Langs Beach and Waipu Cove Ultrafast Fibre Deployment (HNZPT authority 2020/158): final report

report to
Heritage New Zealand Pouhere Taonga
and
Chorus New Zealand Ltd

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Date: 4 March 2021
Reference: 19-1017

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Chorus New Zealand Ltd (Chorus) have installed a new fibre optic cable network around Langs Beach and Waipu Cove as part of the second stage of the National Ultra-Fast Fibre project (UFB2). Excavation took place within road reserves, and mainly involved excavating small pits at regular intervals (usually in line with every second property boundary) within existing service trenches, and directional drilling between these. Additional pits were opened to locate services or extend the cable to property boundaries.

Eleven sites were recorded within 200 m of the affected road reserves under the New Zealand Archaeological Association's (NZAA) Site Recording Scheme (SRS). During the assessment phase of the project, two of these sites (Q08/13 and Q08/22) were identified as having the potential to be affected by works, and two waterways were identified as areas where previously unrecorded pre-European Māori sites, particularly middens, could potentially be encountered (Glover 2019). Chorus applied to Heritage New Zealand Pouhere Taonga

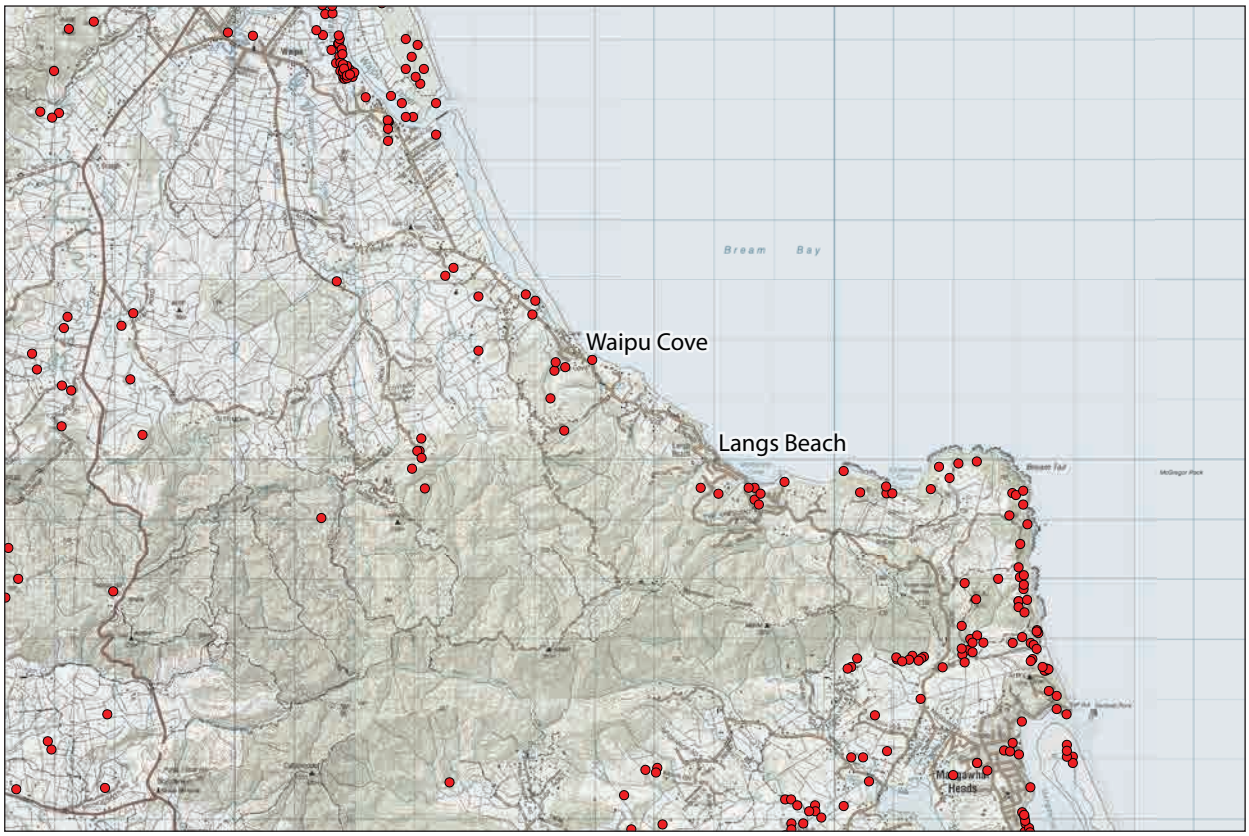

Figure 1. Waipu Cove and Langs Beach, showing archaeological sites recorded in the vicinity.

