkson Rapid Test was applied to identify areas of possible wetland vegetation. Locations of particular interest were low-lying paddock areas and around flow paths.

Potential locations within the site were assessed, as were potential locations adjoining the site which may have been within 10 m of the site boundary, or where a catchment within the site was within 100 m of a potential wetland outside of the site where hydrological connections were possible.

Two potential wetland areas were identified, both of which were associated with headwater gullies. Further assessment of these was undertaken by applying the full Wetland Delineation Protocols in the NPS-FW (a derivation of the Clarkson et al. 2013 method). The locations are shown on Figure 1.

The first potential wetland is at the base of the eastern gully. Water pools there and the soils are pugged from stock damage. The 'pond' or seasonally wet area has been formed by a bund of arum lily that has been planted or has otherwise established along the boundary of the adjoining property, which has impounded surface flows down the gully (Plate 7).



Plate 7. Discharge point for the eastern gully, showing constructed pond and vegetation forming a bund which impounds water along the southern boundary.

Soil samples taken within the ponded area – as well as further up the gully (Plate 8) show no evidence of hydric soil characteristics, meaning that this ponded area, and the gully upslope is not wetland.

There are no potential wetlands within 100 m of this gully.

A vegetation plot undertaken at soil core 1 returned a Prevalence Index score which indicates a dryland plant community (Table 1).

Table 1. Results of the site assessment for vegetation plot 1.

Location	41-43 Brigham Creek Road			
Date	11 March 2021			
Common Name	Species Name	Wetland Status	Group score	Score (prevalence %)
White clover	Trifolium repens	FACU	4	50
Paspalum	Paspalum distichum	FACW	2	10
Ryegrass	Lolium perenne	UPL	5	25
Browntop	Agrostis capillaris	FACU	4	5
Wild carrot	Daucus carota	FACU	4	5
Creeping buttercup	Ranunculus repens	FAC	3	5
		Total		100
Rapid Test – Pass?	No			
Dominance Test – Pass?	No			
Hydric Soils and Wetland hydrology present?	Hydric – no Hydrology - no			
Prevalence Index	4.0			
Is it a wetland?	No Fails on soils and hydrology.			
Improved Pasture?	No – rough grazed			
Is it a NPS-FM wetland?	No			

The second site at which a potential wetland is present is off-site and is located approximately 60 m beyond the southern boundary of this subject site. The potential wetland area was not able to be accessed to properly assess vegetation of soil status. Visual examination from the southern boundary clearly indicates that the feature supports moderately dense soft rush (*Juncus effusus*) amongst a paddock dominated by dryland pasture grasses, and that the feature is located within a distinct upper headwater small gully. We cannot confirm whether this site meets the definition of a NPS-FM wetland or not. We have come across similar sites in many locations around Auckland on similar terrain and farming site histories. Most of those have not been NPS-FM wetlands, however some have.

Out of an abundance of caution we have classed this feature as 'unknown', but have treated it as if it were a NPS-FM wetland, and applied the same degree of engineering consideration for earthworks and stormwater design that would afforded work up-catchment of a NPS-FM qualifying wetland.



Plate 8. Soil cores within the eastern gully. See Figure 1 for locations. All soil cores show deep topsoils with no mottling or light or dark low chroma colours in the soils that might indicate wetland.

3.4 Terrestrial ecology

3.4.1 Vegetation

An assessment of historical and current aerial photos of the site indicates that the area has been actively farmed for an extensive period of time. The current ecological state of the site is extensively modified from its original, pre-human natural state.

Indigenous vegetation is absent.

There are no SEAs recognised by the AUP within the boundaries of the proposed development site.

No threatened plants were recorded from the site.

Vegetation is predominantly pasture, with shelter belts of radiata pine and she-oak (*Casuarina* sp.), small patches of exotic scrub, and exotic conifers and deciduous amenity trees.

Shelterbelts and pasture grassland were the only combination over much of the site. Where pasture had been left ungrazed for several years, inkweed (*Phytolacca octandra*), blackberry (*Rubus fruticosus* agg.) and kikuyu (*Cenchrus clandestinus*) were becoming dominant.

The eastern gully had the greatest amount of woody vegetation and diversity of plant species; however, all of this was exotic species, many of them invasive weeds. Dominant vegetation through this gully (apart from rough pasture) was radiata pine (*Pinus radiata*), macrocarpa pine (*Cupressus macrocarpa*), pampas (*Cortaderia* sp.), gorse (*Ulex europeus*), inkweed, woolly nightshade (*Solanum mauritianum*) and arum lily (*Zantedeschia aethiopica*).

The overall ecology values of the vegetation on the site is very low for habitat for native wildlife, and nil for native plant species.

3.4.2 Birdlife

Birdlife observed on site reflects the modified state of this rural environment. Of the 9 species recorded on site, two were native and are considered to be commonly recorded in rural areas of Auckland. Neither of the native species are classified as Not Threatened (Robertson, et al. 2016).

Native birds recorded on site include:

- Pukeko (*Porphyrio porphyrio* subsp. *melanotus*)
- Spur wing plover (*Vanellus miles*)

Exotic birds recorded from the site:

- Australian magpie (*Gymnorhina tibicen*)
- Blackbird (*Turdus merula*)
- Gold finch (*Carduelis carduelis*)
- Song thrush (*Turdus philomelos*)
- House sparrow (*Passer domesticus*)

- Indian myna (*Acridotheres tristis*)
- Welcome swallow (*Hirundo neoxena neoxena*)

Nesting habitat for birds on site comprises predominantly large, mature shelter belt and amenity trees which are considered to be of low ecological value (for birds) and do not qualify as being ecologically significant under the AUP ecological criteria⁵. Food resources for birds currently present on site come largely from mature weeds and exotic amenity trees which do not meet any of the Auckland Council ecological significance criteria.

3.4.3 Lizards

The Department of Conservation's National Herpetofauna Database has no records of native lizards within ca. 4 km of the site – and even then, those are species found in far less modified environments (forest gecko *Mokopirirakau granulatus* and ornate skink *Oligosoma ornatum*). The nearest record of a copper skink (*Oligosoma aeneum*; not threatened) – which is the species most likely to be present within rural, farmed areas – is 4.2 km to the west and dates to 1968.

Copper skinks can be found in a range of urban and rural environments, including those that have been extensively and recently modified. The majority of the subject site is managed as grazed pasture, however there are some areas of rank grass, scrubby weedland and fallen logs within the eastern gully area which are potential copper skink habitat. The habitat quality in this part of the site is moderate (a good range of refuges and similar to habitat in local rural areas where they have been previously recorded).

Based on the presence (albeit over a small area) of habitat and local records, we regard the likelihood of skinks being present on the site to be moderate. The site is unlikely to constitute core or important habitat for the maintenance of any local lizard populations (should they still exist in the surrounding landscape).

Prior to the removal of vegetation within the area of the site, a lizard salvage should be undertaken by a suitably qualified and experienced herpetologist.

3.4.4 Bats

Habitat for bats is absent from the site. As trees on the site are solitary specimens or narrow shelterbelts that have been regularly maintained, we regard it as unlikely that bats are present or use the site.

The national bat database records the closest location of bats to be 6 km distant to the north within Riverhead state Forest.

The site is within an area that has been on the urban-rural fringe for many years and has been subject to considerable change over the years through the removal and replanting of shelterbelts.

⁵ Auckland Unitary Plan; Schedule 3 Significant Ecological Areas – Terrestrial Schedule

3.5 Summary of ecological values

The site has been heavily modified by past farming activities, which have influenced the state and quality of indigenous communities and habitat for indigenous species on the site.

