

## **Report to Council's Environment Committee – 16 February 2016**

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### **Inventory of slips from Sounds roads into coastal waters**

#### **Summary**

Council commissioned an inventory of past slips associated with roading in parts of the Sounds. A total of 48 slips were identified along Queen Charlotte Sound and Kenepuru Road for the period 1982-2005. The estimated volume of these ranged from 200-35,000 m<sup>3</sup>. The effects of these slips would have caused localised smothering of the seabed that resulted in mortality of sediment marine life, increased turbidity and reduced light transmission of the water column. These effects are more localised and infrequent compared to the ongoing effects of other land uses which expose large areas of bare soil in multiple locations. The mitigation measures associated with reopening roads are prompt and reduce sediment into coastal waters.

#### **Purpose**

The purpose of this item is to present a report of the location, extent, and timing of slips associated with major roads, which impacted on coastal waters in the Sounds.

The report by Miller Consulting is attached: *Some impacts of roading and flood damage on Sounds Roads*.

#### **Overview**

This study is part of a wider programme to better understand the causes and environmental consequences of sediment deposition into coastal waters.

This is being done primarily in three different and complementary ways.

Firstly, there is the sediment seabed coring project in Kenepuru Sound and Beatrix Bay, which aims to identify the rates and sources of sediment prior to, and since, human arrival (the results are due mid-2016).

Second, there are reviews of historic accounts to gain an understanding of the effects of different land-uses on long-term changes to the seabed in both Sounds (Pelorus review done in 2015, QCS due March 2016).

Third, there are targeted studies looking at important contemporary sources of sediment in both Sounds. This includes the recent review of the effects of forestry. There is also a planned study in the Havelock estuary and catchments to identify the causes of the increasing mud build-up on the estuary (to get underway late 2016, results due 2017). Another study is the effects of roads, which is presented here.

An opportunity arose with a retired Marlborough Roads roading engineer, David Miller, to document the history of past slips associated with roading activity. This is distinct from forestry roads. Mr Miller was involved in maintaining the Kenepuru Road and Queen Charlotte Drive from the 1980s to the early 2000s.

The reason for the study is that the construction and upgrading of roads results in exposure of bare soil, due to vegetation removal and creation of cut batter and fill areas. Runoff from areas cleared of vegetation has been shown to carry fine sediment in waterways to coastal waters in the Sounds.

Slips can occur due to the stability of areas above roads being altered by earthworks. This is because of the often abrupt truncation of the natural hill slope to accommodate the placement of the road, and alteration of drainage patterns associated with reshaping the land.

Under high rainfall, the clay-rich soils of the Sounds can become over-saturated triggering slips. This can also happen when culverts block, blowing out the road formation and triggering movement of soil and vegetation debris below the road.

The Queen Charlotte Drive and Kenepuru Road are important transport links in the Sounds. Periodic slips are a consequence of high intensity rainfall events, and altered landforms and drainage created by roads.

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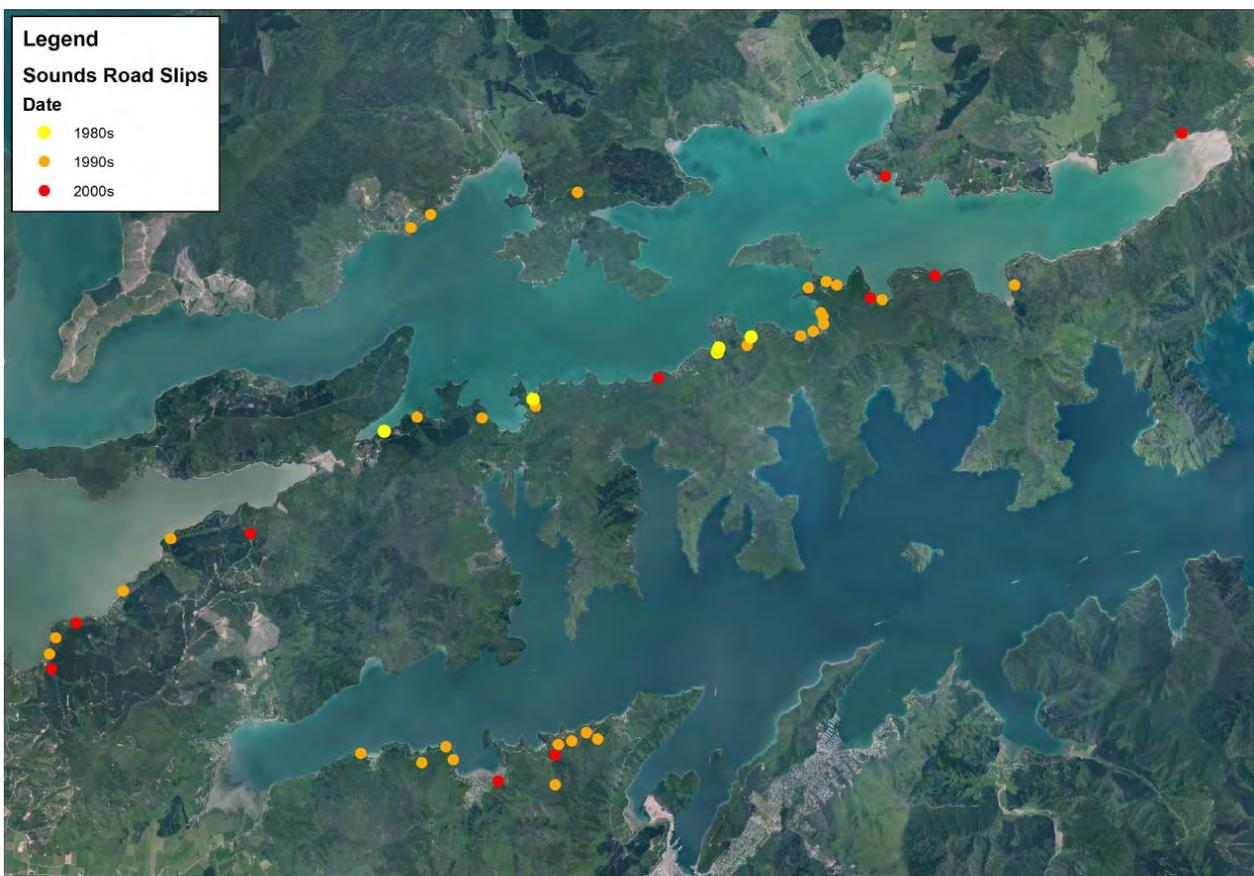
Mr Miller in his report documented 12 slips along Queen Charlotte Drive from 1990-2003 (Figure 1). These occurred periodically over that 14 year period, at an average frequency of approximately one every year. Estimated volumes of these slips ranged from 300-3000 m<sup>3</sup> (Figure 2), with an average slip volume of approximately 1250 m<sup>3</sup>.

There were significantly more slips along the Kenepuru Road with a total of 36 recorded (Figure 1). These dated from 1982-2005, with an approximate frequency also of one every 9 months. Slips were on average approx. 2400 m<sup>3</sup> on the Kenepuru Road (Figure 2), and ranged in volume from 200-8000 m<sup>3</sup> with one extreme event of ~35,000 m<sup>3</sup> in the mid-1990s on the northern side of the Kenepuru above Mills Bay.

The effects of these slips would have caused localised smothering of the seabed causing mortality of sediment marine life. The sediment plume from each slip would also have discoloured the water column and reduced light transmission and thereby affected photosynthesis. There may also have been clogging of fish gills and of the feeding parts of sediment-dwelling filter feeding organisms in the vicinity of the plume.

There are significant differences in terms of effects on coastal waters from slips that occur on average once a year at different locations, versus the ongoing surface run-off from large areas of bare soil in multiple locations created by forestry for example. Slips induced by roading may be more akin to the frequency of slips under native forestry, in that there is little that can be done preventatively by way of mitigation as opposed to other land uses.

Another key difference between these two land-uses is that slips on roads are managed relatively promptly with heavy earth moving machinery to keep the road network functioning. The spoil is also removed to consented sites in different parts of the Sounds. Hence, there are mitigating measures that can reduce the amount of material that may find its way into coastal waters.



**Figure 1:** Slips that entered coastal waters associated with the transport road network on Queen Charlotte Drive (bottom centre – 12 dots) and the Kenepuru Road. Source Miller 2015.

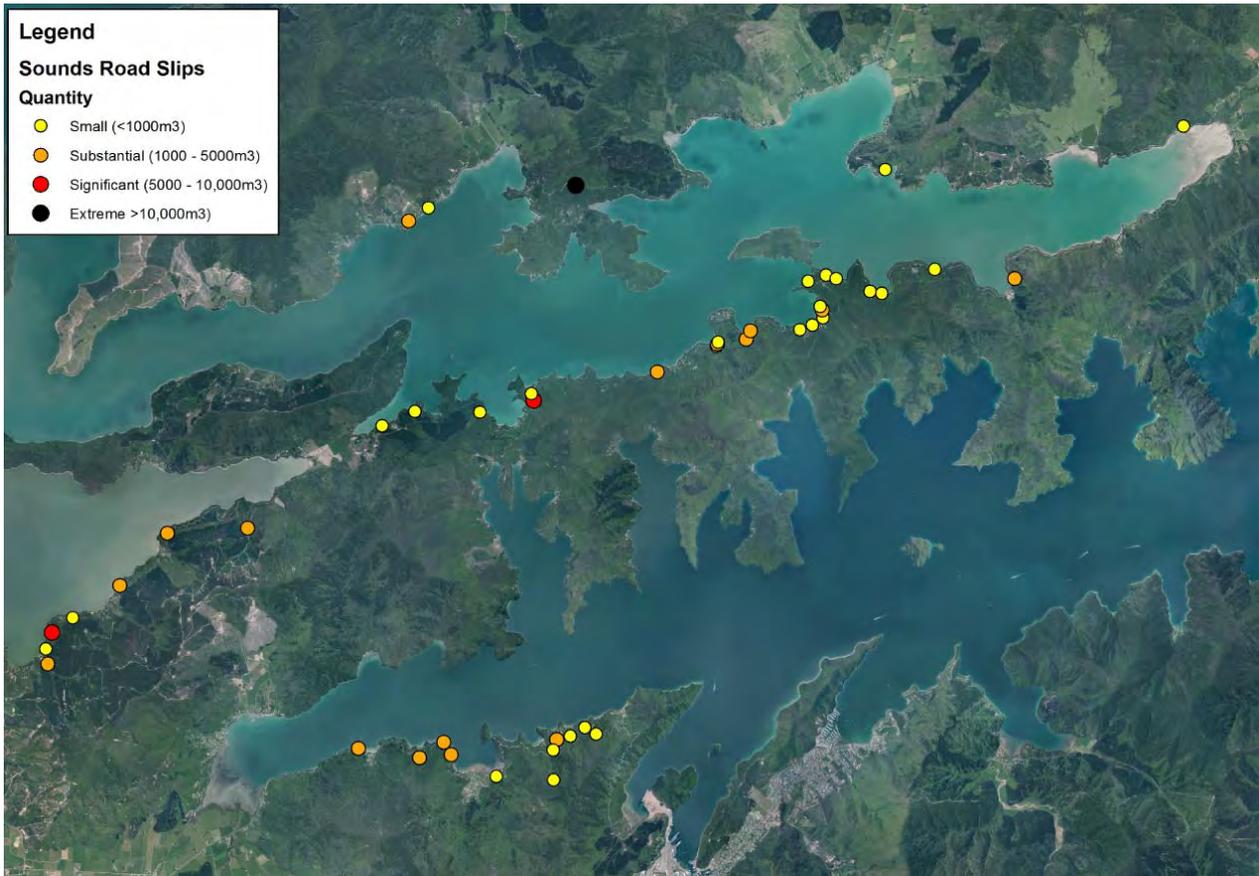


Figure 2: Estimated volume of slip material associated with the slips identified in Figure 1. Source: Miller 2015

# **MILLER CONSULTING**

**ASSET MANAGEMENT, AUDITING AND PROJECT MANAGEMENT**

## **SOME IMPACTS OF ROADING AND FLOOD DAMAGE ON SOUNDS ROADS**

**Part only - Queen Charlotte Drive and Kenepuru Road**

**Period 1985 - 2010**

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**SOME IMPACTS OF ROADING AND FLOOD DAMAGE ON  
SOUNDS ROADS**

**Part only – Queen Charlotte Drive and Kenepuru Road**

**Period 1985 – 2010**

## **Introduction :**

The brief supplied described the scope of the works and this report will cover the area requested by the client.

Queen Charlotte Drive has been described as one road for clarity , in fact the route from Picton to Havelock is actually made up of 4 separate roads , most people describe the whole route as QCD. Along this section distances have been taken from the 50kph sign as the road enters Picton ( before the Ferry terminal exit ) as this is the RAMM definition of the end.

Kenepuru Road has been split into 2 sections ; on the Eastern side distances are from the start of the route at Linkwater intersection , on the Western side distances are from the intersection at the 'Heads' with Titirangi Road.

I do have distances in a format which aligns to Councils' RAMM ( Road Asset Maintenance Management ) system , however, I consider the format the information is delivered in will simplify locating the sites described in the report.

While I can remember in detail all of the events reported on, the date of some events may be suspect as to accuracy , nevertheless , they will have occurred at about the indicated date ( + or – 3 years.)

There are large reports on Councils files especially where liability issues were considered or for significant events with details of quantities and cost etc.

The total for Flood damage to Councils roading network over this period would be in excess of \$20,000,000 ( Twenty million dollars )

Within the report on each site I have made an assessment as to whether the damage / event was the result of Roothing related works , natural events OR a combination of both factors.

My sketches, are just that, and are intended to allow the reader to identify the scale and type of event.

GPS coordinates are taken near the centre of sites and give enough information to identify the location.( Note that some sites are quite long or wide.)

It is obvious that there have been a multitude of other events , an inspection will reveal many obvious sites where other damage has occurred they are not necessarily included as material did not enter the coastal area ( retained on slopes or in bush ) , this report describes all of the significant events that have occurred where material has been deposited into the sea.