(HNZPTA) for an archaeological authority to modify or destroy these sites under section 44 of the Heritage New Zealand Pouhere Taonga Act (2014). Authority 2020/158 was granted by HNZPT on 24 September 2019.

Methodology

During the initial assessment phase, areas within the build were identified where there was potential for archaeological material to be affected. A survey was carried out on 23 August 2019, focussing on the road reserves within the build. Beyond this, sites recorded in the NZAA SRS were accessed via Archsite, the HNZPT digital library was searched for records of archaeological investigations in the area, as was The List (Rārangi Kōrero). Old maps and survey plans held by Land Information New Zealand (LINZ) were accessed using Quickmap and the Whangarei District Council's district plan was checked for any identified heritage areas which were not included in the above resources.

Of the eleven sites identified within 200 m of the build, two pā were identified as having the potential for being affected by works. Two waterways were also identified as having the potential for unrecorded midden sites to be impacted and the surrounding road reserves were demarcated as areas where any ground disturbance should be monitored by an archaeologist.

Construction methodology

Earthworks commenced on 29 October 2019 and were completed December 2019 Archaeological monitoring of relevant areas was carried out by Hayley Glover, Arden Cruickshank and Danielle Trilford of CFG Heritage, accompanied by representatives of the Patuharakeke Te Iwi Trust, in order to identify and record any archaeological features which were exposed.

Installation of the ultrafast fibre network consisted primarily of directional drilling to minimise ground disturbance. These consisted of insertion and receiving pits which were generally 1.2 x 1.2 m, with varying depths, generally around 1 m. These pits also housed the underground cabinets which centralised the connections for a neighbourhood. Although drill shots were capable of being in excess of 200 m long, they were generally at distances of 40 m to allow for individual house connections. In addition to the drill pits, a number of 'potholes' were required to physically and visually identify the location of services prior to a drill shot being made. Because of the inherent risk of sub-surface drilling near existing services, the drill shots were often made next to existing service trenches to allow for accepted minimum distances from high voltage cables and other potentially hazardous services. The overall level of ground disturbance depended on the complexity of services in each particular street and was not consistent over the build, but is still less than traditional trenching methods for installation of services.

Due to this type of ground disturbance, assessing the archaeological effects and interpreting features and the landscape was not as straight forward as typical archaeological monitoring projects. Trenching would traditionally be used for installation projects of this magnitude which would allow an archaeologist to view soil profiles over a significant length and identify subtle landscape modifications that would indicate human activity. Similarly, large scale topsoil stripping such as with housing developments provide an archaeologist with a complete knowledge of the sub-surface archaeological deposits within the project extent.

The drawback of those methods of extensive earthworks is that any archaeological features that are within it are significantly modified. The purpose of the Heritage New Zealand Pouhere

Taonga Act (2014) is '…the identification, protection, preservation and conservation of the historical and cultural heritage of New Zealand', with avoidance and minimisation of damage the preferred approaches for archaeological landscapes. With this in mind, the approach for these projects is to manage the archaeological landscape and the effects on it, rather than to create a robust record of all archaeological sites within a build.

Archaeological monitoring and investigation procedures were developed to ensure disturbance to both archaeological features and council assets was minimised. Where archaeological features were discovered during works, the archaeologist did not extend the hole beyond its intended size as this would increase the modification of the feature and had the potential for destabilisation of the road and other infrastructure. Where archaeological features were discovered, drilling was done at a suitable depth determined by the archaeologist to avoid the archaeological features.

The results of this project should not be seen as an exhaustive list of archaeological sites that exist within the road reserves around Langs Beach and Waipu Cove, or even as a representative sample; but rather an exercise in minimising potential effects on the archaeological landscape of Langs Beach and Waipu Cove.