There are no streams on the site. There are also no wetlands, no indigenous vegetation, no SEAs and no plant or animal species of conservation significance.

One native animal that could be present is the native copper skink, within the rough pasture and weedland areas of the eastern gully. This species is listed as Not Threatened, and this location (if it is present) would not constitute important or core habitat. All native lizards are protected under the Wildlife Act 1953. Where consent is granted under the RMA for the development of such land, the salvage and relocation of native lizards is required.

There is no remnant or secondary regenerating native forest on the site and the vegetation present does not meet any of the qualifying criteria for ecological significance. Mature exotic trees and dense exotic scrub provide limited and low-quality nesting and food resources for birds, and at most benefit a few native birds that are neither threatened nor rare.

4.0 Proposed earthworks and management of potential adverse effects

4.1 Earthworks & development programme

The intended works across the site in terms of stormwater management, treatment and discharge, and management of catchment areas pre and post development are shown in the Figures 2 – 5, and the Drawing sets that accompany the resource consent application.

The following potential adverse ecological effects were identified at the commencement of the engineering design process in relation to the potential wetland to the south of the site:

- Increase in level of sediment discharged to the southern off-site potential wetland during construction.
- Increase or decrease in the quantity of stormwater discharged to the southern off-site potential wetland following development.

4.2 Management of potential adverse effects

As can be seen from Figures 2-5:

- There will not be a significant change to the pre-catchment areas following development; and
- There will be little change to flow rates into the southern or eastern catchments – the rates post-development will be slightly increased.

The above design measures take a precautionary approach to development should the downslope wet gully area be found to be a qualifying NPS-FM wetland. There is no risk of complete or partial drainage of the potential wetland to the south of the site.

The level of potential adverse effect on copper skinks (assuming conservatively that a population is present within the eastern gully area) can be assessed by considering the rarity value of the species being affected, and the magnitude of its loss at the local (catchment or District) level.

The best practice tool widely used to assess significance of effects is the matrix approach as described by the Environment Institute of Australia and New Zealand (EIANZ). The EIANZ matrix approach, and the guidelines within which it is included, has been developed as a guide for ecologists undertaking effects assessments under the RMA (EIANZ, 2018). The EIANZ guidelines and the impact assessment matrix in particular, provides a robust, concise and consistent approach to effects assessment, whilst ensuring that individual expert evaluation and opinion is preserved.

The guidelines have been updated since they were originally released in 2015. We have applied the 2nd Edition version (released in May 2018) which provides updates to parts of the values, magnitude and level of effect analysis.

The three key inputs into an assessment of the level of ecological effect is provided by:

- An assessment of the values (Tables 5 and 6 of the guidance);
- An assessment of the magnitude of the effects on these values (based on criteria listed in Table 8 of the guidance; measured in the context of the catchment (streams) or District (terrestrial values)); and
- The application of a matrix (Table 10 of the guidance) which determines the level of effect based on the ecological value of the site or species assessed and the magnitude of effect.

The level of effect resulting from the matrix analysis can range from 'net-gain' through to 'very high' depending on the various inputs.

Level of effect can then be used as a guide to the extent and nature of the ecological management response required, as outlined in the EIANZ Guidance as follows:

- Project effects in the 'Very High adverse' category are unlikely to be acceptable on ecological grounds alone (even with offset or compensation proposals). Activities having very high adverse effects should be avoided. Where very high adverse effects cannot be avoided (and where policy allows), ecological offsetting or compensation with a net biodiversity gain would be appropriate.
- Project effects in the 'High and Moderate adverse' category represent a level of effect that should be managed through avoidance, design, or offset or compensation actions. Wherever adverse effects cannot be avoided, no net loss of biodiversity values would be appropriate.
- Project effects in the 'Low and Very Low' categories should not normally be of ecological concern, although normal design, construction and operational care should be exercised to minimise adverse effects. If effects are assessed taking impact management developed during project shaping into consideration, then it is essential that prescribed impact management is carried out to ensure Low or Very Low-level effects.
- Project effects in the 'Very Low' category can generally be considered to be classed as 'not more than minor' effects.

The EIANZ effects matrix approach is applied in Table 2.



Figure 2. Scheme plan for the development of the site.

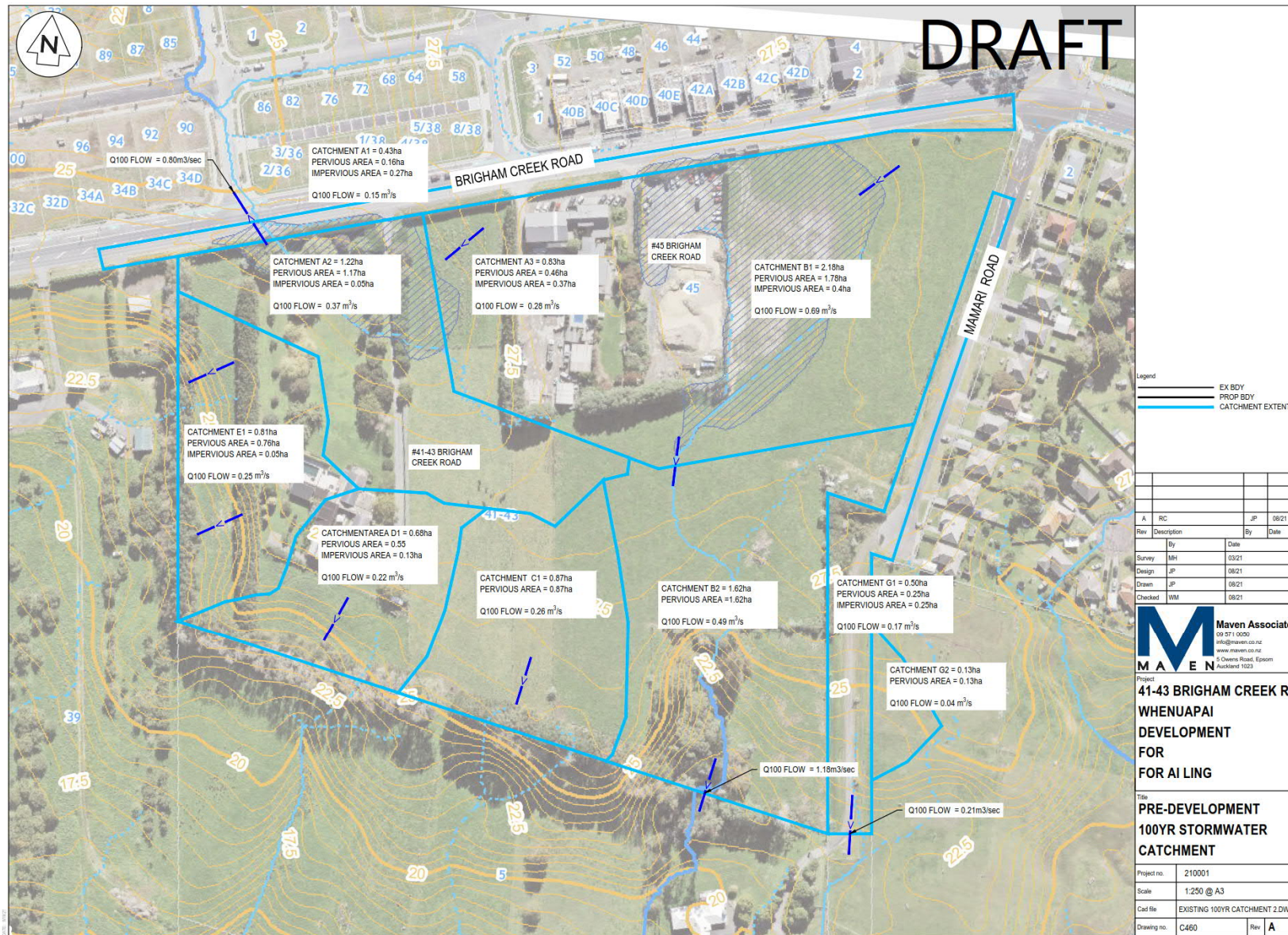


Figure 3. Pre-development sub-catchments and 100 year event flow rates.