When most of these roads were built I am advised that the standard was 12 feet wide on the solid with grades less than 1:8 for this reason there were considerable sidling fills , unbenched and uncompacted.

### **Comment :**

- The section of Queen Charlotte Drive to the Grove Wharf contains all of the significant events on the route ; I would assume this is because the Mahakapawa Hill section is much older than that above. The relative stability over this latter section is quite remarkable having regard to the fact the a very large fire occurred from the Havelock Tip to near Linkwater in about 1990 completely burning off vegetative cover over most of the area ( I was Councils Principal Rural Fire Officer at the time and several helicopters and a significant fire fighting resource was on site for over 20 hours )
- Although NOT part of this report I believe recent publicity and public comment would indicate that many people equate sedimentation etc. of the “Sounds” as being the simple result of forestry or land use when in reality there have been significant natural events or roading related events which have simply been the result of instability of slopes and intense rainfall events.
- In about 1992 ,what is now described as a ‘weather bomb’, affected parts of the “ Sounds” outside the area of this report ; this event passed over D’Urville Island ( central area ) , French Pass , Waitata area , Anakoha and Titirangi roads.

As an example land movements and slips extended in many cases from near the crest of ridges to the sea and at one location on D’Urville Island a complete watercourse shifted about 60m laterally and a relatively new house sits proudly atop the old watercourse ( one would hope it does’nt ry to revert to its previous path as result of a future event ) , another site which has not yet

totally collapsed was surveyed by myself and contains a potential 140,000 cubic metres of material.

In total as a result of this one event above I would estimate in excess of 500,000 cubic metres of material was involved, including damage I am aware of, on private property. There must be many other sites on private land and of major significance.

**QUEEN CHARLOTTE DRIVE SECTION  
PICTON TO HAVELOCK**

## Site 1

**Distance from Picton 50 kph sign : 3.5 km.**

**Coordinates : 259 2073 / 5992047**

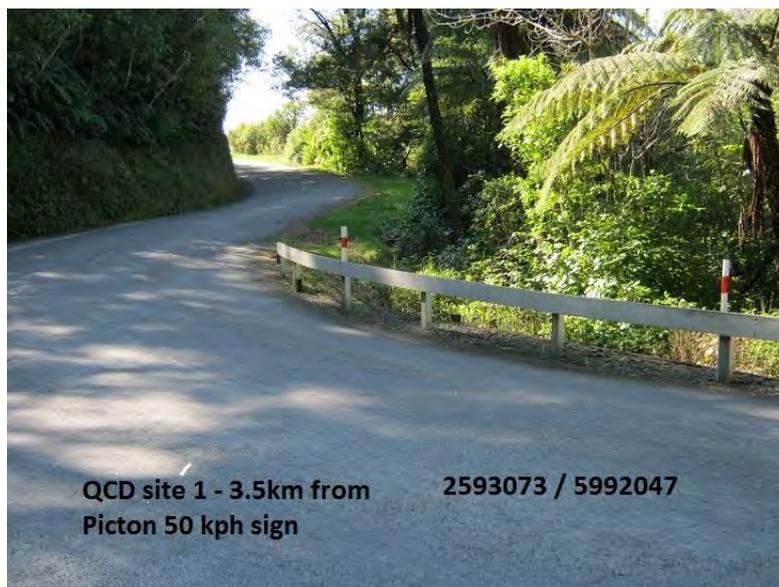
### **Description :**

There is a small retaining wall at this site.

Slips from above the road and over a large length fell onto the road and at this location approx.. 400 m3 extended into Shakespeare Bay .

Just above and beyond this site evidence of early spoil dump sites are apparent.

Photo:



## Site 2

**Distance from Picton 50 kph sign :** 6.1 km.

**Coordinates :** 2592830 / 5992864

### **Description :**

This location is at a significant retaining wall : a slip developed above the road flowed across the road, scouring the outer edge by up to 4 metres, and thence into the adjoining gully and to the coast.

There was approx.. 600 m3 in total of material to the coast.

I consider the roading related activities ( widening ) may have been a significant contributor to the damage.

**Approx. Date :** 1990



### Site 3

**Distance from Picton 50 kph sign :** 6.3 km.

**Coordinates :** 2592629 / 5992977

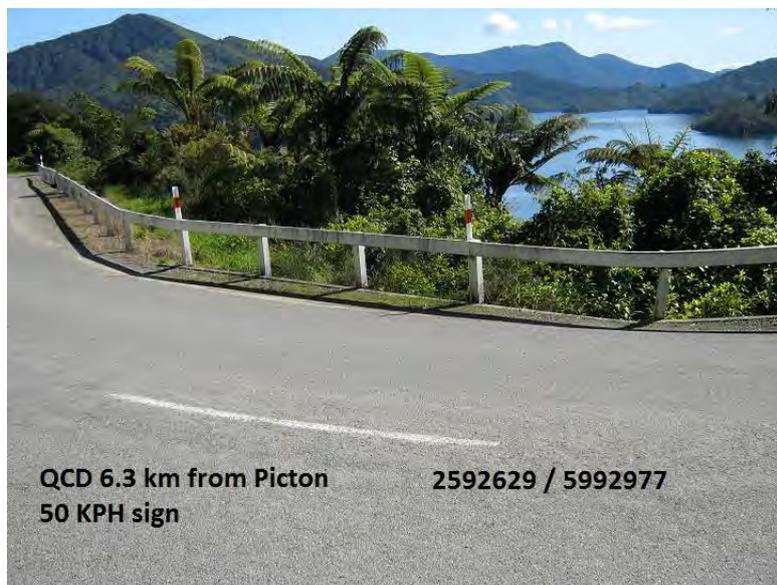
#### **Description :**

A slip developed above the road ( LHS ) and the extent is still visible , being app. 20m long and extending 20m above the road carriageway .

Material crossed the road , collapsed the shoulder material and thence to the coast.

There are 2 retaining walls at this site and there was approx., 600m<sup>3</sup> to the coast.

**Date :** This event occurred approx., 1995.



## Site 4

**Distance from Picton 50 kph sign :** 6.8 km.

**Coordinates :** 2592371 / 5992826

### **Description :**

This slip developed above the road and some of the slip faces are still evident.

Up to 4 metres of the carriageway collapsed and in total approx.. 500 m<sup>3</sup> flowed to creek and thence to coast.

There is an obvious spoil site which is now a vehicle 'turnoff' /passing area ; there are a considerable number of these and virtually every outer corner has had some quantity of material placed ( many are now used as parking / passing areas) ; I noted that at the time of inspection there was still some material recently stockpiled near this site ( this may be a temporary storage area allowing the carriageway to be opened.

I consider widening works may have contributed to the instability and collapse of the face / faces above the road , most of the old slip faces are still visible in this area.

**Date :** This event occurred approx. 1998.



## Site 5

**Distance from Picton 50 kph sign :** 7.2 km.

**Coordinates :** 2592130 / 5992762

### **Description :**

This was a large event , note the retaining wall near 80 metres long in total.

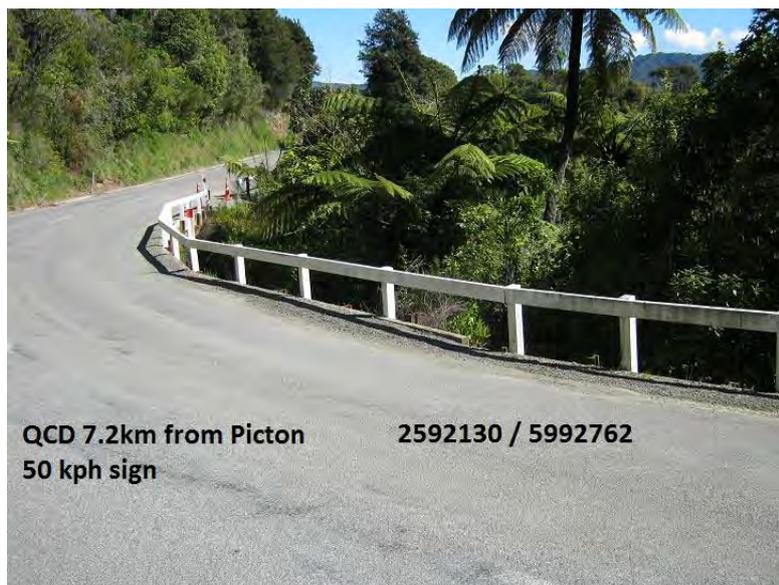
The old slip faces are still evident above the road ( LHS ) and up to 4 metres of the carriageway width was lost during the event.

Many of the slips above the road are still unstable and further damage is likely although the risk of material overtopping the retaining walls is considered slight.

There was app. 1500 m<sup>3</sup> of material in total which flowed to the creek and thence to the coast.

I consider the event may have been significantly influenced by road widening works.

**Date :** the approx.. date of the event was 1996



## Site 6

**Distance from Picton 50 kph sign :** 7.55 km.

**Coordinates :** 2592067 / 5992578

### **Description :**

At this site slips from before this site flowed around the LHS drainage system and over the side of the road which collapsed the edge ; there was also a significant fall from the face above the road.

At the time of inspection 10 / 2015 it is obvious there have been further and recent falls at this site and a new 'toe' wall has recently been constructed to try to lend support to the toe AND to arrest some material before it falls onto and blocks the road.

There is a significant spoil site just beyond this site on the RHS. ( obvious )

There was approx.. 800 m3 which crossed the road and flowed down the face and to the receiving creek below and thence to the coast.

NOTE many smaller events near this location.

**Date :** The approx. date of the first event was 2000 – note also current at this site at time of report ( see photo ) ; this bare face is typical of previous sites that are now revegetated.



I would consider widening works precipitated the damage.

## Site 7

**Distance from Picton 50 kph sign :** 9.2 km.

**Coordinates :** 2591059 / 5992110

### **Description :**

This site is at the RH corner above Ngakuta Bay ; The private accessway to the beach North of the road collapsed and took part of Councils road with it .

There was approx.. 300 m3 which went straight down directly to the edge of the water.

The road was reinstated by widening the new cut face opposite the site ,moving the road and the drive about 6-8 metres East , constructing a retaining wall and reforming the private access .

There Is an old spoil disposal site approx.. 80m forward of this site.

NOTE the photo is taken looking back towards Picton.

**Date :** Approx. 2003



## Site 8

**Distance from Picton 50 kph sign :** 11.25 km

**Coordinates :** 2590259 / 5992498

### **Description :**

This slip emanated above the road and flowed over the road ; the outer edge collapsed and a significant retaining wall structure was constructed ,this wall is over 30 m long.

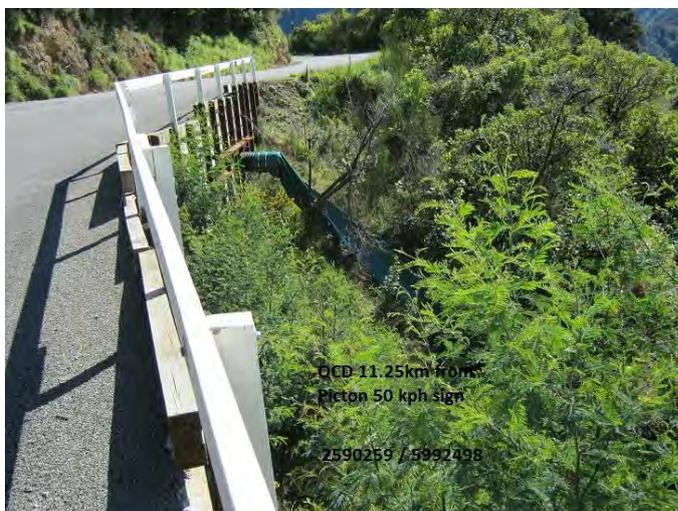
The fill especially at the southern end spilt after the wall suffered some damage by rotation and collapse of backfill and has recently been repaired and the road reinstated.

The old slip of approx.. 1200 m<sup>3</sup> flowed directly to the sea and is still obvious below the road ( all second regrowth vegetation )

The extent of the slip above the road is still apparent, I consider it is roading related ( old sidling fill and steepened batter face).

I could not see any evidence of the material at the coast line ( water was clear at the time of inspection – this does not mean there is no evidence , simply I could’nt see it from the road into clear water 10/2015 )

**Date :** The original event occurred app. 1990



## **Site 9**

**Distance from Picton 50 kph sign :** 11.5 km

**Coordinates :** 2590125 / 5992720

### **Description :**

This site was the scene of significant damage to the road and private property.

The damage consisted of the total collapse of the road over a length of some 36metres to the sea and app. 3000 m3 of slip material.

It damaged beyond repair an 'A ' Frame house located below the site which shifted on its foundations ( it did NOT fall into the sea )

Subsequent survey and research showed that the section of road had been considerably elevated above an earlier vertical alignment by about 2-3 metres and this was further evidenced by the remains of a section of old culvert that had been left below the road when the later section was constructed. It was considered , and still is , that this was a significant contributor to the damage as it was still discharging water post event ( subsequently blocked off )

The road was reinstated to the profile and alignment that existed before the event and a retaining wall was constructed at the outer edge .

This retaining wall is a 'Gabion basket' structure with horizontal reinforcement within the backfill layers ; at 9metres high it is the highest structure of its type in Marlborough ; it was constructed under my direction and was completed and opened on Xmas Eve app. 1993

The wall design was by TH Jenkins ( now Aurecon )

The information regarding the the original construction which elevated the road was from the files of Davidson Ayson ( Mr C. Davidson supplied them at the event )

I recall there were considerable potential liability issues in respect of the house damage ; details will be on Councils files.