Background

Langs Beach and Waipu Cove are located in Bream Bay, Northland. Bream Bay is bounded by volcanic headlands to the north and the south. The majority of the soils around Langs Beach and Waipu Cove are moderately to well drained clay loams with some more poorly drained clays towards the coast (Department of Lands and Survey, New Zealand 1981).

Bream Bay was named by Captain Cook when he anchored in 1769, after noting the large quantities of bream (snapper, *Chrysophrys auratus*) in the area (Orange 2005). Kauri trees were prolific in the Waipu area and were felled for use in dwellings and for masts and spars. After these forests had been cleared, much of the vegetation in the region was scrub and regenerating bush (Gates 2002).

Pre-European Māori

Pre-European Māori settlement of Waipu Cove and Langs Beach is attested to by the pā, storage pits, and middens in this area. Agriculture and exploitation of marine resources would have been an important part of life in this area. The numerous storage pits that have been located on the ridges behind Langs Beach and on the headland pa are good supporting evidence that agricultural activity was occurring in this region (Maingay 1990). While a lot of the soils inland are moderately or strongly leached, fertile lands nearer the coast were likely to have been used for gardening (Maingay 1990).

Historic

Between 1795 and 1825, Waipu and some surrounding areas became embroiled in warfare between iwi to the north and south (Gates 2002). In addition to this, by the mid-1850s, the Crown obtained the Waipu and Ruakaka blocks in Bream Bay (Tamatekapua Law 2011). This led to a reduced Māori population in the area, and though there were still Māori residents living there, the area was subsequently colonised by Europeans (Gates 2002).

Bream Bay, and Waipu in particular, was the location of a large immigration scheme of more than 800 Scottish people into New Zealand, beginning in 1853 (Molloy 1990). In 1817, Reverend Norman McLeod led approximately 400 people to settle in Novia Scotia however, the cold climate and crop failures resulted in famine and the group set sail for Australia where they had heard stories of a better life. Land prices were unaffordable due to the gold rush, so a party travelled to New Zealand to negotiate with the government (Molloy 1990). Eventually, land in Waipu was allotted to them by Governor George Grey and Scottish immigrants continued settling in the area until 1959 (Molloy 1990; Ryan 2002).

Archaeological background

In 1990, Joan Maingay carried out an archaeological survey in Langs Beach where the Lang Cove Company Ltd were planning on subdividing and developing land. She noted that middens sites Q08/304, Q08/305, and Q08/306 had already been damaged around 1975 after bulldozing of the area, and at the time of this investigation were almost entirely destroyed, with the exception of some midden associated with Q08/306 (Maingay 1990). Maingay also investigated a pa site (Q08/326) in 1996. The pa was highly eroded, but a platform and ditch were identified, and midden deposits up to 200 mm thick were identified on the site (Maingay 1996).

Inland, Architage Heritage Consultancy excavated sites in preparation for Bream Bay Properties Ltd in 2006 (Baquié and Harlow 2006). The areas designated for development contained four known midden sites (Q08/512, Q08/513, Q08/514, and Q08/515). The investigation unearthed 20 fire scoops beneath the shell midden, as well as a pit and some stake holes. Baquié and Harlow (2006) suggest that the area was used for food preparation and could have prepared food for the nearby pa (Q08/516).

In 2008, CFG Heritage carried out archaeological investigation near Waipu Cove in preparation for the construction of a residence located east of a pa site (Q08/7) (Hudson 2008). Midden was found during the excavation, and a sample was used for radiocarbon dating, giving an age of cal AD 1355–1423 at a 95% confidence interval. This is earlier than expected for a pa site, and suggests the site was in use prior to building the pa.

Geometria conducted archaeological monitoring in 2010 in preparation for the construction of a residence near a midden site (Q08/542) (Carpenter 2010). A small amount of charcoal and fire cracked rock was found in association with the midden, but no fire scoops or hāngī were located, suggesting that this was a short-term occupation.

In 2014, CFG Heritage investigated a residential property in Waipu Cove where midden associated with site Q08/537 was located during construction (Harris 2014). The investigation located various artefacts and features including scatters of midden, obsidian flakes, a fire scoop with fire cracked rock and charcoal, and a pit feature. Radiocarbon dating of shell gave a date between the late 15th and late 17th centuries, within the mid to late pre-European period.