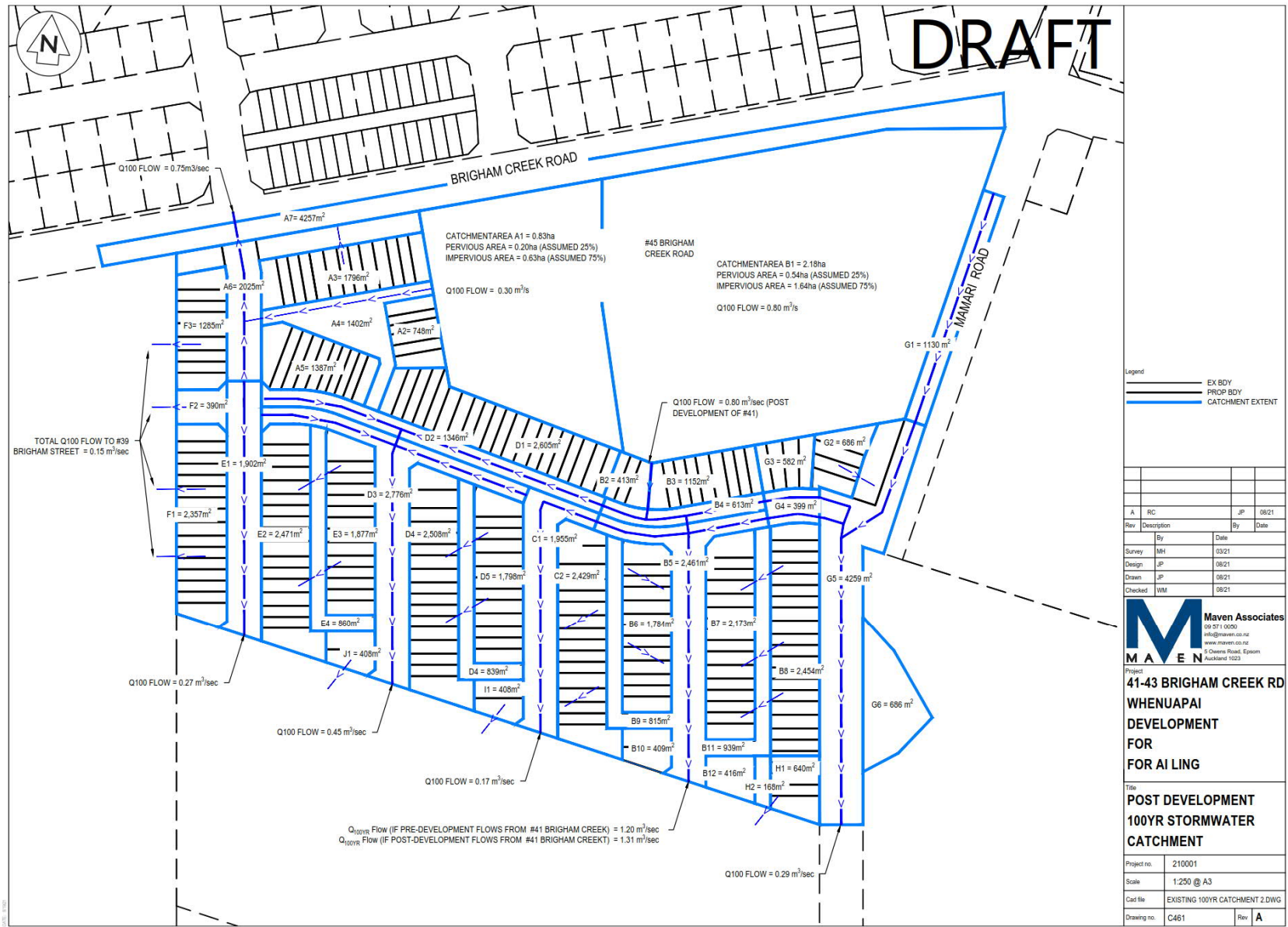


Figure 4. Post-development sub-catchments and modelled 100 year event stormwater flow rates.

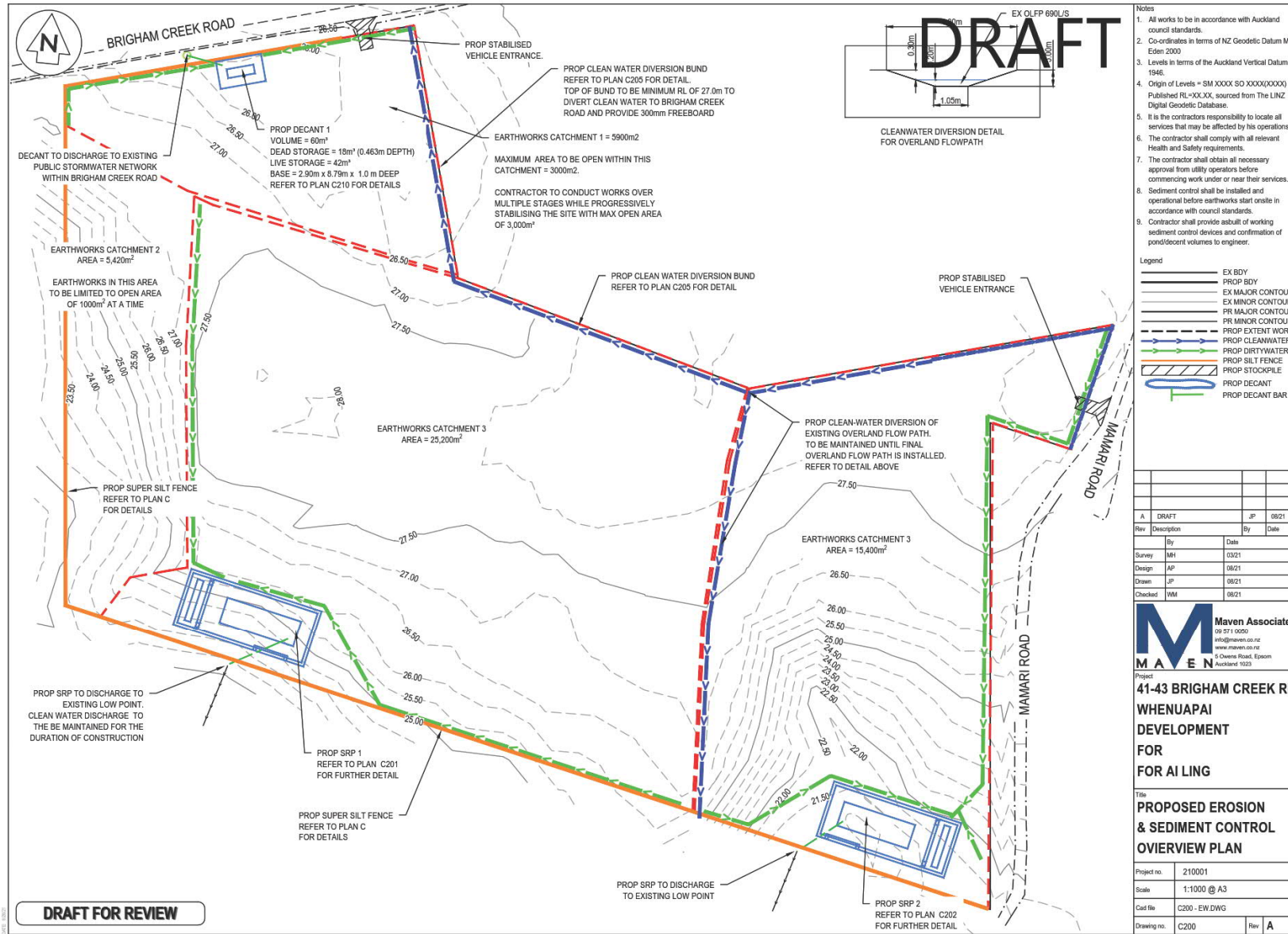


Figure 5. Erosion and sediment controls proposed for the site works.