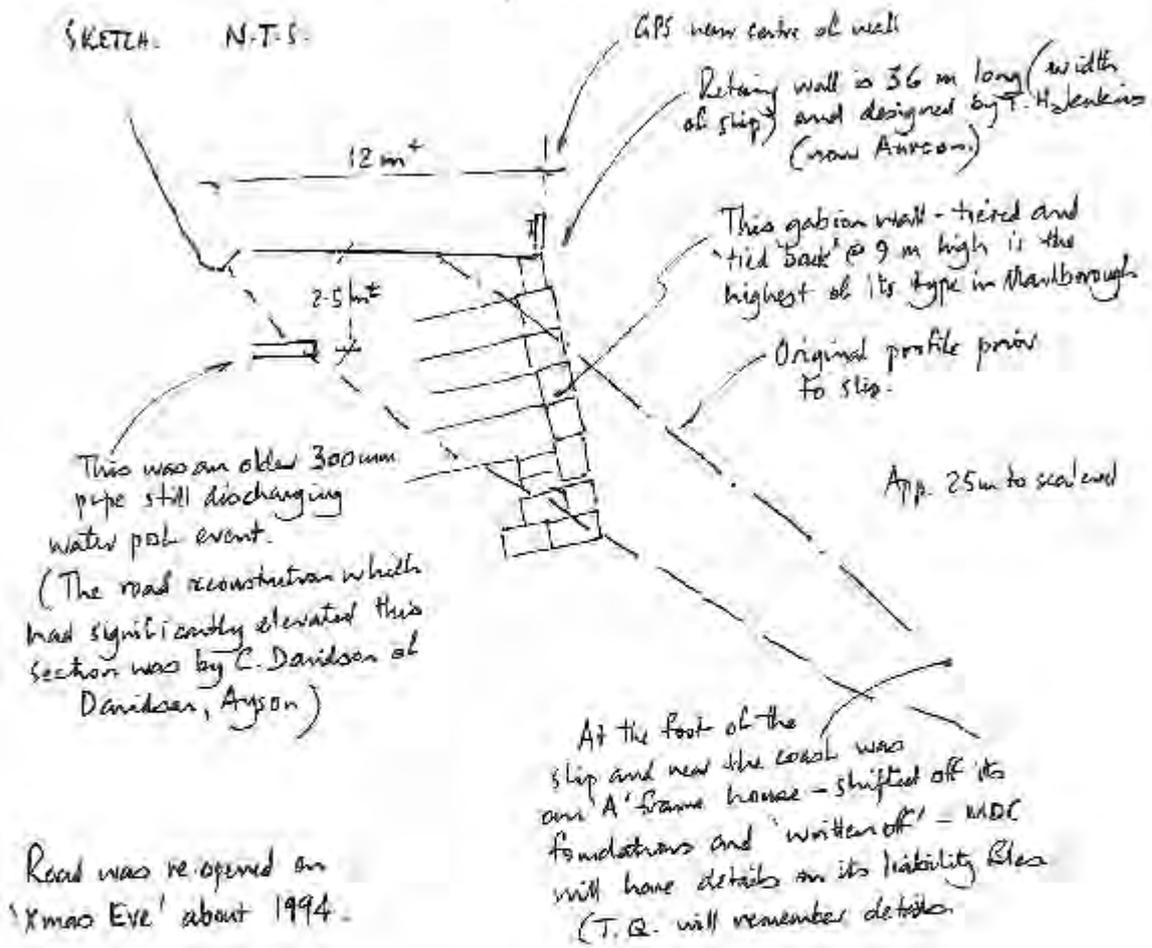
At this time there were a number of smaller events beyond this site and still evident in places.



Site 9 photo ( see sketch, following page )

QUEEN CHARLOTTE DRIVE SITE 9  
11.5 KM. 2590125 / 5992720

SKETCH. N.T.S.



## **Site 10**

**Distance from Picton 50 kph sign :** 12.15 km +-

**Coordinates :** 2589695 / 5992441

### **Description:**

This site was the subject of extensive damage when slips emanating from 2 watercourses ( each distinct and apparent on site ) crossed the road carrying away the outer edge at 2 locations to a width of approx. 4 metres and blocking both culvert installations with the result significant quantities of material estimated at over 1200 m<sup>3</sup> discharged down the watercourse below the road and into the sea.

There were 5 or 7 properties below the road ( down Blythels Bay drive ) and they were most concerned at potential damage to those houses at the time ( thankfully no damage occurred )

Material was continuously being washed down the Western watercourse which had been denuded of vegetation for a considerable height above the road and in an attempt to restrict the effects of this ,the Consultant ( Opus ) directed a number of rail irons be driven into the watercourse above the road in an attempt to trap debris before it flowed onto and across the road, this was partly successful , the branches type material did block against the rails and form a type of detention area above the road.

Careful investigation reveals the evidence of these ( now obscured by bush ) and it is apparent the stream bed has aggraded by about 2metre as only a short top section is now visible of one rail !

The significant rail iron wall was constructed at the Eastern side and a bench and selected rock wall was constructed at the Western side ( this latter is not apparent at this time being overgrown and / or grassed ) Several pipes at the major watercourse had dropped into the stream below the road and were recovered and reused.

Although the slips “heads’ are well above the road and would indicate it was a natural event it is possible that the watercourse had been steepened during road construction and may have contributed to the damage. I would consider

it was a combination of both and lean towards the first ( i.e it was simply a natural erosion event )

Note the photo is looking back towards Picton with the Blythel Bay drive and photo left / distant.

**Date** : The date was approx. 1996



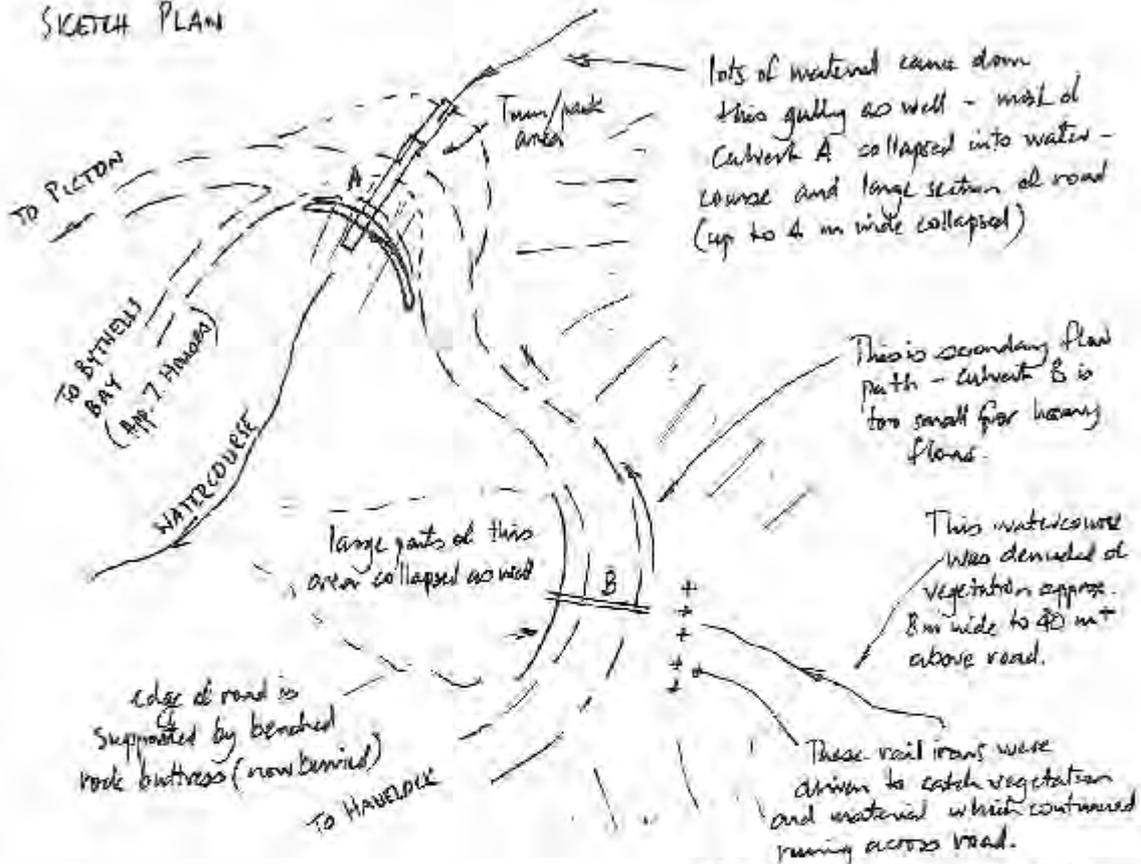
QUEEN CHARLOTTE DRIVE

SITE 10

12.15 Km

2589695 / 5992441

SKETCH PLAN



lots of material came down this gully so well - most of Culvert A collapsed into water - course and large section of road (up to 4 m wide collapsed)

This is secondary flow path - culvert B is too small for heavy flows.

This watercourse was denuded of vegetation approx. 8m wide to 40m+ above road.

These rail irons were driven to catch vegetation and material which continued running across road.

(Note the bed has aggraded by about 1.5-2.0 metres and rails are barely visible now)

One of the owners in Bythell Bay was Neil Kendall - Local Milkman for many years (he may be able to describe impact on road for you)

## **Site 11**

**Distance from Picton 50 kph sign :** 13.7 km

**Coordinates :** 2588610 / 5992608

### **Description :**

This was a significant event where approx. 4 metres plus of the road edge collapsed , accompanied by , or caused by a slip on the LHS above the road.

The extent of the damage is apparent on both sides of the road and below the 60metre long retaining wall , although some second growth vegetation now covers much of the area.

At the time of the event the face below the road was completely denuded of vegetation to the coast.

There was another similar but much smaller event forward about 100metres from this site.

There was near 2000 m<sup>3</sup> in total which went directly to the sea.

I consider the collapse may have been caused by an instability of the old sidling fill on the outer edge exacerbated by the slip and water running over the road from the LHS – this LHS face would have been excavated during widening works.

**Date :** The initial damage occurred approx. 1994 ( there have been subsequent repairs to the retaining wall.

See next page for photo of site , note Mirror at corner on photo foreground.



**QCD 13.7km from Picton  
50 kph sign 2588610  
/5992608**

**NOTE mirror in photo  
foreground centre**

## **Site 12**

**Distance from Picton 50 kph sign :** 14 km.

**Coordinates :** 2588312 / 5992532

### **Description:**

This site has , and continues ,to cause problems over many years .

The major significant event causing a rethink of Councils strategy for reinstatement occurred in about 2004 following another major subsidence at the site and the subsequent releveling of the pavement.

Just before the site was resealed I was advised a hole about 200mm dia had appeared and no bottom was encountered when a 2.4m long 'crowbar was dropped through the hole.

I went to the site and arranged a small excavator to dig a test pit ; to my amazement I discovered about 10 differing pavement layers over a 1.2 m depth extending from about 0.5-1.5m below the pavement level. In retrospect probably 3 of these had been during my period in the area so it is obvious the site had been moving consistently probably since the first construction of the route.

Within the test pit there were several wide ( up to 100mm ) cracks , some extending forward and back along the road ; we were unable to define a bottom to them and in at least one we could hear subterranean water running in a significant flow well below the base of the test pit.

It was time for a major investigation and design and Opus engaged a Geologist on Councils behalf to investigate the site ; at the same time I approached NZTA ( the flood damage part funding agency ) to see if they would fund a vertical realignment lowering the road to try and take some of the pavement surcharge from what was obviously an immense slumping of the road.

The Geologists identified a significant problem with uphill water conduits flowing below the road and lubricating a slip face proper that extended to the coast AND that the slip had modified the line of the coast by extending > 4

metres forward into the tidal zone ( continually material and sediment was being scoured away by tidal action )

The remedial works involved dewatering works above the road , ( note at the time of this survey 10/2015 free water was discharging all along this face in spite of these works ),lowering the road over a length of approx 120 metres ( including vertical curves and resurfacing ).

In total about 3000 m<sup>3</sup> or near 6000 tonnes of material was removed from the carriageway and the total volume of the slip in total is estimated at > 55,000 cubic metres of which > 10,000 m<sup>3</sup> has migrated extending the coast .

Note the pavement has again been resurfaced over the area, indicating there has been a further event since 2004, and I noted the outer edge of the pavement appears to be slowly subsiding again.

**Date :** The last major works were effected in app. 2004 ( I would assume the site has been moving in some way since at least 1960 )

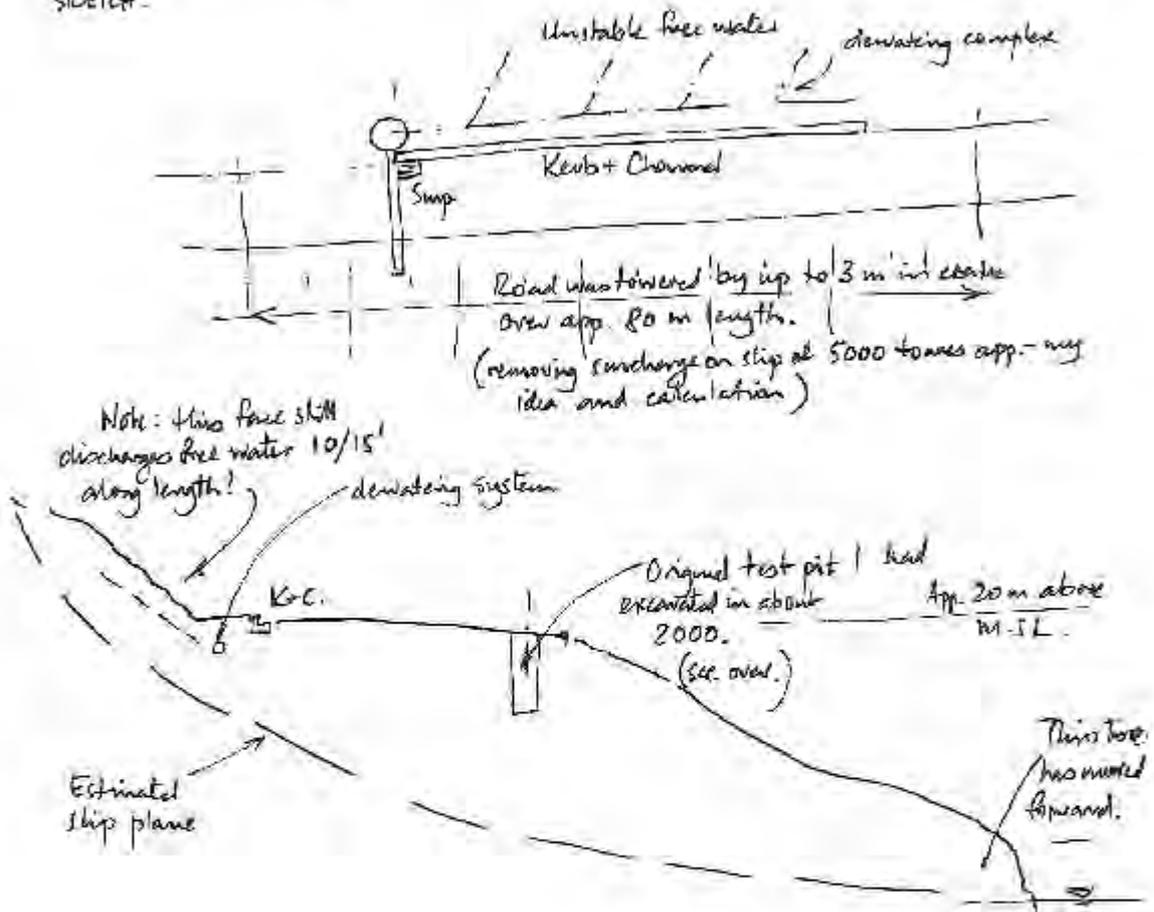
I consider the damage is the result of a natural slip and that the road simply sits within that slip plane ( see sketches -2 pages )