In 2019, Clough and Associates undertook high-level desktop heritage assessments of Langs Beach and Waipu Cove to inform on whether there could be any constraints on the build. These assessments are brief but do identify six recorded archaeological sites within Langs beach and one in Waipu Cove which may be affected by works. This assessment did not look into the individual sites, and should be looked at as a basic overview of the towns (Judge and Clough 2019a; 2019b).

Results

The majority of works occurred in previously disturbed soils within the road reserves, though the depth of disturbance varied across the build. There were three locations where potential archaeological material was encountered during works, at both Waipu Cove and Langs Beach. Only one of these (Feature 2) revealed in-situ material and was recorded as a site (Q08/605).

Feature 1

This feature was located in the road reserve adjacent to 878 Cove Road, in Waipu Cove. It was comprised of a sparse scatter of shell, charcoal and fire cracked rock intermixed in a 600 mm thick layer, located beneath 80 mm of topsoil (Figure 4). Beneath this was a layer of dark, charcoal stained sand. The deposit had been heavily modified, likely as a result of the house/shed construction at 878 Cove Road. Fill from the house may have been used to level out the lawn and verge areas. Probing was inconclusive and the extent of this material is not known. No sample was taken as it was redeposited, and it was not recorded in the SRS.

Feature 2 – Q08/605

This feature was also located on Cove Road in Waipu Cove, outside 836/840 Cove Road. It is an extensive midden deposit which was exposed in multiple access pits. Probing suggests the

Figure 2. Waipu Cove, showing features encountered during works.

Figure 3. Langs Beach, showing features encountered during works.

Figure 4. Sparse scatter of shell, charcoal, and rock comprising Feature 1. Photo scales = 1.0 and 0.5 m.

deposit extended for at least 20 m along the roadside with one test pit was dug to confirm the results of probing.

The test pit consisted of approximately 200 mm of topsoil, followed by a 120–150 mm mixed layer consisting of redeposited shell, clay and modern rubbish, including a bag of lime. Beneath this disturbed layer was a 350 mm thick lens of midden consisting of shell, charcoal, hāngī stones, and some fish bone in a very dark soil matrix. A 10 litre bulk sample was taken for analysis and the feature was recorded as site Q08/605.

Feature 3

Feature 3 was located at Langs Beach, on the roadside near 46 Wairahi Rd, when shell was observed during the digging of an insertion hole (Figure 6). Scattered fragments of shell were encountered within a slightly ashy matrix approximately 200 mm beneath the surface. The majority of the identifiable shells were tuatua (*Paphies subtriangulata*), but other bivalves, including tuangi *(Austrovenus stutchburyi)*, were noted as well as some gastropods. Most of the shell was fragmented and non-diagnostic. A second pit had also been opened approximately 10 m west of this and also had a small amount of scattered shell present within a darker, likely charcoal stained, matrix. The deposit in the second pit was 300 mm below the surface and approximately 150 mm thick on average, located beneath the topsoil and immediately on top of a clay layer the same as the first pit. The full extent of the redeposited shell is unclear as probing was ineffective. Beyond this, the thin layer of topsoil had clay immediately beneath it.

Figure 5. Feature 2, Q08/605. Note the disturbed upper 120–150 mm with a bag of lime visible in the left baulk. Photo scales = 1.0 and 0.5 m.

Figure 6. Redeposited midden (Feature 3) above layer of scoria, alongside road kerb. Photo scale = 0.5 m.

A small trench was then dug along the edge of the verge, next to the kerb, revealing more of the same shell deposit in a dark matrix. A piece of a mammal limb bone was encountered approximately 100 mm below the surface. The bone had a cut mark on it and was above a stormwater pipe. Immediately beneath this soil was a layer of scoria on top of clay, meaning the bone is a recent deposit which occurred during installation of the stormwater pipe and is not archaeological.

Due to the redeposited nature and limited distribution within the vicinity, it appears that the original midden deposit may have been within the road and redeposited during road construction and it was not recorded in the SRS.

Analysis

One 10 litre bulk sample was taken from midden Q08/605. The results of analysis are summarised below. The midden was washed in a 3.2 mm wet sieve and then sorted to class (shell, bone, charcoal) for specialist analysis. The total weight of the sample after sieving was 7.2 kg.