Table 2. Assessment of significance of ecological effects using the EIANZ matrix method.

Factor	Value of resource ^a	Magnitude of effect ^b	Level of effect ^c
Loss of copper skink habitat	Low	Very Low	Very low

^a EIANZ matrix tables 5 and 6.

^b EIANZ matrix table 8; measured in the context of the catchment (wetlands/ streams) or District (terrestrial values).

^c EIANZ matrix table 10.

The level of potential effects in terms of loss of ecology values is assessed as 'Very low'.

This 'Very low' level of ecological effect is equivalent to 'less than minor' when considered in the context of potential effects on the environment under the RMA.

Where the level of effects is anticipated to be 'Very low', the EIANZ guidelines recommend that normal design, construction and operational care should be exercised to minimise adverse effects. For native lizards, this equates to good practice salvage and relocation as part of vegetation clearance.

For a site where moderate quality habitat exists for copper skinks, but where there are few local records, the development of a Lizard Management Plan would be disproportionate to the level of potential effect. Instead, a condition of the resource consent (if granted) should be sufficient to require that a qualified and experienced herpetologist is present on site to undertake a salvage operation in accordance with best practice, prior to the removal of vegetation within the eastern gully area.

5.0 Recommendations

1. An ecologist should undertake a physical mark out on site to ensure that potential habitat for copper skinks is clearly delineated on the ground, that proposed works avoid these features, and that a salvage for native lizards within this potential habitat is undertaken prior to (as part of) vegetation clearance.

6.0 References

- Goodman JM, Dunn NR, Ravenscroft PJ, Allibone R, Boubee JAT, David BO, Griffiths M, Ling N, Hitchmough RA, and Rolfe JR. 2014. New Zealand Threat Classification Series 7: Conservation status of New Zealand freshwater fish, 2013. Department of Conservation, Wellington.
- Hitchmough R, Barr B, Lettink M, Monks J, Reardon J, Tocher M, van Winkel D, and Rolfe J. 2016. Conservation status of New Zealand reptiles, 2015. New Zealand Threat Classification Series 17. Department of Conservation, Wellington.
- Robertson HA, Dowding JE, Elliott GP, Hitchmough RA, Miskelly CM, O'Donnell CFJ, Powlesland RG, Sagar PM, Scofield RP and Taylor GA. 2013. Conservation status of New Zealand birds, 2012. Department of Conservation: New Zealand Threat Classification Series 4.
- Sawyer J. and Stanley R. 2012. Criteria for the identification of significant ecological areas in Auckland. Auckland Council.

Report prepared by:



.....
Graham Ussher

Principal Ecologist

GTU
g:\shared drives\rma ecology main drive\rma ecology ltd\active projects\2112 brigham creek
rd\working\ecological effects assessment rc\brighamcreekrd_ecology_assessment_31aug2021_final.docx

41-43 Brigham Creek Road JV

C/ - The Property Group

Level 14

55 Shortland Street

Auckland 1010

Attention Natasha Rivai

Dear Natasha

41-43 Brigham Creek Road: Plan Change: information request regarding ecological effects

We refer to the further information request dated 18 February 2022 from Todd Elder, Policy Planner at Auckland Council regarding Council's further information request for proposed private plan at 41-43 Brigham Creek Road, Whenuapai.

You have asked us to provide a response to items 33 - 38 of the request.

The queries regarding ecological matters are presented below in italics, with Council's request, followed by our reply.

Request 33

33. The Ecological Effects Assessment concludes that the potential wetland at the base of the eastern gully is a 'pond' and not a wetland. In the report this is based upon a soil core showing no evidence of hydric soils. Hydric soils can take many years to establish and therefore the absence of hydric soils alone is not sufficient evidence to determine the site is not a wetland (as is may have recently formed). During the site visit pooling water and a dominance of Ranunculus and Persicaria was observed in this area. The Ecological Effects Assessment also refers to the area as being 'seasonally wet' which would seem to indicate a wetland hydrology in excess of the thresholds outlined in the hydrology tool. If the applicant is to maintain that this area is not a wetland, further evidence including the use of the vegetation and hydrology tools would be required.

- a. <https://environment.govt.nz/publications/wetland-delineation-hydrology-tool-for-aotearoa-new-zealand/>
- b. <https://environment.govt.nz/publications/wetland-delineation-hydrology-tool-for-aotearoa-new-zealand/>

I would also draw attention to the recent guidance from the Ministry for the Environment concerning induced wetlands: <https://environment.govt.nz/assets/publications/Defining-natural-wetlands-and-natural-inland-wetlands.pdf>

Our reply

The area referred to is an area where temporary ponding of water occurs. We agree that the vegetation (as dominated by non-pasture species of wetland facultative species) is an indicator of potential wetland status. However, the soils do not match (they are not hydric).

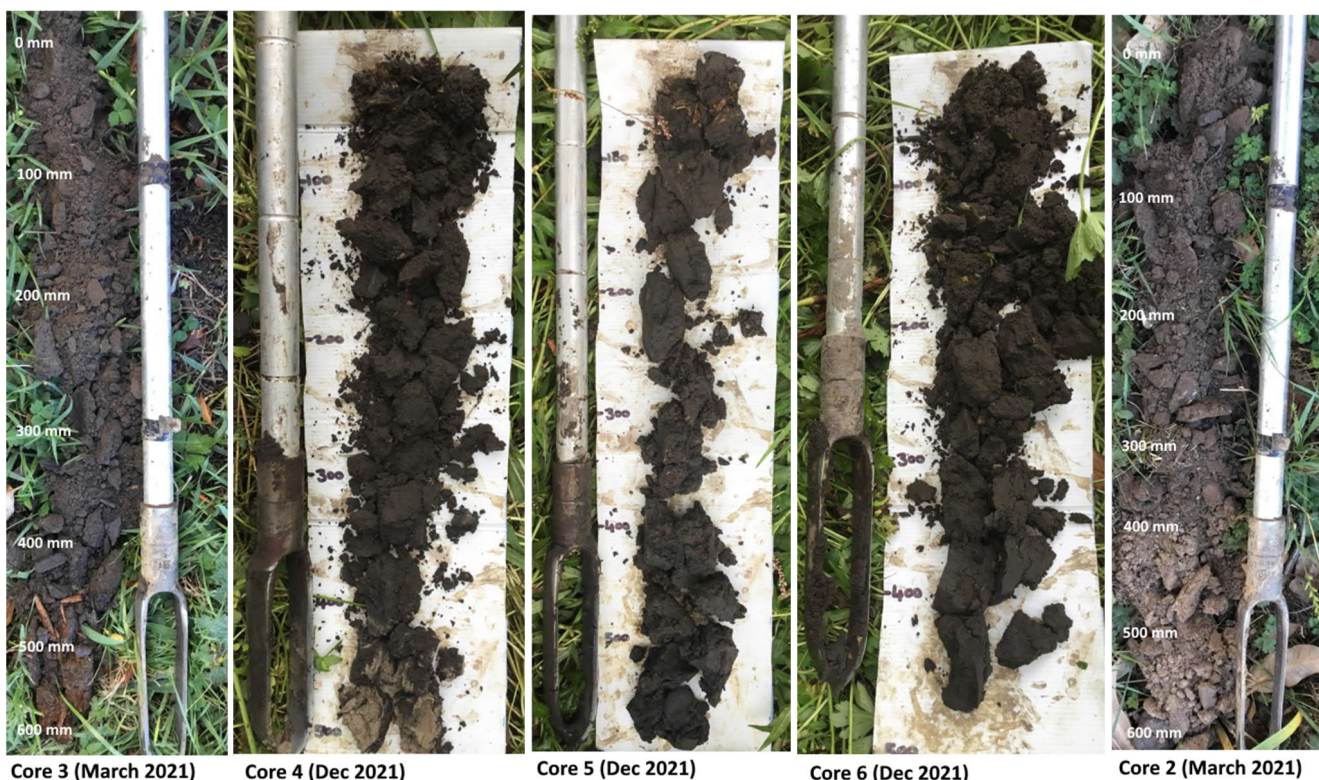
We re-visited the site on 21 December 2021 and undertook further work on soils and vegetation. The vegetation is confirmed to comprise species that are adapted to wet environments – with a dominance of creeping buttercup and water pepper.