QUEEN CHARLOTTE DRIVE  
14 KM FROM PICTON

SITE 12  
2588312 / 5992532

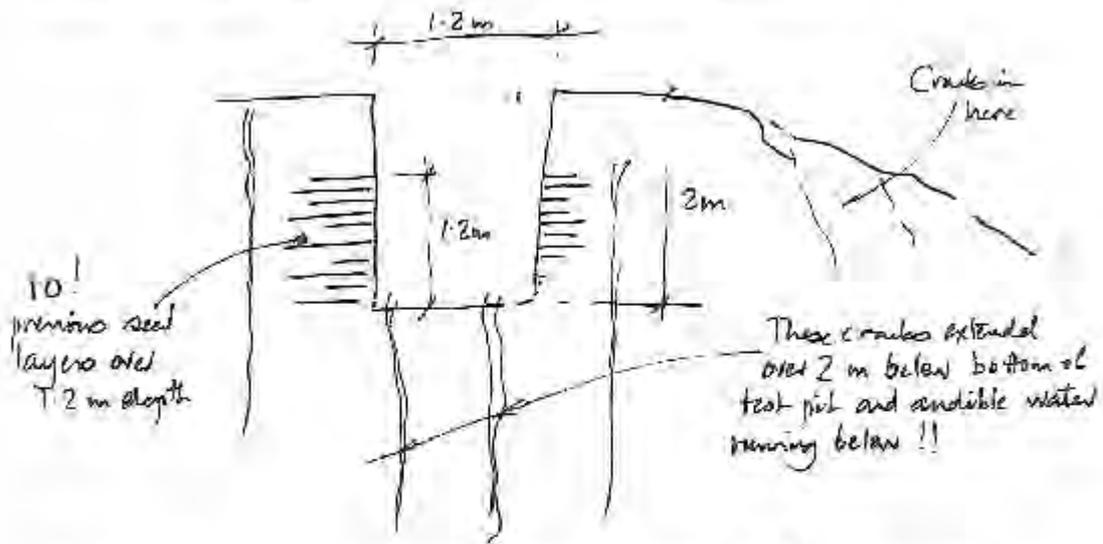
SKETCH



QUEEN CHARLOTTE DRIVE  
14 Km From Pieton

SITE 12

SKETCH OF TEST PIT (N.B. located near GPS reference)



First identified by a small hole appearing in road surfacing - on pushing down a 'crowbar' was > 2 m deep!! Test pit was then excavated.

Note: A geologist surveyed this site - his report will be available from Opus Consultants -

## Site 13

**Distance from Picton 50 kph sign : 25 km**

**Coordinates : 2578669 / 5990220**

### **Description :**

This area was a historic spoil site ( including the boat ramp area AND a large area on the LHS of the road ) which contains approx. 3000 m3 of spoil excluding the LHS area.

The material was carefully levelled and compacted and grassed following the dumping of spoil at the site in about 1990 .

NOTE the LHS spoil site continued until about 2006 under a permitted activity ( this is now being used as a 'chip' stockpile site.)

In approx. 1992 the Havelock 'Lions' developed the area to form the amenity site that exists now ; I have observed over the years a continued use by campers and general motorists.

I consider it was a good use of materials with a very low environmental impact.



## **Site 14**

**Distance from Picton 50 kph sign : 25.8 km.**

**Coordinates : 2578066 / 5990632**

### **Description :**

This site was a spoil site , properly stripped , benched and compacted with fill layers allowed to dry before being levelled .

A couple of culverts were extended to allow the fill to be widened

Material began being dumped at this site in about 1990 and continued until about app. 2004 – ( the last section was the western area.) The site contains app. 6000 m3 of spoil.

Following levelling of the area a local resident Mr Bob xxxxx , resident at number 754 undertook to create and maintain the roadside refuge and day tripper area together with tables , signage , etc.

The area is a real benefit to Marlborough and the community and is a credit to the foresight , commitment , financial input and work by the developer.

The total length developed and maintained is now near 200 metres long and up to 12m wide.

Another great use of the spoil from slips and road widening works done in an environmentally conscious manner.

See following page for photo

**Queen Charlotte Drive  
site 14 25.8km from  
Picton**



**2578066 / 5990633**

**KENEPURU ROAD**  
**LINKWATER TO THE 'HEADS' SECTION**

## **Site 1A**

**Distance from Linkwater Intersection :** 5.2 km.

**Coordinates :** 2583106 / 5994111

### **Description :**

There are no obvious signs now , however , in about 2005 there was an immense discharge of debris and material through this culvert ( the Ohingaroa Culvert ).

It was the likely result of clear felling forestry in the catchment above the culvert and a subsequent slip ( see sketch ) , into the watercourse and out into the Bay. I would suspect a slash site had collapsed partially damning the watercourse before bursting as there were a large number of floating logs in the Mahau Sound area post the event.

The whole watercourse was stripped of all vegetative cover and velocity through the culvert at peak flow was estimated at over 3m /sec. ( very high )

Looking upstream and downstream some evidence is perceptible but difficult to imagine what it actually looked like at the time of the event – the downstream view extended out to the sea !

The estimated quantity discharged through the culvert was estimated at over 3000 m<sup>3</sup> .

NOTE the photo is taken looking back to Linkwater

This is one of the largest structures of its type in Marlborough being a pipe arch of near 9 m span and 5.2 m rise . It must have been an impressive sight when it was flowing to capacity as occurred during the event ( debris evidenced the height of the flood waters post event )

**Date** 2005 app.



**Kenepuru Road 5.2km  
from Linkwater  
2583106 / 5994111**

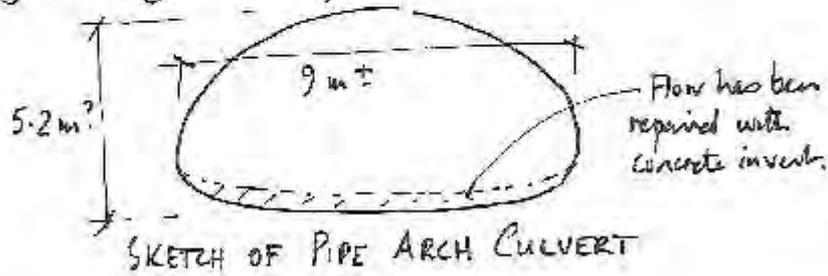
**NOTE photo is looking  
back towards Linkwater  
and culvert**

KENEPEHU ROAD - EASTERN SIDE  
 SITE 1A - 5.2 KM FROM LINKWATER  
 2583106 / 5994111



Following clearing  
 this whole section collapsed.  
 Watercourse was completely bare  
 and Arroso pipe arch  
 app. 9 x 5 m was completely full  
 (estimated velocity > 4 m sec!!)

There was > 2000 m<sup>3</sup> of slash and material went thru culvert.  
 (following event it was possible to drive a large 4wd vehicle from  
 coast right through culvert!)



## Site 2A

**Distance from Linkwater Intersection :** 5.5 km ( near centre )

**Coordinates :** 2583072 / 5994384

### **Description :**

This section about 200 metres long collapsed from the RHS above the road, onto the road and across collapsing most of the edge of road and over the bank.

The total event involved near 2500m<sup>3</sup> of which app. 500 m<sup>3</sup> went to the coast.

The instability of the RHS bank is still apparent in areas along the length , the slips commenced near the pole in photo distance up to and including the photo location .

The photo is taken looking back towards Linkwater.

**Date:** The event occurred in about 1988 and closely followed clear felling above the road at this site ( NOTE this was an earlier and different clear felling site to the one referred to at Ohingaroa culvert – site 1 )

I consider the increased runoff from the cleared area may have been a significant contributor to the damage.



## Site 3A

**Distance from Linkwater intersection :** 5.7 km.

**Coordinates :** 2583177 / 5994669

### **Description :**

This site has evidenced movement for a number of years and first repairs were undertaken in approx.. 1988 , since then there have been several recurring settlements of a major nature .

The existing retaining wall is the 3<sup>rd</sup> constructed at this location , the first wall rotated and then collapsed and is buried to all intents , the second rotated and deformed so badly that most of it was removed and reused to construct the current wall .

The existing wall is evidencing some distress ,bulging and deformed although its integrity appears OK.

In app. 1995 the current wall was constructed and at that time a 'cutoff' drain was installed below the RHS watertable with depths of >5metres ( the limit of excavator reach at that time )

The section of road , AND the adjoining house on the top side of the road are all believed to be within a 'slip plane' that extends from above the house , through and below the road and retaining wall rails and extends to the coastline. The quantity involved in the slip is considered in excess of 8000m<sup>3</sup>.

It was observed by me in about 1988 that the coast line has moved forward perceptibly by about 4-5 metres ( I do not know if any further movement is apparent )

I consider the slip is a natural event .

I recall the EQC Assessor ( with whom I had joint assessment of many sites ) Mr. Jim Cxxxxxxx suggested to me that the house may have been uninsurable after several damage events – I do not know if this is actually the case or not !



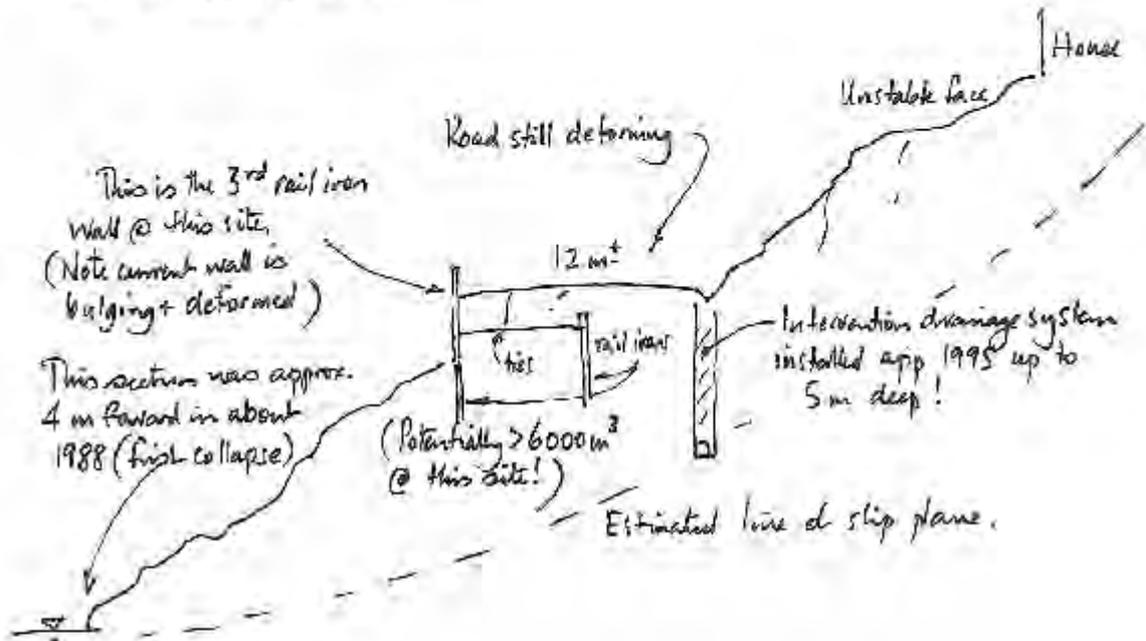
Site 3A ( see sketch on following page )

KENEPUEN ROAD SITE 3A

5.7 km FROM LINKWATER

2583177 / 5994669

SKETCH SECTION AT SITE



## Site 4A

**Distance from Linkwater intersection :** 6.6 km

**Coordinates :** 2583549 / 5994933

### **Description:**

This site was the subject of road widening works undertaken in approx.. 2004

There is a significant site ahead of this where a house above the road was threatened ( this does not form part of this report as no material went to the sea )

At the site under consideration much of the length >100metres collapsed onto the road , and at one location the road edge collapsed and approx.. 600m<sup>3</sup> of material went to the coast .

The scene of this is still apparent but I was not able to discern any residual material when looking down from the road at the time of my survey ( 10 /2015 ) The material went over near photo foreground / left.

The photo is taken looking back towards Linkwater.

**Date ;** The date of the event was app. 2004



## **Site 5A**

**Distance from Linkwater Intersection :** Near centre of reserve 7.15km.

**Coordinates :** 2584079 / 5995100

### **Description:**

This area is now described as the Ohingaroa reserve , in fact most of it and part of the area towards the culvert was a historic bulk fill site ( known colloquially as 'Millers Reserve' )

Filling commenced in the area prior to the subdivision which created the current Ohingaroa Bay , and was at about the time the Armco culvert was installed and the road realigned to its current location.

This was approx.. 1988, at this time the only residence in the bay was of Mr Dxxx , the developer and land owner in the area.

The subdivision occurred in about 1990.

The development and creation of the current Ohingaroa Reserve on what was, at that time, a coastal reclamation , has been carried out my me with regard to the environment and has created a valuable asset for Marlborough and campers / residents of the Bay ( especially the boat launch area ).