Shellfish

Shell from midden Q08/605 was analysed by Hayley Glover or CFG Heritage using conventional methods with species identification based on Morley (2004). Shell that did not have any diagnostic portions was classed as residue. Shellfish counts are given as MNI (Minimum

Table 1. Shellfish from Q08/605.

Taxon	Common name / Māori name	MNI	Weight (g)
Austrovenus stutchburyi	Cockle / tuangi	21	33
Paphies australis	Pipi	80	700
Paphies subtriangulata	Tuatua	1	<1
Perna canaliculus	Green lipped mussel / kuku	2	3
Zeacumantus lutulentus	Horn shell / koeti	2	<1
Unidentified gastropod		1	2
Non diagnostic residue		–	500
Total		107	1238

Number of Individuals), which is the Number of Identified Specimens (NISP) for gastropods, and NISP divided by two for bivalves (Table 1).

The shellfish assemblage from Q08/605 is primarily comprised of pipi (*Paphies australis*) with some tuangi (*Austrovenus stutchburyi*). Both of these species are intertidal to subtidal, typically found in protected areas like harbours, bays, and estuaries. The prevalence of pipi suggests that a sandy shore environment was being exploited, reflecting use of the local beach at Waipu Cove.

Bone

11 g of bone from Q08/605 was analysed by Matthew Campbell of CFG Heritage. In addition to the fish bone below, six fragments of bird (small to medium sized taxon) long bone shafts were identified, four of which were burnt. Fish identification followed the methodology outlined in Campbell (2016), adapted from the methodology developed by Leach (1986).

There was very little fishbone sampled, and much of it was not identifiable. From the material that was identified, there were several bones from snapper and jack mackerel, with vertebra from a yellow-eye mullet and gurnard present as well (Table 2). The small size of the sample means little can be said about this assemblage.

Table 2. Fish bone from Q08/605.

Taxon	Common name / Māori name	NISP
Chrysophrys auratus	Snapper / tāmure	6
Aldrichetta forsteri	Yellow-eye mullet / kātaha	1
Trachurus sp.	Jack Mackerel / hauture	4
Chelidonichthys kumu	Gurnard / kumukumu	1
Fish sp.	2	

Lithics

5.9 kg of fire cracked rock was identified in the sample from Q08/605, but no flaked or ground stone artefacts were present.

Charcoal

19 g of charcoal was present in the sample taken from Q08/605 and was analysed by Ella Ussher of CFG Heritage. Due to the very small size of the samples, a representative sample of at least 50 specimens from each bulk sample were identified, with a system of identification to extinction. While this is a low number overall, it can be argued that this strategy still meets most of the four "rules" for anthracological analysis outlined in Chabal et al. (1999), Théry-Parisot et al. (2010) and Dotte-Sarout et al. (2015).

Table 3. Charcoal analysis from Q08/605.

Species	Common Name	Count	%
Pittosporum umbellatum	Haekaro	27	54
Leptospermum scoparium	Mānuka	8	16
Nestigis sp.	Black or white maire	4	8
Melicytus ramiflorus	Māhoe	4	8
Metrosideros excelsa	Pōhutukawa	1	2
	Conifer	6	12
Total		50	

The charcoal sample from Q08/605 was dominated by shrubs such as haekaro (54%), mānuka (16%), and māhoe (8%) (Table 3). These are supplemented by a small number of trees including black or white maire (8%), pōhutukawa (2%) and some conifer (12%). These are all coastal or lowland species that have a geographic range that included Northland, however it is likely that the conifer was driftwood or old wood due to the very degraded condition of the specimens in comparison with the rest of the sample. It is possible that these fragments instead indicate some primary forest clearance in the surrounding area.

The charcoal identified mostly represents firewood collection during the pre-European Māori occupation of Waipu Cove, but also indicates the environment within which the site was occupied over time. Firewood selection clearly targeted easy to access and burn shrubs but the presence of a small amount of conifers and canopy species suggest that either primary forest stands remained in the vicinity, or, more likely, old wood or driftwood was also chosen to burn. It is important to point out that these species do not present a comprehensive picture of all vegetation in the surrounding area, just those selected for burning in cooking fires which also survived as charcoal rather than turning to ash.