The flow chart within the guidance attached to the NPS-FM provides a step-wise sequence of assessment using vegetation, soil and hydrology indicators. The process requires that soils are hydric for a potential wetland site to qualify. It is not enough to have vegetation (or hydrology) as the only wetland indicators. Without qualifying soils, the site is not a wetland.

We took three more soil cores within this wet area – within the lowest point and on the edges. All soil cores were within areas dominated by wet-adapted plants (buttercup/ water pepper/ Yorkshire fog grass). These are shown below, together with the soil core taken in March 2021 within the same area, and a reference sample taken on the slope/ dry soils nearby. None contain indicators of hydric soils as defined in Fraser et al. (soil guide referred to in the NPS-FM wetland classification and delineation guidance). Soils must qualify as hydric soils for a potential wetland area to be classed as wetland – if it does not pass the soils test, it is not a wetland (see flow chart in the NPS-FM wetland delineation and classification guidance). Updates to this guidance chart in subsequent clarification documents from MfE have no legal standing (they cannot replace the NPS-FM official guidance) and in any case they also require that soils AND hydrology tests be both met together for a site to be classified as a wetland.

We agree that if this system was left for another 30 years+ wetland soils may develop and the site may be then be defined as a wetland. That could also be said of (for example) cow-shed pugged areas and septic tank overflow slopes where vegetation comprises 'wetland-type' species but soils have not yet been saturated for long enough to develop hydric indicators.

The current state of the environment at this low area of the site is that it is not a natural inland wetland under the NPS-FM and it is not a wetland as defined in the RMA.



(above). Soil cores taken within the wet basin on the site, and a core taken outside of the basin on the nearby slope/ spur (Core 2). Core 3 is taken after summer and shows dry soils. Cores 4 – 6 are taken just after the wet season and show moist profiles. None of the cores show redox mottling in the upper 300 mm or dark or light low chroma colours within the top 400 mm that are at variance with the reference core. The cores indicate that the basin comprises accumulated fine sediments over underlying basement clays.

Request 34

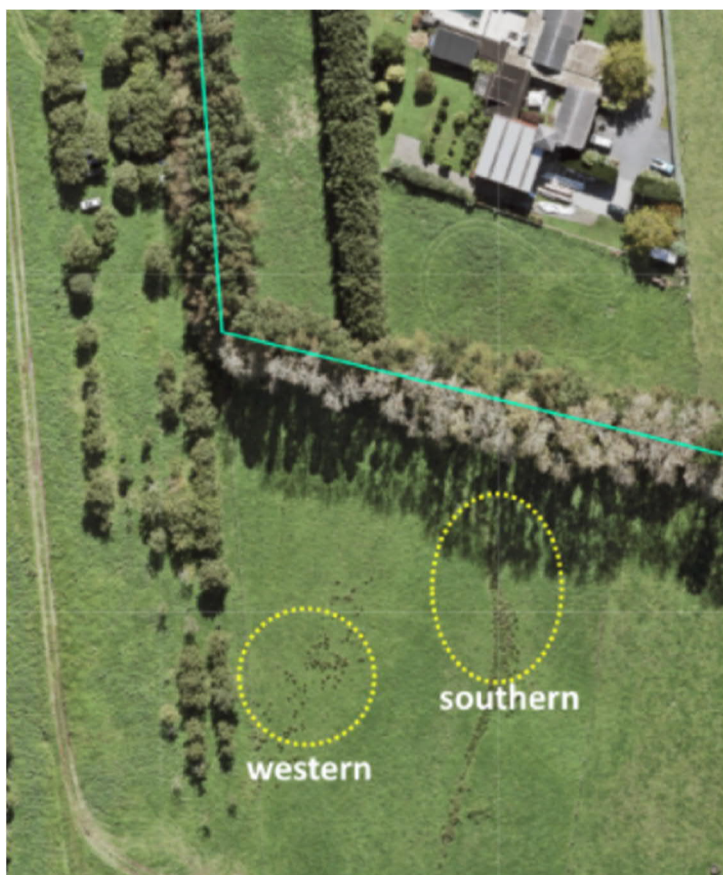
34. The Ecological Effects Assessment notes a potential natural wetland to the south of the subject site. From the site visit there would also appear to be an equally similar area approximately 30 metres to the west of the identified potential wetland.

Information request: Please comment and update assessment as necessary.

Our reply

We visited these sites in December 2021 and undertook vegetation and soil sampling to assess wetland status. We applied the NPS-FM classification protocols (including Fraser et al. soil assessment).

We refer to these sites as the southern wet area and the western wet area (see below).



Southern wet area:

- Vegetation dominated by Yorkshire fog (40 %), lotus (10 %) and sweet vernal (5 %), also with creeping buttercup (35 %), soft rush (10 %) and sorrel (2 %).
- Most of the stippling on the aerial photo (indicative of soft rush areas) above has either been removed by pasture maintenance since this aerial photo was taken, or is along the margins of the adjoining overland flow path; the potential wetland area is at the head of the gully and in this aerial is beneath the shading caused by the adjacent shelterbelt line.

- Soils are fine silts with no mottling and no dark or light low chroma colours in the top 400 mm (see below).
- Overall, while the area is wetter than the surrounding basin sides and spurs, the soils are not hydric, and the vegetation is dominated by pasture grass species (Yorkshire fog, lotus and sweet vernal; which are part of paddock maintenance (pasture improvement) including weed control, fertiliser application and re-seeding) – meaning that the site does not qualify as a natural inland wetland under the NPS-FM nor as a wetland under the RMA.

Core 7 (slope reference)

Core 8 (southern basin)

Core 9 (southern basin)

Core 10 (southern basin)



Western wet area:

- Vegetation dominated by Yorkshire fog (55 %), lotus (5 %) and sweet vernal (5 %), with also creeping buttercup (10 %), soft rush (5 %), paspalum (10 %), sorrel (3 %) and bare ground (7 %).
- Soils are fine, moist, silts with light red mottling in the top 300 mm and a light low chroma colour change at 350 mm (see below). This qualifies this soil as a hydric (wetland) soil.
- Overall, while the area is wetter than the surrounding basin sides and spurs and the soils are hydric, the vegetation is dominated by pasture grass species (Yorkshire fog, lotus and sweet vernal; which are part of paddock maintenance (pasture improvement) including weed control, fertiliser application and re-seeding) – meaning that the site does not qualify as a natural inland wetland under the NPS-FM.
- The site does qualify as a wetland under the RMA.