It may be of interest that Council created an allotment following the new culvert construction using a section of severed land and closed road , and subsequently sold, however a later storm caused severe downstream scouring of the creek to the coast and the then owner, Mr Bxxx , sued Council ( I don't know the outcome of the case ) details will be on Councils files.



**Kenepuru Road -  
Ohingaroa Bay Reserve  
2584079 /5995100**

**NOTE refer to  
accompanying sketches  
for details**



## **Kenepuru site 6 A**

**Distance from Linkwater :** 7.8 km.

**Coordinates :** 2584381 / 5995506

### **Description :**

This site was an area where the side of the road collapsed to the coast .

There is a similar but much smaller site just past here . The photo is taken looking back towards Linkwater and the second site ( not shown ) is in photo right foreground ( note there is no retaining structure at this second site )

Some material did collapse onto the road from the cut faces above the road, at and beyond this site , and it is possible that some of this material may have blocked the drainage systems and diverted water over the 'fragile' sidling fill face .

There was approx.. 1200 m<sup>3</sup> to the sea at these 2 sites

**Date :** The date of the event was app. 1992



## **Kenepuru site 7 A**

**Distance from Linkwater :** 9.5 km

**Coordinates :** 2585224 / 5996438

### **Description :**

Material from above and below the road collapsed into the sea at this site

The rail iron retaining wall was constructed 43m long ( note : the sump and discharge system for road water – a marginal success ! )

Material went almost directly to the sea and there was near 1800 m<sup>3</sup> at this location .

The photo looks back towards Linkwater ( I had problems with the sun for some photos !! )

**Date:** The approx.. date of this event was 1992

***NOTE : There were similar but much smaller events obvious forward of this site examples are at 9.7 / 9.8 / 9.9 ( 2 ) , and to 10.7 km. At most of these other sites material did NOT reach the coast OR were very small and some occurred before my time with Council. Generally they would have occurred over the period 1980 - 2000***

I consider this site and the others referred to above would have been significantly contributed to by the original 'sidling' fills unbenched and uncompacted which simply collapsed when saturated.

See photo overleaf.



**Kenepuru Site 7A**  
**9.5 km from Linkwater**

## Site 8 A

**Distance from Linkwater :** 11.65 km

**Coordinates :** 2586650 / 5996530

### **Description :**

**A major event :** Look forward as you pass the 'Folly' access sign on the corner before this site and you can see the head of slips on the LHS of this catchment ; similar but much larger slips also occurred in the RHS of this catchment, looking upstream.

The event followed clearfelling of forestry above the road and the slips referred to above contributed to the damage caused.( probably the sole contributor to the event )

It appeared as though the watercourse had become blocked by a collapse of a 'skid site' which had temporarily blocked the catchment before bursting and flowing to the road .

The road was scoured out to about 9 metres deep at the lower ( western side ) and extended back up the line of the culvert to about 10 metres from the now completely blocked inlet pipes ( about 20 lineal metres of the culvert pipes had collapsed into the watercourse ) a 'long reach 25 tonne excavator was unable to dig to the inlet of the culvert in an attempt to drain above the culvert ; the road of course was completely impassable being a 'gaping' chasm..

A new culvert was installed at a considerably higher level than the original culvert and an attempt was made to clear the watercourse above the culvert ; several hundreds of cubic metres of material was removed but it was obvious there were several thousand m<sup>3</sup> in the watercourse ; the decision was made to leave the slash and material in the watercourse and import rock fill which was levelled and compacted to form a new creek invert for a total distance of about 80 metres upstream ; this raised the new invert of the creek by about 4-5 metres .

The old culvert had been blocked and sealed off to prevent future ingress and flow of water into the new formation.

The accompanying sketch describes the works.

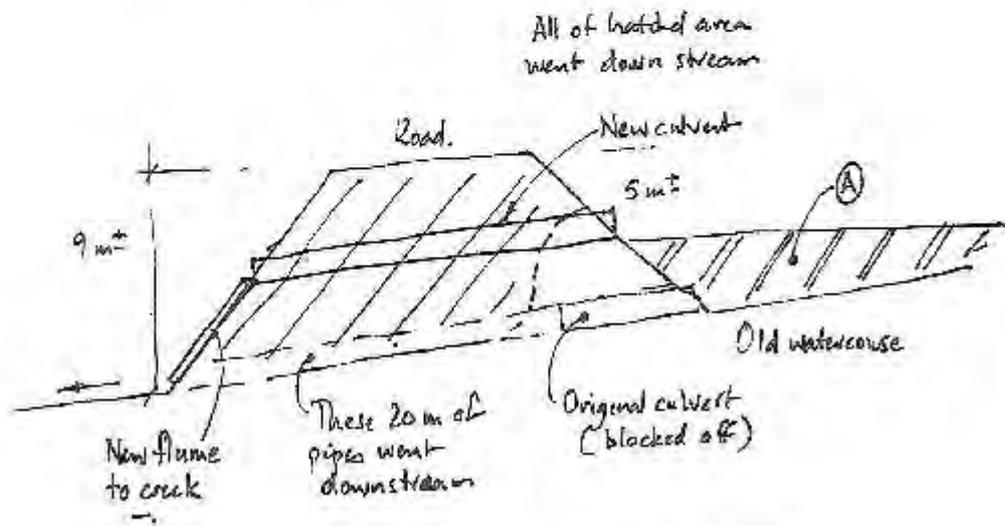
There was estimated to be in excess of 5000 m<sup>3</sup> of material which flowed down the watercourse to the sea. Large quantities of slash and other material was evident floating in the Sound for some time after the event.

**Date** : the event was in approx.. 2005



KENEPURU ROAD  
SITE 8 A

11.65 km from Linkwater



(A) All of this creek invert was raised with a combination of slash, slip material and hand rock sheathing - 80 m long x app. 15 m wide

SKETCH SECTION AT SITE N. T. S

**NOTE :**

*About 250 metres down Mahau Road ( 13.1 km from Linkwater ) is the Major spoil site for the Kenepuru Road spoil .*

*I assume it is still in operation.*

*This spoil site was commenced in about 1989 following negotiations with the then owners Gxxxxxxx Bros. ; the land was leased and fenced off to prevent public access and was used for most of the disposal near this area for some time.*

*The original consent and lease ran out ( the original owners had died in the meantime ) and the site had ceased to be used.*

*When I returned to Council in about 1995 one of my first jobs was to arrange an extension and a new consent for the site ; I carried out survey and design for a RC and acted for Council at a hearing before a Commissioner ( DOC had objected to the new consent ) ; Council will have extensive files in relation to this site.*

*The original consent was for 150,000 m<sup>3</sup> of spoil and the later consent increased it by about another 100,000 m<sup>3</sup> ( power lines in the area had to be raised to maintain working clearances.)*

*This does not form part of the events relating to slip material entering the sea but is attached for general information only.*

## Site 9 A

**Distance from Linkwater :** 15.5 km.

**Coordinates :** 2589034 / 5998378

### **Description :**

At this site the outer edge of the road ( about 2-3 m wide ) collapsed to the sea.

There is a 15 metre long and high retaining wall at the location.

Approx. 500 m<sup>3</sup> of material collapsed to the sea and I consider the cause was roading related ( an old sidling fill ? )

**Date :** The event happened in about 1988.



## Site 10A

**Distance from Linkwater :** 16.5 km

**Coordinates :** 2589615 / 5998631

### **Description:**

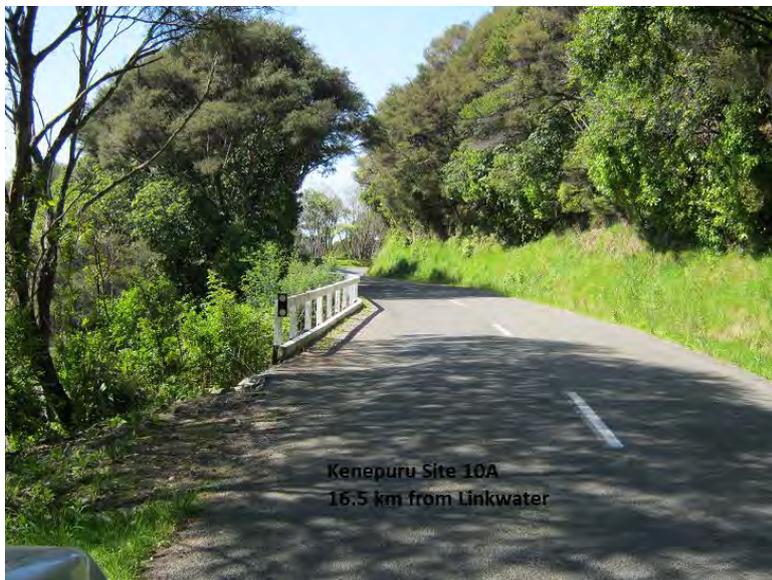
This site was the scene of an underslip which extended near 5 metres into the roadway and collapsed to the coast.

There is a 26 metre long ( high ) rail iron wall at the site ; the material flowed down near the Northern end of this wall.

There was approx.. 600 m<sup>3</sup> of material

I consider it was caused by a collapse of the road ( probably part was an old sidling fill )

**Date :** The date was app. 1990



**Note :**

***There have been many events between Site 10 a and site 11A and near and above Broughton Bay Road , however , none of them reached the sea.***

***Near 17.3 km ( the site of the 'single lane ' section of road ) we inspected above the road for some considerable height above the road and in an area bounded by the creek and culvert at the south end , extending North there was significant cracking and movement.***

***This is the reason this section of road has been left unchanged , i.e. afraid the whole face may drop onto the road and potentially several houses below the road.***

***If it does collapse it is likely to be a significant event involving thousands of metres 3 and over nearly a 200 metre length of road.***

## **Site 11 A**

**Distance from Linkwater :** 18.45 km.

**Coordinates :** 2590768 / 5998615

### **Description :**

A large event involving over 2000 m<sup>3</sup> of material of which app. 1000 m<sup>3</sup> went to the coast .

There is a major rail iron retaining wall at this site 56 m long ( high in places )

The event removed 3 metres of the outer edge of the road , some material from above the road had blocked drainage systems and spilt over the road as well as the underslip material.

I believe the event was caused by instability of the formed road.

**Date :** the date of the event was app. 1992

***NOTE : Beyond this site near 18.6 km there are 2 locations that have slumped but NOT collapsed several times since about 1988 . They could be considered to be “just hanging on “ the edges of the slip plane which extends through and above the road are apparent and perhaps 30-40 m long each.***

***There are also 4 events between Te Mahia and Onahau Roads – none of these reached the coast.***

***Note also Onahau Bay road was the end of the initial road development in the area.***



**Kenepuru Site 11A**  
**18.45km from Linkwater**

## **Site 12 A**

**Distance from Linkwater** : 20.4 km

**Coordinates** : 2591719 / 5998825

### **Description :**

The scene of a dramatic event and major damage to a downhill property.

Material fell onto the road from several slips above the road blocking drainage paths and diverting some water flows over the unstable edge near this site.

There was a catastrophic collapse of the outer edge and the face to the road / track below and thence into the sea.

A house / shed below was completely smashed to pieces ,with only the 2 outer walls standing ; everything else had been carried to the coast.

There is a 37 metre long rail iron wall at the site and almost unbelievable regrowth covering what was a large completely bare face nearly 70 m high with visibility straight to the sea!

There are extensive reports on file regarding this event including reports from Jim Cxxxxxxx and myself . We had a joint inspection .

The building was owned by a Mr A . Pxxxx

NOTE there was a significant spring which ran for some time midway up the face from the sea.

The estimated quantity was near 5-6000 m<sup>3</sup>

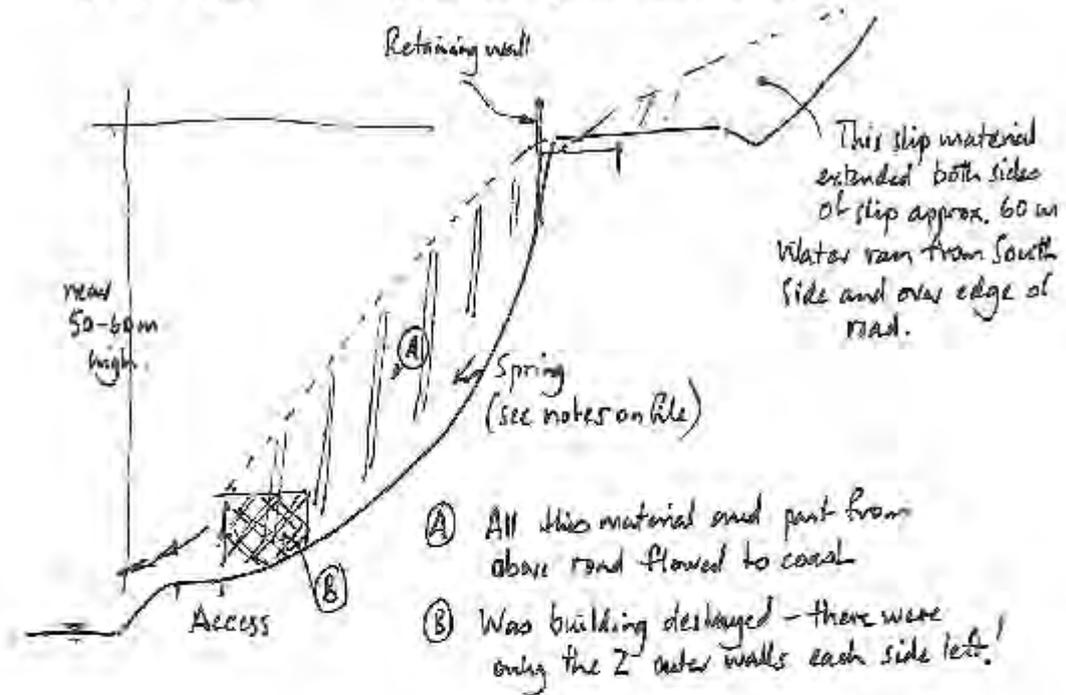
**Date** : the event was app. 1992



# KENEPUKU ROAD

SITE 12A

20.4 Km from Linkwater



- (A) All this material and part from above road flowed to coast
- (B) Was building destroyed - there were only the 2 outer walls each side left!