Chronology

One charcoal sample from Q08/605 was sent to the Waikato University radiocarbon lab for dating and needed to be processed as an AMS date due to the small sample size.

The results of radiocarbon dating suggest this site was in use in the mid-late 1400s (Table 4), slightly skewed by an outlier mode created by the calibration curve 'wiggle.' This low probability outlier could probably be discounted, indicating that it is most likley that the sample was

Table 4. Results from radiocarbon dating from Q08/605.

Site	Lab No.	CRA BP	cal AD 68%	cal AD 95%
Q08/605	Wk-52168	441 ± 19	1450–1490	1440– 1510 (83.5%) 1590–1620 (11.9%)

deposited between cal AD 1440 and 1510. This date is fairly consistent with other radiocarbon dates retrieved at surrounding sites, sitting between the midden at Q08/7 (Hudson 2008), dating to cal AD. 1355–1423 with a 95% confidence interval, and the slightly later Q08/537 (Harris 2014), a midden dating to cal AD 1471–1673 at a 95% confidence interval.

Discussion and conclusion

One in situ archaeological site was encountered during this build (Q08/605), which had not been previously recorded in Waipu Cove. A single 10 litre bulk sample was analysed.

The shellfish identified within this project are representative of harbour species which would have been exploited from primarily the intertidal and sandy shore areas surrounding Waipu Cove. This midden is not unexpected for a site such as this and does not appear to contain any material imported from different environments.

The fishbone is typical for a site like this one, but due to the small size of the sample, it is not possible to make any observations about fishing or processing methods employed.

The charcoal species identified are all coastal or lowland species that have a geographic range that included Northland, with the exception of some more degraded samples of conifer which may be representative of driftwood.

Although only one radiocarbon date was obtained, it can be considered a relatively early date nationally, albeit consistent with other dates in the area. Further archaeological investigations in the Waipu Cove area would assist in providing a better understanding of temporal patterns.

Works undertaken within Langs Beach and Waipu Cove have indicated that there has been extensive modification to the ground surface in areas where cut and fill activities have been undertaken for the formation of roads and house platforms. It should be noted however that this does not mean that all archaeological material within the road reserves has been destroyed, as Q08/605 is evidence that there are still extensive midden deposits within the road reserve, which may be capped by fill activities and not have any surface visibility.

As with the other UFB2 builds undertaken in recent years (for example, Cruickshank 2020; Cruickshank and Craig 2020; Cruickshank and Ussher 2020; Cruickshank 2021) this type of directional drilling often does not produce the levels of archaeological evidence that would be produced through trenching or large-scale earthworks projects. Even in builds such as Omokoroa (Cruickshank 2020) where the density of archaeological sites on the peninsula is well documented and has been subject to dozens of archaeological investigations in the past 15 years, in situ archaeological material was only encountered in four separate insertion holes, with no material occurring in the next closest holes. The encountering of archaeological material during the fibre builds proves to be rare, even in dense archaeological landscapes.

The lack of archaeological evidence encountered during this build should not be seen as a lack of archaeological evidence within Langs Beach or Waipu Cove, but is a justification of the use of minimal disturbance methods such as directional drilling and avoidance of high-risk areas.

References

Baquié, B. and D. Harlow 2006. Preliminary Archaeological Report to the New Zealand Historic Places Trust in Fulfilment of Conditions Relating to Authority No. 2006/186, Bream Bay Properties Ltd, Millenium Way, Waipu South, Northland. Unpublished Architage report.

Campbell, M. 2016. Body part representation and the extended analysis of New Zealand fishbone. *Archaeology in Oceania,* 51(1): 18–30.

Carpenter, J. 2010. Report on Archaeological Monitoring at Lot 1 DP 416367, Millenium Way, Waipu. Unpublished Geometria report prepared for G. and A. Denize.

Chabal, L. 1990. L'étude paléo-écologique de sites protohistoriques à partir des charbons de bois: la question de l'unité de mesure. Dénombrement de fragments ou pesées. In T. Hackens, A. Munaut and C. Till (eds), *Wood and Archaeology. Bois et Archéologie. First European Conference, Louvain-la-Neuve*: 189–205. PACT, 22. Conseil de l'Europe, Strasbourg.