- The closest point of the wetland to the proposed development at 41-43 Brigham Creek Road is 65 m.

See below for photo of the western wet area, picture of a representative 2 m x 2 m portion and a soil core taken within the wettest part of this western area.





Core 11 (western wet area)

Request 35

35. The Ecological Effects Assessment includes a copy of drawing C461 (Rev A) showing a Q100 discharge in the vicinity of the identified potential wetland to the south of the subject site of 0.45 m³/s. However, the Stormwater Management Plan includes the same drawing (same revision) with a Q100 of 0.3 m³/s.

Information request: Please clarify.

Our reply

The correct statistic is 0.3 m³/s (see Maven plan in updated Plan Change ecology report). Note that the potential wetland to the south of the site is not a wetland under the NPS-FM or RMA.

Request 36

36. With regard to the effects on the potential wetland to the south, the Ecological Effects Assessment notes that there will not be a significant change to the pre-catchment areas following development.

Information request: Can the applicant please confirm the existing and post development drainage catchment areas contributing to the potential wetlands to the south of the site. Please also confirm the percentage of imperviousness in the pre and post development scenarios. In preparing this response also consider that there is a proposed public stormwater line collecting flows intercepting the southern boundary and conveying flows to a proposed public stormwater line to the south east of the site (drawing C450).

Our reply

We understand that the public stormwater line was part of a previous application to Council which has now been superseded to show individual discharges to the south via multiple points. This revised stormwater plan aims to deliver the same overland flows to the southern catchments compared to pre-development and therefore will not affect the southern non-wetland area or the western RMA wetland area.

Request 37

37. The Ecological Effects Assessment also notes there will be little change to flow rates into the southern or eastern catchments and that the rates post-development will be slightly increased.

Information request: Noting the discrepancy in the Q100 flow from drawing C461, can the applicant please confirm the pre and post development flow rates contributing to these potential wetland areas across a range of rainfall events. Also please comment on the potential effects of increased imperviousness on the potential wetland hydrology, including both surface water and shallow groundwater.

Our reply

Please see the information supplied by Maven.

Request 38

38. While drawing C461 referred to in the Ecological Effects Assessment shows the Q100 stormwater overland flows, drawing C450 in the infrastructure report shows the Q10 Stormwater Catchment Plan. C450 shows a proposed public stormwater line collecting flows intercepting the southern boundary and conveying flows to a proposed public stormwater line to the south east of the site.

Information request: Please assess the effects of this stormwater infrastructure on the potential wetlands to the south of the sites – in particular how this is in accordance with the assertion that there will be little change to flow rates into the southern or eastern catchments.

Our reply

We understand that the public stormwater line was part of a previous application to Council which has now been superseded to show individual discharges to the south via multiple points. This revised stormwater plan aims to deliver the same overland flows to the southern catchments compared to pre-development and therefore will not affect the southern non-wetland area or the western RMA wetland area.

We trust that this provides the information that Council has requested.



Graham Ussher

Principal Ecologist

g:\shared drives\rma ecology main drive\rma ecology ltd\active projects\2112 brigham creek rd\working\s92 reply march2022 plan change\brighamcreekrd.s92reply.ecology.planchange.15march2022.draft.docx

41-43 Brigham Creek Road JV Ltd

c/- Property Group Ltd

Attention: Natasha Rivai

Dear Natasha,

41-43 Brigham Creek Road: Plan Change

We have been engaged by 41-43 Brigham Creek Road JV Ltd¹ to provide an assessment of the ecological values of the 41-43 Brigham Creek Road site for the purpose of informing a proposed Private Plan Change.

The site is proposed to be rezoned, for the purposes of developing future housing (Figure 1).

Methods

A site visit was undertaken on 11 March 2021 to assess the variety of ecosystems and the ecological values present within the Plan Change footprint. A further site visit was undertaken on 21 December 2021 to obtain information within potential wetland areas within the site and on the property adjoining the southern boundary of the site. This included soils and vegetation plots. An assessment of bat habitat was also undertaken.

The site walkover was carried out to assess and map all streams and wetlands within the site.

All waterways and flow paths were mapped as being permanent, intermittent or ephemeral based on the definitions in the AUP (see below). Photographs were taken and a general description of the waterway was undertaken to note characteristics including riparian species and cover, and connectivity to other waterways.

A general characterisation assessment of the mapped stream reaches and wetlands was also undertaken with key ecological features recorded. Vegetation was assessed across the site with a focus on the presence of indigenous species. Birds identified visually and audibly were recorded across the site, including native and introduced species. The field survey included identification of habitats potentially occupied by native lizards, and an assessment of potential bat habitat.

The ecological investigation used the AUP SEA criteria to assess the significance of ecology values recorded from the site. Wetlands were assessed using the definition within the Resource Management Act 1991 using the definition within the National Policy Statement on Freshwater Management 2020 (NPS-FM).

Results

The site is located within a typical Auckland rural environment. The landform slopes gently to the south, with catchment watercourses in the general area discharging to the upper part of the Waitemata Harbour. The site supports one dwelling with substantial amenity gardens, and surrounding paddocks and fields that are

¹ This report has been prepared in accordance with our letter of engagement dated 11 February 2021.

used for stock grazing. Several appear to have been retired for several years with rank grasses and weedland establishing.

The site has been heavily modified by past farming activities, which have influenced the state and quality of indigenous communities and habitat for indigenous species on the site.

The northern part of the site has been extensively landscaped and no flow path is discernible. There is no stream in this location.

The southern part of the site supports two small, headwater slopes in the central and western portions that discharge overland flow into shallow gullies off the site to the south. There is no stream in these locations on the site.

The far eastern part of the site discharges overland flow to the south as well. At that location, there is a broad shallow flow path that discharges to the southern boundary, where it is impounded by a shallow excavated pond and bund created by plantings on the next-door property. The flow path does not support a stream – there is no indication of a channel, sediment sorting, pools or floodplain, and the entire extent of the basin floor is well colonised by terrestrial plants.

The pond at the boundary has been created (if not through deliberate excavation), by a combination of cattle or animal trampling, and a row of planting across the boundary creating a bund that impounds surface flows behind it. The ‘pond’ or seasonally wet area has been formed by a bund of arum lily that has been planted or has otherwise established along the boundary of the adjoining property, which has impounded surface flows down the gully.

Soil samples taken within the ponded area – as well as further up the gully show no evidence of hydric soil characteristics (fine silts with no mottling and no high or low chroma colour change). A vegetation plot returned a Prevalence Index score which indicates a dryland plant community.

By contrast, vegetation within the ponded area comprises mostly creeping buttercup (*Ranunculus repens*), water pepper (*Persicaria hydropiper*) and Yorkshire fog grass (*Holcus lanatus*), all of which are wetland facultative or wetland plants, contributing to a Prevalence Index score of less than 3 – which means the plant community is a wetland community.

When paired with the soils test, and the NPS-FM wetland classification flow chart, this area does not support the necessary characteristics (in particular hydric soils) to qualify as a wetland under the NPS-FM or the RMA. This site does not support a wetland.

There are no potential wetlands within 100 m of this gully.

Two potential wetland sites to the south of the subject site were investigated. The areas were accessed in December 2021 to assess vegetation and soil status.