## **Site 13 A**

**Distance from Linkwater :** 20.6 km

**Coordinates :** 2591680 / 5998948

### **Description :**

The edge of the road approx. 3 m wide collapsed to the sea at this site. NOTE that forward of this site the road surface evidenced settlement and instability and has done for many years.

There was approx.. 2000 m<sup>3</sup> of material of which about 500 m<sup>3</sup> would have entered the sea.

Council was having some difficulty ensuring supplies of Rail iron and long delays to get H5 timber treatment and I designed this wire basket mesh and horizontal reinforcement wall as a 'trial' ( see sketches )

It has obviously stayed in position and retained the road , however ,it has rotated since construction as evidenced by the rails which have been straightened and replaced several times. ( aesthetically it would have to be considered pretty poor )

The wall face was constructed against timber shutters but began moving and settling almost as soon as they were removed and the final backfill placed – in retrospect the newer rigid wire baskets would have been much more successful )

The wall is some 57 metres long and there is another 80 metres +- of various other treatments ( gabions , posts , select fill etc )

GPS was taken near the centre of the structural wall.

**Date ;** The damage occurred in app 1988

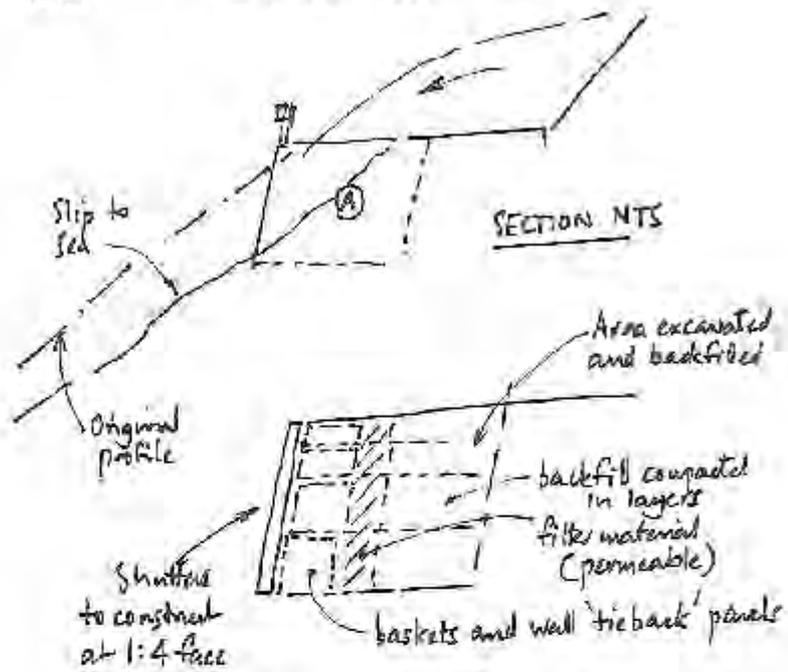


**Kenepuru Site 13A**  
**20.6 km from Linkwater**

# KENEPURM ROAD

SITE 13A

20.6 KM from Linkwater.



DETAIL AT (A) NTS

Sketches of wall (typical) NTS.

## **Site 14 A**

**Distance from Linkwater :** 22.4 km

**Coordinates :** 2589547 / 6001890

### **Description :**

This was one of the major spoil sites when Kenepuru Road was widened in 1985

At that time I had just arrived in Marlborough and I was taken out to view the works and advised the prominent Pine tree was the Northern Boundary of Councils sections and it was OK to cover them with spoil as they , Council , would relinquish the sections as part of the expense of widening the road.

I duly supervised the benching of the site and the disposal of spoil at the site.

In total 38,000 m<sup>3</sup> were placed.

About 4 years later I was checking boundaries near the coast due to a neighbours dispute and I happened to notice some survey pegs ; I carried out more survey and returned to advise the CEO of Council that the 'good news' was Council still had all it sections to sell , the 'bad news' was that it would have to arrange with the Vxxxx Estate to purchase some land we had completely buried !!

It was not long after this that the front 10 metres of the spoil site collapsed to the sea , luckily there was only 1 property affected ( Mr Mxxxxx ) and that was only minor.

In total approx.. 10,000 m<sup>3</sup> had dropped directly into the coast.

The spoil site was retired after the first use and a 'no dumping' sign erected ( there is still a sign at this location ) , however , local contractors / builders / residents etc. continued to dump material at the top ; this blocked drainage systems which diverted water to the culvert South side and may have precipitated the damage ; in any event it was roading related.

The repair of the site involved trimming and compacting the new face and installing contour drains diverting water to the south ; this appears to have been successful and no further damage has occurred .

The repair design was done by T H Jenkins ( now Aurecon )

Date : the collapse occurred about 1989



# KENEPURU ROAD

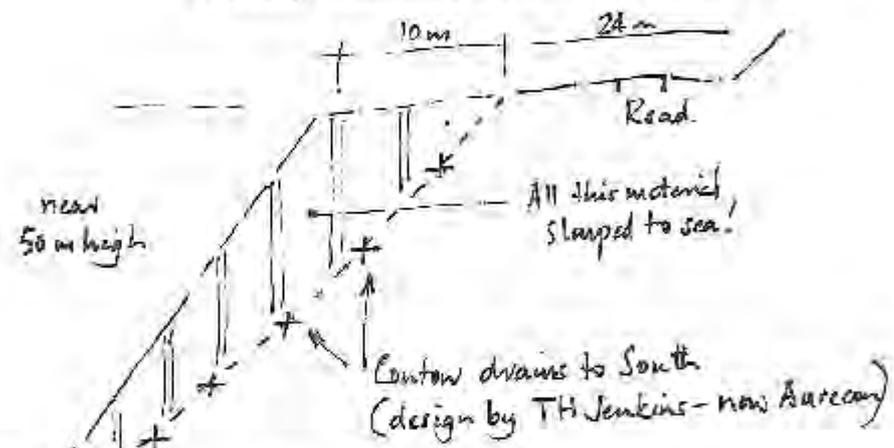
SITE 14A

22.4 km from Linkwater



## PT PLAN NTS

\* Council sections are accessed off Tawa Bay Rd.



Fill area was > 50 m wide.

## SECTION NTS

## Site 15 A

**Distance from Linkwater :** 23.7 km

**Coordinates :** 2593838 / 5999303

### **Description :**

This was the site of a slip emanating above the road and crossing the road taking most of the carriageway and app. 1200 m<sup>3</sup> of material to the sea.

This retaining wall uses Universal Beams in lieu of Rail irons which had become unavailable at the time.

**Date :** this event was app. 2000

***Note The corner at 23.8 km was a large spoil site in 1985 with over 10,000 m<sup>3</sup> of spoil dumped here with no problems .***

***There are 2 similiar events forward of the site – these did not reach the sea.***



**Site 16 a – Site 17A – Site 18A**

**Distance from Linkwater :** 25.3 – 25.45 – 25.5 / 25.55 km

**Coordinates :** 2594960 / 5999790 to 2594993 /5999870

**Description :**

***NOTE Sites 16 A and 17A abut one another and Site 18A is only slightly forward but discharging to the same watercourse OR section of coast ( Puketea Bay )***

***The events occurred at slightly different dates with Site 17A having 2 major events.***

**Site 16A** - At this site the complete RHS of the road collapsed onto the road blocking drainage systems.

The material flowed over the road and down the drive / access scouring this out to a depth of several feet .

The flow went under the corner of the house causing some damage and app. 600m<sup>3</sup> of material flowed into the Bay.

I consider this was exacerbated by the widening works however the area above the road up to and through the Power pole access track is all cracked and fractured ; for this reason this section has not been widened again.

***NOTE that water usually runs along the length of the RHS emanating from above the road.***

**Date :** this event first occurred in about 1988 but has caused problems since although material has been confined to the road environment.



## Site 17 A

At least 2 major slips occurred in the bush clad area upstream of the significant culvert .

The South slips were visible from beyond the site looking back and extended nearly to the skyline ; a smaller but similar slip occurred on the North side of the creek.

The original culverts , and the road , were swept away by the large amount of material that coursed down the creek to the sea.

The 1st event was in 1992 and involved near 3000 m<sup>3</sup> of material being discharged into Puketea Bay.

A smaller event occurred in about 2000 , at this time culvert repairs were again undertaken and the stone baskets installed to protect the access in the event of future floods . A second 1.2 m dia culvert was added at this time doubling the waterway.

At this second event there was only about 500 m<sup>3</sup> of material to the coast.



### **Site 18A**

There are 2 areas here where the excavated banks above the road collapsed ( still visible in places ) collapsed onto and over the road and down to the creek and out to the sea.

There was approx.. 800 m<sup>3</sup> of material.

These events occurred in about 1988

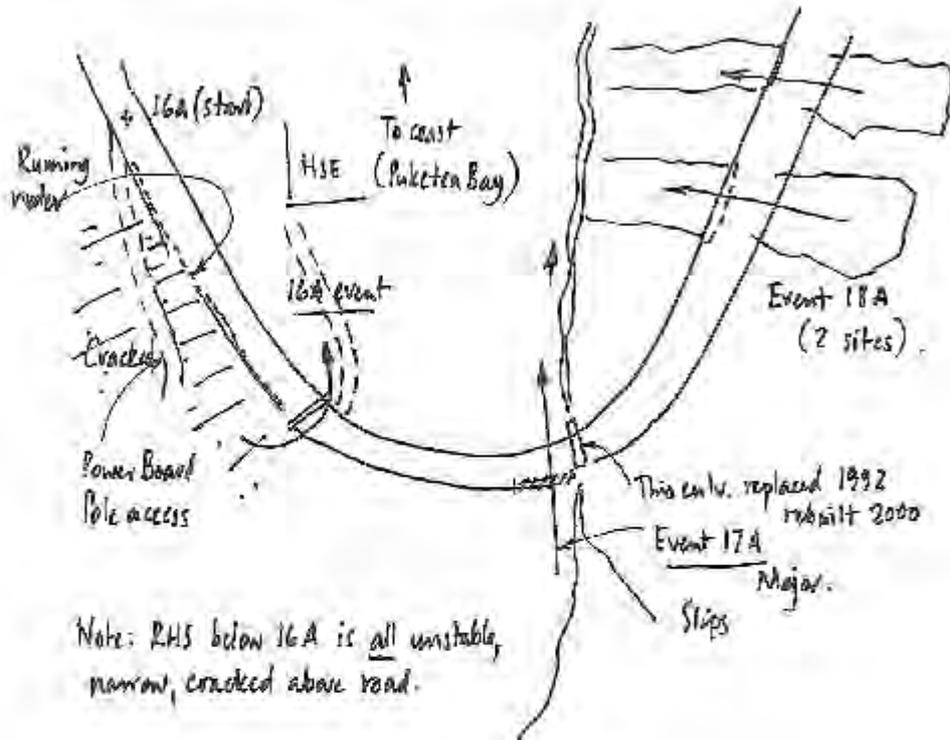
I consider events 16A and 18A were the result of land disturbance as a result of road widening ; events 17A were natural erosion well away from the road proper.



**Kenepuru Site 18A**  
**NOTE Gabion wall just**  
**before this site**

# KENEPUKU ROAD

SITE	16A	17A	18A
FROM LINKWATER	25.3*	25.45	25.55 / 25.60



Note: RHS below 16A is all unstable, narrow, cracked above road.

Big slip, was visible from corner near 26 Kus - now overgrown

SKETCH PLAN  
N.T.S.

## Site 19A

**Distance from Linkwater :** 26.4 km.

**Coordinates :** 2595184 / 6000224

### **Description:**

This was a major spoil disposal site during the widening works in 1985-86

The site was benched nearly at sea level and developed in layers of fill , compacted and contoured .

The new road alignment is significantly north of the original section and sits atop the filled area.

There was app. 15,000 m<sup>3</sup> placed in this fill and there have been no problems with stability since it was constructed.

The site filled was approx.. 30metres long and over 20 metres wide with a fill height of app. 20 metres +/-.

The original road can be seen in photo right.



## Site 20 A

**Distance from Linkwater :** 26.85 km.

**Coordinates :** 2595486 / 5999917

### **Description:**

If one stops at the wall at 26.6 km ( before this site ) and looks forward there is evidence of 2 large slips that extended way above the road- i.e. lighter vegetation.

Similar slips occurred on the South side of this catchment as well.

There have been at least 2 events at this site however the significant event was in approx.. 1996 when these slips took out a section of road and the culvert and flowed into the sea.

No damage occurred to the adjacent house and only minimal material on the drive.

The culvert was a large 'Armco' steel pile which was destroyed ; remnants of it are visible in the creek below . it was replaced with a 1.5m concrete pipe.

There was app. 2000 m3 of material to the sea / coast and I consider it was a natural erosion event ; the slips emanated well above and away from the road.

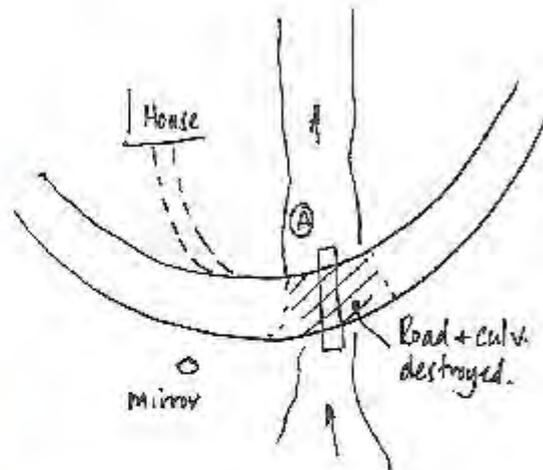
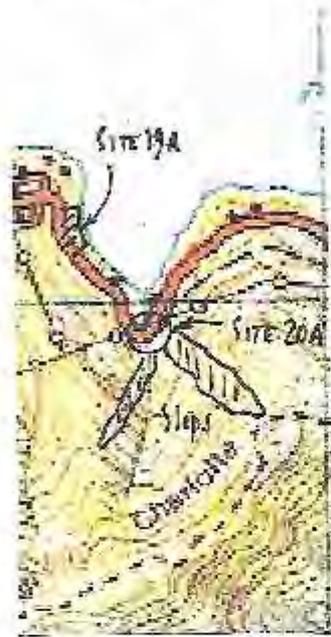
Date ; the event was in app. 1996



# KENEPURU ROAD

SITE 20A

DISTANCE FROM LINKWATER 26.85 KM



SKETCH PLAN NTS

Ⓐ Evidence of original steel Armo pipe in watercourse near here

## **Site 21 A**

**Distance from Linkwater :** 27.05 km

**Coordinates :** 2595566 / 6000070

### **Description :**

There is a 24m long rail iron wall at this site ( high )

The slip from the RHS flowed across the road and to the sea – its extent is still apparent above the road.