Cruickshank, A. 2020. Omokoroa UFB2 Build (HNZPTA authority 2018/186): final report. Unpublished CFG Heritage Ltd report to Heritage New Zealand Pouhere Taonga and Ultrafast Fibre.

Cruickshank, A. and J. Craig 2020. Kihikihi UFB2 build (HNZPTA authority 2019/446): final report. Unpublished CFG Heritage report to Heritage New Zealand Pouhere Taonga and Ultrafast Fibre.

Cruickshank, A. and E. Ussher 2020. Matapihi UFB2 build (HNZPT authority 2019/099): final report. Unpublished CFG Heritage report to Heritage New Zealand Pouhere Taonga and Ultrafast Fibre.

Cruickshank, A. 2021. Huia Ultrafast Fibre Deployment: final report. Unpublished CFG Heritage report to Heritage New Zealand Pouhere Taonga and Chorus Ltd.

Department of Lands and Survey 1981. *NZMS 290 Sheet Q08/09: Soils, Maungaturoto-Kaipara*. Wellington: Department of Lands and Survey, New Zealand.

Dotte-Sarout, E., X. Carah, and C. Byrne 2015. Not just carbon: assessment and prospects for the application of anthracology in Oceania. *Archaeology in Oceania* 50(1):1-22

Gates, R. 2002. Manaia's Story. Haysmith, W., J. Langsford, and B. McKenzie (eds) *Pride of the Lion: Waipu, the People and the Place 1939-2000.*

Harris, J. 2014. *Archaeological Investigations at Site Q08/537, 12C Annes Road, Waipu Cove (HPA Authority 2014/585).* Unpublished CFG Heritage report prepared for Karen and Tim Jones.

Hudson, B. 2008. Proposed Sutherland residence at Estuary View Heights, Waipu Cove: archaeological monitoring and excavation. Unpublished CFG Heritage report prepared for the New Zealand Historic Places Trust and John and Erika Sutherland.

Judge, C. and R. Clough 2019a. High level desktop heritage assessment for Langs Beach, Northland. Unpublished CFG Heritage report to Chorus.

Judge, C. and R. Clough 2019b. High level desktop heritage assessment for Waipu Cove, Whangarei District. Unpublished CFG Heritage report to Chorus.

Leach, B. 1986. A method for the analysis of Pacific Island fishbone assemblages and an associated database management system. *Journal of Archaeological Science*, 13: 147–159

Maingay, J. 1990. Lang Cove, Northland: Archaeological Survey of Proposed Subdivision, 31 January 1990. Unpublished report.

Maingay, J. 1996. Archaeological Inspection of the Bogart Property, Waipu Cove. Unpublished report.

Molloy, M. 1990. McLeod, Norman. *Dictionary of New Zealand Biography*, https://teara.govt.nz/en/biographies/1m39/mcleod-norman (accessed 31 May 2019).

Morley, M. 2004. *A Photographic Guide to Seashells of New Zealand.* New Holland Publishers, Auckland.

Orange, C. 2005. Northland Places. *Te Ara – the Encyclopedia of New Zealand,* http://www.TeAra.govt.nz/en/northland-places (accessed 31 May 2019).

Ryan, T. 2002. The Nova Scotian Settlement. In W. Haysmith, J. Langsford and B. McKenzie (eds) *Pride of the Lion: Waipu, the People and the Place 1939-2000.*

Tamatekapua Law 2011. WAI 1040, WAI 745, WAI 1308: In the Waitangi Tribunal in the matter of Te Tiriti o Waitangi Act 1975 and in the matter of Te Paparahi o Te Raki Inquiry and in the matter of a claim filed by Paki Pirihi on behalf of Patuharakeke and a claim filed by Ngawaka Pirihi and others on behalf of the owners of Pukekauri 1B1, 1B2, 1B3, 1B4 and 1B5 an Takahiwai 4C, 4D1, 4E, 7A, 7B2 and 7C.

Théry-Parisot, I., L. Chabal and J. Chrzavzez 2010. Anthracology and taphonomy, from wood gathering to charcoal analysis. A review of the taphonomic processes modifying charcoal assemblages, in archaeological contexts. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 291: 142–153.