Southern wet area:

- Vegetation is dominated by Yorkshire fog (40 %), lotus (10 %) and sweet vernal (5 %), also with creeping buttercup (35 %), soft rush (10 %) and sorrel (2 %).
- Most of the stippling on the aerial photo (indicative of soft rush areas) above has either been removed by pasture maintenance since this aerial photo was taken, or is along the margins of the adjoining overland flow path; the potential wetland area is at the head of the gully and in this aerial is beneath the shading caused by the adjacent shelterbelt line.
- Soils are fine silts with no mottling and no dark or light low chroma colours in the top 400 mm (Plate 9).

- Overall, while the area is wetter than the surrounding basin sides and spurs, the soils are not hydric, and the vegetation is dominated by pasture grass species (Yorkshire fog, lotus and sweet vernal; which are part of paddock maintenance (pasture improvement) including weed control, fertiliser application and re-seeding) – meaning that the site does not qualify as a natural inland wetland under the NPS-FM nor as a wetland under the RMA.

Western wet area:

- Vegetation dominated by Yorkshire fog (55 %), lotus (5 %) and sweet vernal (5 %), with also creeping buttercup (10 %), soft rush (5 %), paspalum (10 %), sorrel (3 %) and bare ground (7 %).
- Soils are fine, moist, silts with light red mottling in the top 300 mm and a light low chroma colour change at 350 mm (see below). This qualifies this soil as a hydric (wetland) soil.
- Overall, while the area is wetter than the surrounding basin sides and spurs and the soils are hydric, the vegetation is dominated by pasture grass species (Yorkshire fog, lotus and sweet vernal; which are part of paddock maintenance (pasture improvement) including weed control, fertiliser application and re-seeding) – meaning that the site does not qualify as a natural inland wetland under the NPS-FM.
- The site does qualify as a wetland under the RMA.
- The closest point of the wetland to the proposed development at 41-43 Brigham Creek Road is 65 m.

One native animal that could be present is the native copper skink, within the rough pasture and weedland areas of the eastern gully. This species is listed as Not Threatened, and this location (if it is present) would not constitute important or core habitat.

The national bat database has three records of long-tailed bats 300 m to the west of the site (recorded in 2020), within an area of large plantation trees and older exotic shelterbelt trees, and in close proximity to a key watercourse that has large, mature trees lining it. We have assessed the potential for bat habitat within the site, using the criteria in the DOC/NZTA national guidance to assess quality.

For this site, there are no streams on the site and the nearest substantial watercourse with open water is near to where the Bat Database records are shown.

For this site, the shelterbelts in the central and western part of the site are young and until recently have been managed (trimmed sides). The species of tree (Casuarina) has an open foliage and lacks flaky bark, knot holes or cavities that bats might find favourable. Therefore, these trees score as Low Risk Trees and, in our opinion, no further consideration of these is required in term of potential bat habitat.

The trees at the eastern end of the site are a cluster of older and large macrocarpa and eucalyptus trees (total 9 trees). These support features (flaky bark) that bats may find favourable for roosting – and therefore score as High-Risk trees. No sign of roosts was found from our ground inspection and we could not see occlusions, holes, splits or cavities from the ground in those trees; however, that cannot be relied upon solely as an assessment of bat presence or potential for the trees overall to provide favourable roost habitat.

We note that all of the trees on this property can be felled without requiring resource consent from Auckland Council, and that the survey for bats is matter for the Wildlife Act (DOC), rather than the Resource Management Act.

The landowner's intention is to follow the NZTA/ DOC protocols for managing potential adverse effects on bats (Protocol B: Pre-felling procedure 1.4.1 and Protocol C (if bats are confirmed to be present)). These

include undertaking a survey for bats immediately prior to felling of the older trees in the eastern macrocarpa/ eucalyptus group to ensure that bats are not using these trees at the time of felling.

Overall, given the history of the site and its distance from a substantial watercourse, we regard the potential for bats to be using the site to be low.

There is no remnant or secondary regenerating native forest on the site, the vegetation present does not meet any of the qualifying criteria for ecological significance. Mature exotic trees and dense exotic scrub provide limited and low-quality nesting and food resources for birds, and at most benefit a few native birds that are neither threatened nor rare; most birds present are exotic species.

In terms of stormwater flows, the post-development flows have been designed to closely match the pre-development flows. This is relevant for the south-western part of the site (catchment D1 on the plans by Maven in Attachment B) where the western wet area qualifies as an RMA wetland.

Conclusions with regard to Plan Change provisions

The Private Plan Change proposes to re-zone this area for housing, with the possibility that all vegetation could be removed from across the site.

There are no ecology values recorded from the site or nearby that warrant the inclusion of specific Provisions associated with this Plan Change. The existing suite of objectives and policies within the Auckland Unitary Plan, and national-level legislation such as the NPS-FM provide adequate protections for biodiversity and ecology values, and would be applied to this site.



.....

Graham Ussher

Principal Ecologist²

g:\shared drives\rma ecology main drive\rma ecology ltd\active projects\2112 brigham creek rd\working\plan change ecology report\brighamcreekrd_planchange_ecology_15march2022.v2.issued.docx

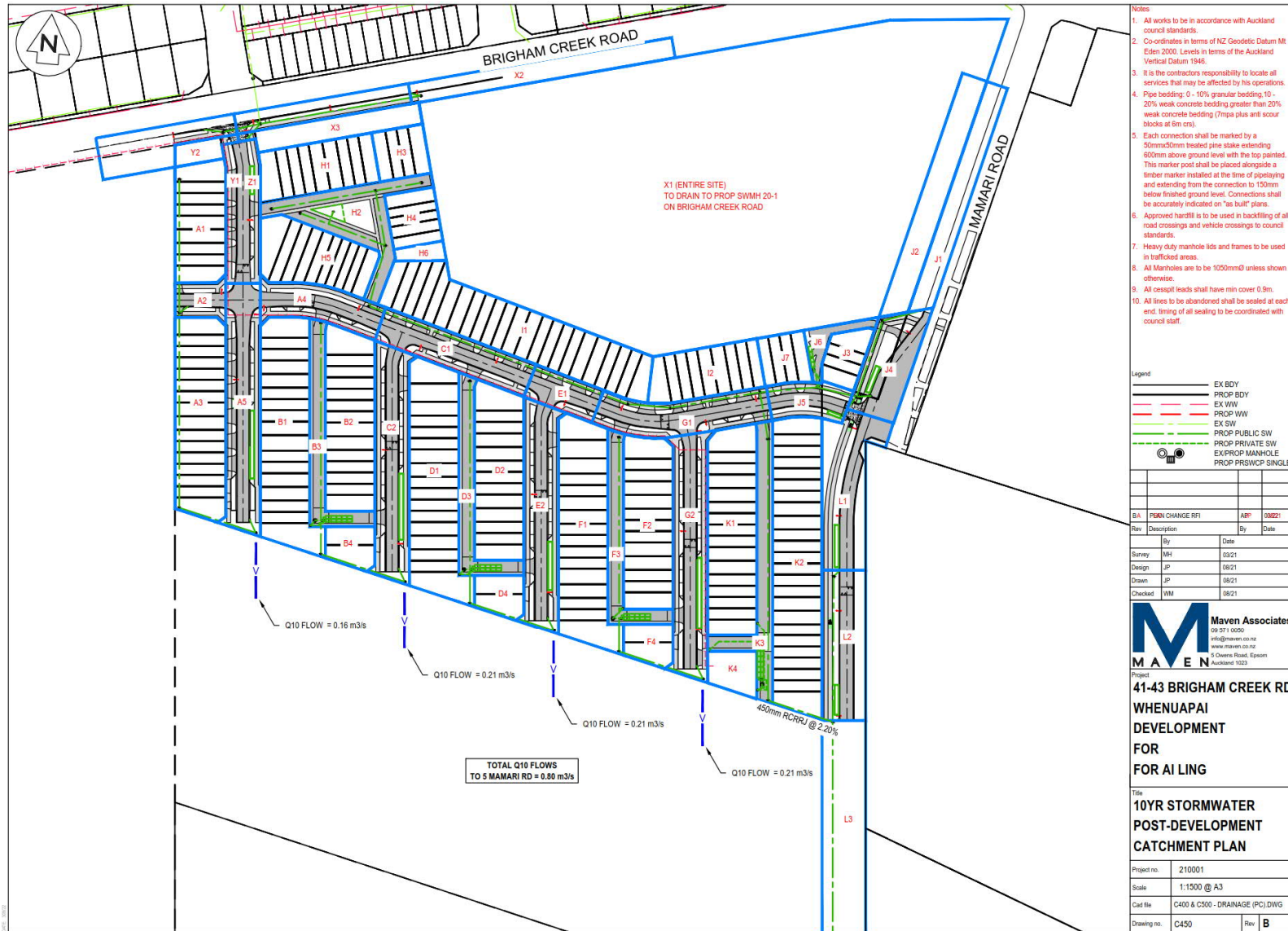
² This report has been prepared for the benefit of our Client with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement. Any use or reliance by a third party is at that party's own risk. Where information has been supplied by the Client or obtained from other external sources, it has been assumed that it is accurate, without independent verification, unless otherwise indicated. No liability or responsibility is accepted by RMA Ecology Limited for any errors or omissions to the extent that they arise from inaccurate information provided by the Client or any external source.