There was near 2000 m<sup>3</sup> at this site of which some 1200 m<sup>3</sup> would have reached the sea.

**Date :** the event occurred app. 1992



**Site 22 A**

**Distance from Linkwater :** 28.2 km

**Coordinates :** 2596441 / 6000089

**Description :**

There is a 20 metre long rail iron wall at this site

Approx. 400 m<sup>3</sup> of material from a slip on the RHS crossed the road and entered the sea.

There is another smaller area approx.. 30 m forward of this site.

**Date :** approx.. 1990



## **Site 23 A**

**Distance from Linkwater :** 28.4 km.

**Coordinates :** 2596575 / 5999975 ( near centre )

### **Description:**

This is 'Cowshed Bay' the significant DOC camping site on this road.

This was a significant spoil site at the road widening works undertaken in 1985/86 and large quantities of spoil were dumped above and below the road.

The site prior to these works was simply a bit of light bush with a creek at each end ; the road was generally east of its current location ( it was significantly straightened )

The levelling and landscaping work was carried out by T . Lxxxxxxx a previous Chairman of the Kenepuru Road Board before Council took over the area , an ex. owner of the Portage and environmentally sensitive to the area. His wife was prominent in Forest and Bird as well. T.L at that time lived at Puketea Bay.

All of the area development is the result of our work including the accessways and camp site areas there was a small track to the beach.

In total there was near 25,000 m<sup>3</sup> of spoil placed at the site and to my knowledge there has never been any problems with the area .

Above the road near 18,000 m<sup>3</sup> was placed and levelled from about 60 m above the road and adjacent to the south creek

A real benefit to DOC , Marlborough and the community and a great asset for the future.

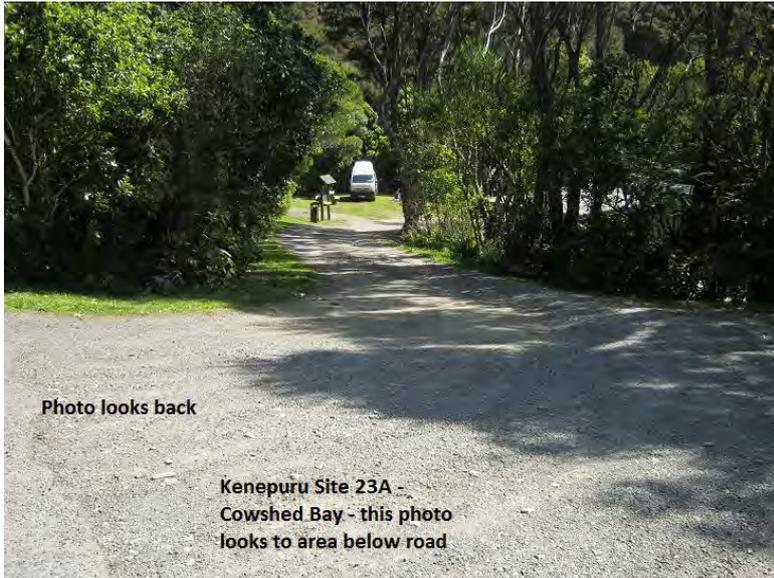
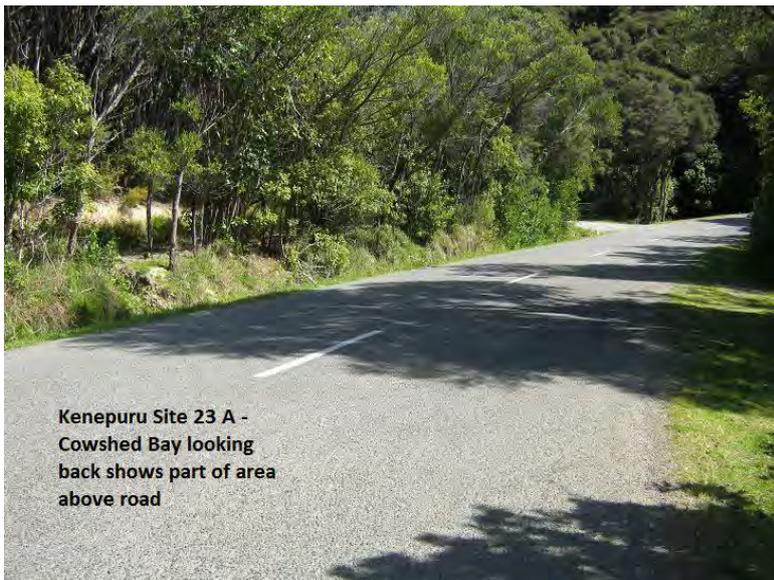


Photo looks back

Kenepuru Site 23A -  
Cowshed Bay - this photo  
looks to area below road



Kenepuru Site 23 A -  
Cowshed Bay looking  
back shows part of area  
above road

## Site 24 A

**Distance from Linkwater :** 29.55 km

**Coordinates :** 2596662 / 6000179

### **Description :**

This was a collapse of the outer edge of the road and the original bank below the road.

There is a 25 metre long rail iron retaining wall at the site.

Approx. 600 m<sup>3</sup> went directly to the sea.

Note the transfer station just beyond this site.

**Date :** approx.. 1990



## Site 25A

**Distance from Linkwater :** 28.6 km

**Coordinates:** 2596849 / 6000302

### **Description :**

The section of bank in the photo left and extending over a length of about 120 metres slumped towards and onto the road.

It then flowed forward and began running over the road edge and in front of the Portage Shop and thence down the beach access to the sea.

In total there was app. 500m<sup>3</sup> which flowed into the sea and I consider the whole area is unstable , however, early road widening works may have precipitated the event.

The whole area is considered unstable and has NOT been trimmed back to its original profile , nor has a proper roadside drainage system been installed due to a reluctance to disturb the area.

Note the Manhole in the centre of the road in photo front , this is part of a stormwater system from the road to the RHS before this site.

**Date:** This event occurred in app. 1992



See also sketch that follows.

## **Site 26A**

**Distance from Linkwater** : 29.1 km.

**Coordinates** : 2596835 / 6000440

### **Description :**

The photo is taken below the Portage shop looking back.

There have been 2 significant events here.

The first was in app. 1998 when a large slip in the water supply catchment for the Portage occurred.

A huge amount of material flowed down from above the boat parking area , blocked the culvert , covered the boat parking area about 0.5 m deep then flowed over the road , past the shop , some over the tennis courts , and into the sea via the boat launching access.

The quantity to the sea is estimated at over 1200 m<sup>3</sup>

The second event occurred in app. 2000

Another slip similar to that above occurred and ran over the road to the coast , however, following the event a hole about 2m<sup>2</sup> appeared near the steps to the shop.

There was a large water flow audible and on inspection this was the junction of concrete pipes from the creek above the road and boat park ( see sketch ) and Armco steel pipes extending to the coastline and exiting just South of the boat launching ramp.

We carried out investigative photography within the system and discovered :

- 1 Most of the Armco pipe had rusted and collapsed
- 2 There was a 'tomo' of about or larger waterway than the pipe ( 450mm dia ? ) generally along or below the line of the pipe to the outlet.
- 3 about 500m<sup>3</sup> of material went to the sea at this event

I do not know if it was ever repaired , I suspect not as it was owned by the shop owner ( who also incidentally owned most of the carparking area )

The area near the hole was patched and filled in .

I consider the first event was a natural erosion of the hillside above the site the second was a result of roading works .

There are the photo images of the pipe camera work and reports on Councils files .



## Site 27A

**Distance from Linkwater :** 29.2 km

**Coordinates :** 2596798 / 6000505

### **Description :**

This photo is looking towards the Portage wharf and a walking access alongside the road.

At this site the complete RHS of the road , and the banks above , collapsed to the sea over the length from the carpark to the wharf with app. 700 m<sup>3</sup> into the sea.

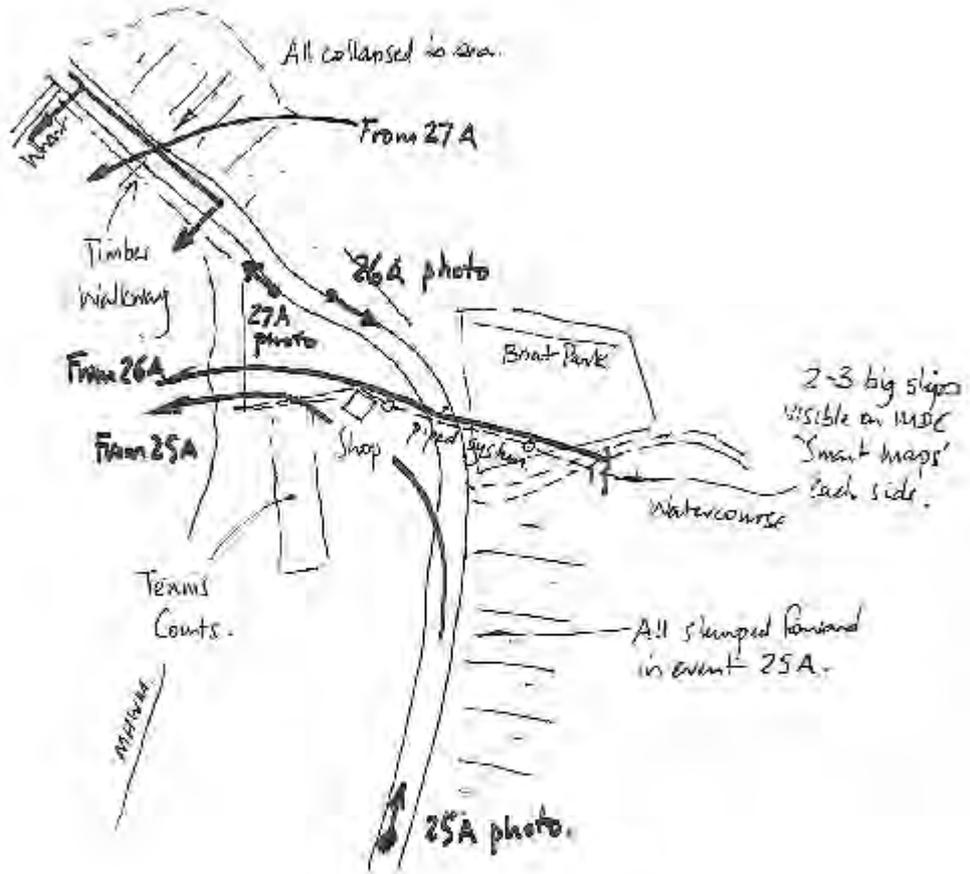
An officer of Council ( not me ) arranged to import a large number of broken power poles from the MEPB and placed them alongside the area to provide support to the new road ( current section ) ; there was quite a 'ruckus' at the time because it certainly was'nt an aesthetic treatment and looked a bit stark in the area . So the sympathetic timber walkway was installed along the outer edge .

I consider early road widening probably contributed to the collapse.

It may be of interest that the NZ Army constructed much of the floating wharf complex for the Portage ( don't ask me how this was arranged ! )



# KENEPUK ROAD SITES 25A, 26A, 27A.



## Site 28A

**Distance from Linkwater :** 29.7 km.

**Coordinates :** 2596583 / 6000953

### **Description :**

This site was the scene of an 'underslip of the road ' to the sea.

There was also a significant slip from above the road and there are 2 smaller events near here.

The first slips were in app. 1996 although later events occurred up to 2004 ( when a drive was constructed above the road and the edge collapsed )

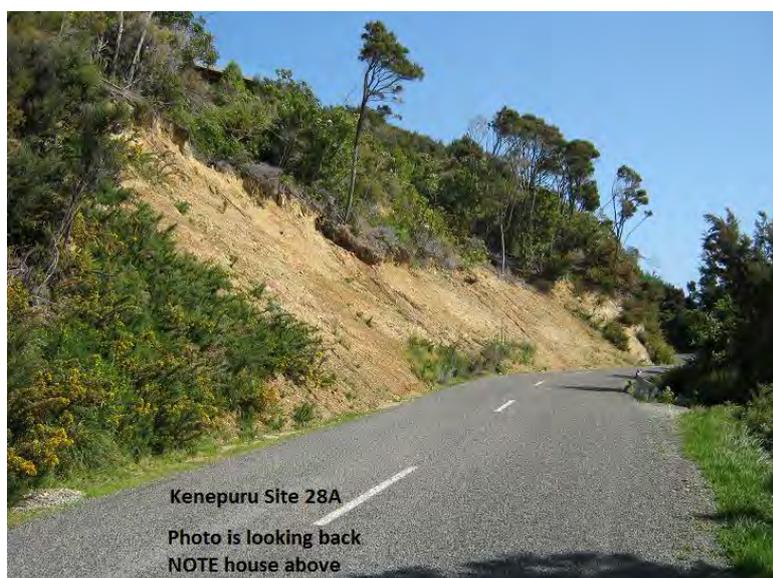
There are some minimal retaining walls constructed of gabions , posts etc. which probably don't offer much long term stability.

I consider earlier road widening probably contributed to the event.

Approx. 600 m<sup>3</sup> of material went to the sea.

**Date :** the 600 m<sup>3</sup> event was about 1996.

The photo is looking back



## Site 29A

**Distance from Linkwater :** 30.3 km.

**Coordinates :** 2596901 / 6001064

### **Description :**

This was a large slip on the RHS which is still evident.

The material crossed the road and fell directly to the sea when about 3 m of the LHS of the road collapsed as well.

There is a 20m long rail iron wall and a section of stone gabion walls about 30 metres long beyond that.

There was near 800 m<sup>3</sup> of material to the sea

Probably roading related.

**Date :** the event first occurred in app. 1992 ( there have been subsequent smaller falls at this site.).



## **Site 30A**

**Distance from Linkwater :** 30.55 km

**Coordinates :** 2597085 /6001003

### **Description :**

This site is just before a significant event at 'Shagins' ( not to sea )

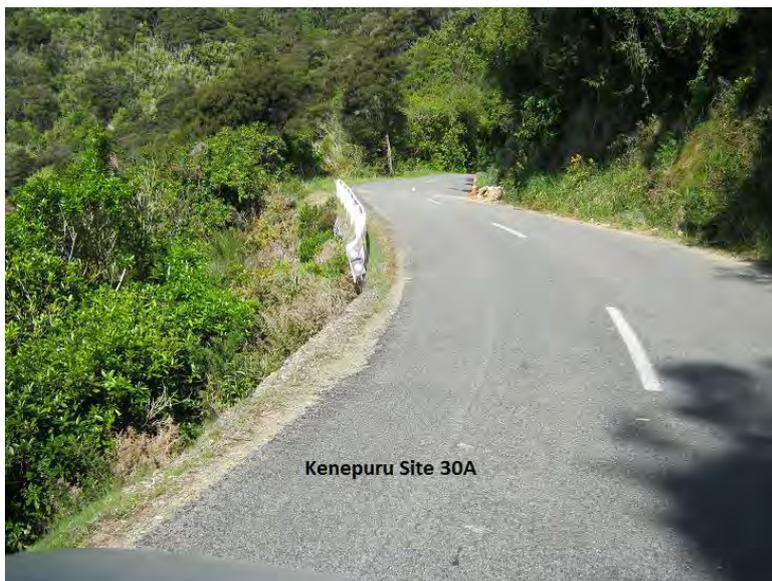
The road and approx.. 3 metres of the edge collapsed to the sea at this site.

There is a gabion wall app. 20 metres long which appears to be rotating slightly but appears stable.

There was app. 500 m3 of material to the sea.

Probably roading related.

**Date :** The event occurred app. 1996



## Site 31 A

**Distance from Linkwater :** 31.5 km

**Coordinates :** 2597509 / 6000584

### **Description :**

This is 'Shagins' spoil site.

It was an engineered disposal site with detail plans prepared by TH Jenkins and Ass. ( Now Aurecon ) with benched lower area .

There was also significant work done on debris and silt control with detention fences along the lower edge and controlled filling.

The site was also fenced off with a locked gate preventing unauthorised use.

Currently it looks a 'bit of a mess' with heaps of spoil , logs etc

I note the fences and gates have gone ( see also 'Wander bay' site comments )

And the whole area is uncontrolled.

The site has proved stable and no material has entered the sea yet !!

The site contains over 15,000 m<sup>3</sup> of spoil.

**Date :** work commenced in about 1996 and has continued to the present time.



## Site 32 A

**Distance from Linkwater :** 31.6 km

**Coordinates :** 2597683 / 6000774

### **Description :**

Note on the RHS several obvious slip sites

This site is just above 'Picnic Bay'

There was over 2000m<sup>3</sup> fell to the road but only about 200 m<sup>3</sup> went to the sea.

Note on LHS material still on LHS shoulder and along edge of seal ; this must be comparatively recent and since my time with Council.

The cause is probably roading related.

**Date :** The event was app. 2004 till the present ?



## Site 33A

**Distance from Linkwater** : 32 km.

**Coordinates** : 2597895 / 6000743

### **Description :**

There is another smaller site just before this location.

Evidence of the RHS is obvious and the LHS of the road before the high rail iron wall is unstable.

The wall is 17metres long.

There was app. 400m<sup>3</sup> to the sea at this location.

Probably roading related.

**Date** : the event occurred app. 1998



## Site 34A

**Distance from Linkwater :** 33.6 km.

**Coordinates :** 2598832 / 6001169

### **Description :**

This is the site of an underslip to the sea.

There is no retaining structure but the LHS is unstable'

The damage is apparent at this site.

I suspect some slip material from RHS may have been stacked here to dry and has contributed to the event.

**Date;** The event occurred app. 2002



## **Site 35 A**

**Distance from Linkwater :** 33.9 km

**Coordinates :** 2599076 / 6001184

### **Description:**

This is the 'Wander bay' spoil site.

I surveyed and designed the spoil site and a RC was obtained for the works so there will be information on Councils files.

In any event there was a large gully extending south from the northern ( road edge ) of the site and this was carefully filled and levelled and has been stable.

The site was fenced off , with a locked gate installed , this lasted 2 days and the complete instillation was gone ; subsequent attempts have met with the same result and some vehicles now drive across the edge of the fill ( obvious )

The whole site was to have been replanted post construction but , in fact , it just covered in Gorse and looks pretty untidy.

'Wander Bay' was a DOC site ; there is a nice little beach here however the access ran across private land. The owner subsequently applied to Council for some land use changes but after the outcome has closed the area.

I recall the site holds over 24,000 m3 of material

**Date :** the spoil site started in about 2004.



## **Site 36A**

**Distance from Linkwater :** 35.7 km.

**Coordinates :** 2600248 / 6001003

### **Description :**

This was a major site with the hillside above the road on RHS collapsing onto and over the road near the rail iron wall location.

I was the first vehicle to reach the Portage in 1996 and had on board the CEO of Council , 2 Councillors and a DOC representative.

When we finally reached this site my loader was attempting to clear the slip from the road ; it extended about 30 metres along the road about 3 m high and was also running over the road edge . Every time he took a load to near the 'Black Rock' gate about another 5m<sup>3</sup> flowed down to take its place.

We estimated there was about 1200 m<sup>3</sup> already in the sea and with the permission of the DOC officer we commenced to push another 800 m<sup>3</sup> over the edge to allow the road to be reopened.

While we were on site the Councils CEO and Councillors decided they would try and reach the middle of the slip by negotiating fallen trees etc. . To the great delight of myself and the DOC officer they fell into the slip material and promptly sank to their waist !! , I told them they were'nt coming in my vehicle like that so they took off their strides and sat in the back seat of my car. I took them to the Portage where the then owner lent them some track suit pants and socks and we enjoyed a few more examples of 'Sounds' hospitality before returning home.( only about 3 hours worth as I recall !! )

**Date :** the event occurred in 1996 I consider it was a combination of road widening works and natural erosion that caused the event.



***NOTE : At 36.2 km there is an old spoil site which contained near 18.000 m<sup>3</sup> of material .***

***This dramatically slumped in about 2000 and the road follows down the lowered area in a steep vertical Sag curve.***

***I have not attached a photo , the area is obvious and is well distant from the coast , however , does evidence some of the dramatic slumps etc that can occur and are obvious virtually along the whole length of the road to near the 'Heads'***

**KENEPURU ROAD**  
**'HEADS' TO END OF ROAD ( WESTERN SIDE )**

## **Site 1 B**

**Distance from 'Heads' :** 1.2 km

**Coordinates :** 2603238 / 6003725

### **Description :**

The outer edge of the road collapsed at this site to the sea over app. A 20 metre length carrying trees and scrub with the slip.

The most recent event was in about 2009 and at this time the road was moved away from the coast and the new concrete channel section installed.

Previous slips have occurred at this location , the earliest commencing in about 1990.

There is app. 500 m<sup>3</sup> of material which has entered the sea .



## Site 2 B

**Distance from 'Heads' :** 9.4 km.

**Coordinates :** 2597958 / 6002953

### **Description :**

The outer edge of the road collapsed at this site ( has been an old event )

The gabion basket wall near the south end was installed app. 2008

The slip contained app. 300 m<sup>3</sup> and collapsed directly to the sea , it is evident at the edge of the water ( 10 /2015 ) . Note some vegetation.

Note the Black Farmtuff culvert recently installed at the southern end of the site and now hanging suspended in space .

This was installed post my time with M.Roads so must have installed approx.. 2012-13 .

**Date :** varies up to near present time.



### **Site 3 B**

**Distance from 'Heads' :** 21.58 – 21.75 km ( + - )

**Coordinates :** 259 /6002689 to 2592469 / 6002665 ( new section only )

#### **Description :**

It is difficult to believe the scale and scope of this event with the growth of Gorse and Broom etc. covering virtually all evidence of the damage.

This was the most significant site in the Kenepuru area to my knowledge.

The event occurred in approx.. 1996 and a complete section of the hillside and a section of road near 60 metres long collapsed to the coast and the sea.

The complete road was sheared away about 4 metres deep and the section shown in the photo is all new road constructed approx.. 10 – 20 vertically uphill from the original site.

The flat before the sea was covered about 1 m deep over perhaps 300 m<sup>2</sup> and the total volume to the coast is estimated at 35,000 m<sup>3</sup> of which 20,000 m<sup>3</sup> plus was the original slip and the balance was 'pushed' over the side by a local contractor A .Hxxxxx using a 25 tonne excavator and a D8 ? bulldozer .( NOTE this machinery was on site for nearly 2 weeks – disposing of near 2000 m<sup>3</sup> / day over the side.) – the contractor advised me of the quantity he disposed of.

I could not visit the site for some time as large sections of the roading system were impassable before this site as a result of this major event , however , there will be a number of photographs on Councils filing systems.

The slip emanated from about 40-50 vertical metres above the current road location and I consider was a natural erosion in what was a very heavy rainfall event.

Photo is taken looking back towards the 'Heads' note the extensive Gorse etc. growth covering the slip face ( both sides of road )

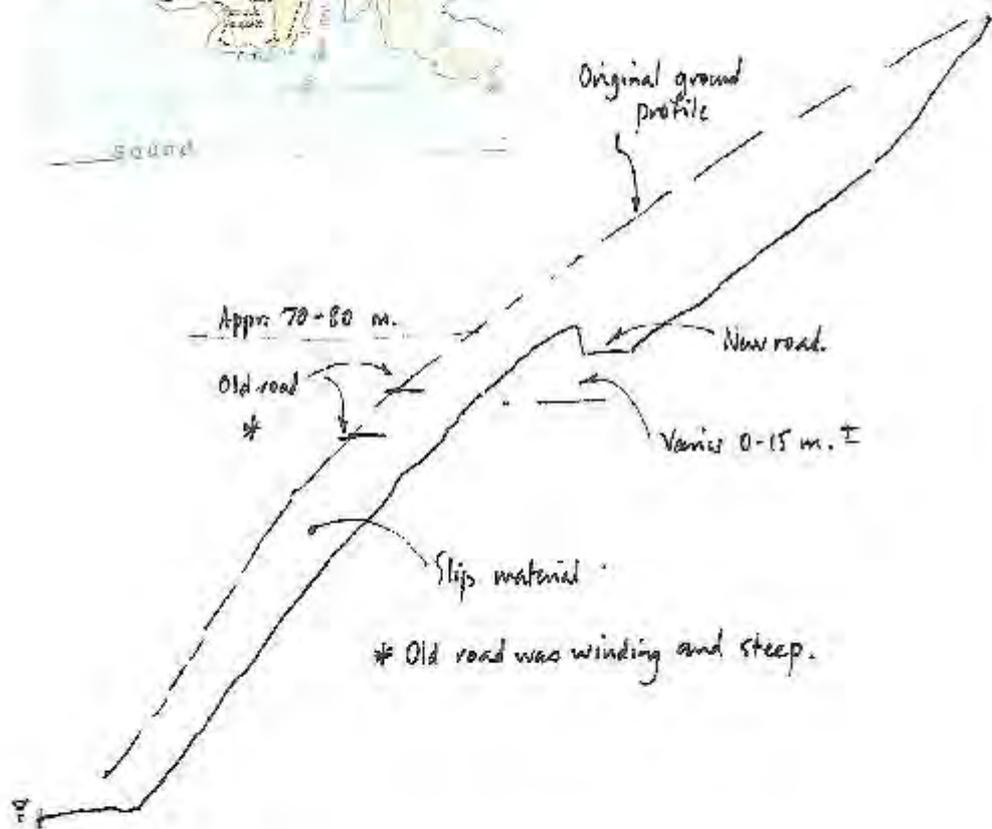
Although not evidenced in the photo , this section is quite steep uphill from photo distance.



# KENEPURU ROAD

SITE 3B

APP. 21.6 Km from 'Heads'



## Site 4 B

**Distance from 'Heads' :** 26.6 km.

**Coordinates :** 2589524 / 6002022

### **Description :**

This is comparatively minor event with a slip across the road and down to the coast.

Note the Gorse etc. regrowth on the faces above and below the road.

There was only about 200 m<sup>3</sup> reached the coast of a total volume near 1500 m<sup>3</sup> ; the balance was arrested by the road OR on the downhill slope.

I consider it may have been precipitated by what was a new cut batter at the time which collapsed and the material 'pouring' over the road collapsed the outer edge which would have only been an old sidling fill.

Date : the event occurred about 1994.



## Site 4 B

## **Site 5 B**

**Distance from 'Heads' :** 27.0 km.

**Coordinates :** 2589461 / 6001906

### **Description :**

This event involved the complete collapse of the road edge and approx.. 2/3 rd of the road carriageway to the sea.

This was a pretty significant event at the time and the whole road was shifted back on the photo left by about 4 metres.

This site was completely bare above and below the road right to the coast and including material which was 'cast' over the side ( note that a large amount was placed just forward and left of the site ) involved app. 2000 m3.

Once again Gorse and other vegetative growth covers the site on both sides.

I consider this event was probably caused by the excavation above the road steepening the cut batter face.

The extent of the site is evident and the photo is taken looking back to show the existing revegetated slope to the sea on photo right.

**Date :** the date of this event was app. 1990

The contractor that repaired this site was C.Pxxxxxxx.

See over for photo.



**Kenepuru site 5 B**