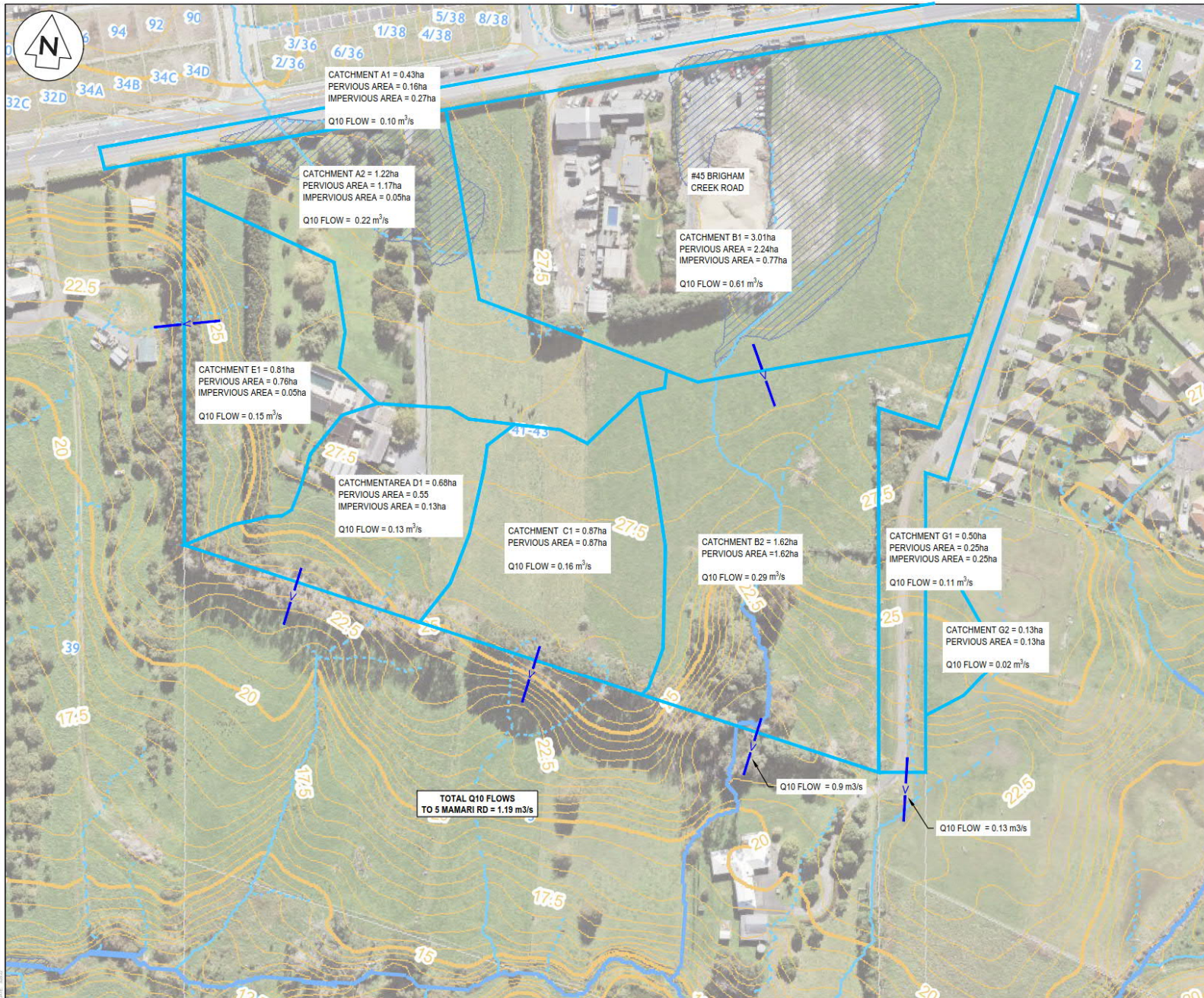
Attachment A



Figure 1. The investigations area (turquoise boundary), with location of wetland investigation soil cores and vegetation plots. Potential wetland areas in the eastern ('pond') part of the site and in the southern and western parts of adjoining land (not on the site) were investigated for the presence of wetlands (yellow circles).

Attachment B





- Notes**
- All works to be in accordance with Auckland council standards.
 - Co-ordinates in terms of NZ Geodetic Datum Mt Eden 2000. Levels in terms of the Auckland Vertical Datum 1946.
 - It is the contractors responsibility to locate all services that may be affected by his operations.
 - Pipe bedding: 0 - 10% granular bedding, 10 - 20% weak concrete bedding greater than 20% weak concrete bedding (7mpa plus anti scour blocks at 6m c/s).
 - Each connection shall be marked by a 50mmx50mm treated pine stake extending 600mm above ground level with the top painted. This marker post shall be placed alongside a timber marker installed at the time of pipe laying and extending from the connection to 150mm below finished ground level. Connections shall be accurately indicated on "as built" plans.
 - Approved hardfill is to be used in backfilling of all road crossings and vehicle crossings to council standards.
 - Heavy duty manhole lids and frames to be used in trafficked areas.
 - All Manholes are to be 1050mmØ unless shown otherwise.
 - All cesspit leads shall have min cover 0.9m.
 - All lines to be abandoned shall be sealed at each end. Timing of all sealing to be coordinated with council staff.

Legend

- EX BDY
- PROP BDY
- CATCHMENT EXTENT

B	PLAN CHANGE RFI	AP	03/22
Rev	Description	By	Date
Survey	MH		03/21
Design	JP		08/21
Drawn	JP		08/21
Checked	WM		08/21



Project
41-43 BRIGHAM CREEK RD
WHENUAPAI
DEVELOPMENT
FOR
FOR AI LING

Title
10YR STORMWATER
PRE-DEVELOPMENT
CATCHMENT PLAN

Project no.	210001
Scale	1:1500 @ A3
Cad file	C400 & C500 - DRAINAGE (PC).DWG
Drawing no.	C451
Rev	B

