Whakatane Spit Fuse Flood Management Plan

Bay of Plenty Regional Council
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NEW ZEALAND

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Part 1: Background

The current status with the Whakatāne River mouth configuration is that there is an existing physical situation that is not likely to change, due to man-made modifications, in the short-term. The next key driver that could provide momentum for changing the river mouth configuration is the Whakatāne District Council (WDC) Whakatāne River Entrance Improvement Project. As at July 2012 the River Entrance Improvement Project is underway and a number of potential options are being investigated.

As there is unlikely to be a change in the current man-made river mouth configuration in the short-term a Whakatane Spit Fuse Flood Management Plan for the existing situation is required. It is proposed that the new Flood Management Plan be an update of the current Plan which is outlined in the Bay of Plenty Regional Council (BOPRC) Flood Manual.

The proposed Whakatane Spit Fuse Flood Management Plan is based around preparing the spit fuse so that it can be eroded by the river flood flow to provide an overflow path and hence increase the overall conveyance capacity of the river mouth.

The general process by which the spit fuse erodes is that the energy within the flood flow attacks the eastern end of the spit adjacent to the river. The eastern end of the spit is essentially ‘peeled back’ by the river energy. At some stage during this process the end of the spit is eroded sufficiently so that the flood flows can pass to the west of Statue Rock and out to sea. This process is dependent on the status of the spit, magnitude of the flood flow and sea conditions. Once flood flows have opened the fuse, the end of the spit continues to erode to a state that can accommodate the flood flows and balance the sea state.

The existing western spit training wall is located in such a way that it provides a barrier between the river flood flow and the end of the spit. The maximum erosive forces within the flood flow cross-section are below the top level of the current wall. Consequently the river has difficulty opening the spit fuse with western spit training wall in place.

With the western spit training wall in place, the current spit opening process is more related to a head differential across the spit between the flood water level on the inland side of the spit and the open sea level (including the storm influenced sea state). It has been noted, during several recent flood events, that the spit fuse does not blow until low tide because that situation is required to provide sufficient head differential across the spit especially when there are rough sea conditions elevating the average sea level. Also, overtopping surface erosion is aided during the receding tide because of elevated pore-pressure (relative to sea level) within the spit sand mass assisting in ‘softening’ the spit structure.

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Part 2: Spit Fuse Flood Management Plan

The overall intent of the Spit Fuse Flood Management Plan is to lower the level of the eastern end of the spit to encourage the river to overtop during flood events and then erode an overflow path (on the western side of Statue Rock) as required.

There are two main aspects to the lowering of the eastern end of the spit:

1 Flood management - lowering spit level and form a fuse-channel immediately prior to a forecast rainfall/flood event.

2 Maintenance management - pre-emptive lowering of spit level when sand volumes and/or crest levels increase aimed at reducing the time required to complete flood management preparations (Item 1 above).

2.1 Flood management

Prior to a predicted flood event a fuse-channel is constructed through the eastern end of the spit. The purpose of the fuse-channel is to provide a path for the river to flow to the sea and commence eroding the spit.

The fuse-channel is constructed when a flood event is likely to occur. Trigger levels for the construction of the fuse-channel are:

- A predicted rainstorm event which is expected to exceed 100 to 150 mm of rainfall in the Whakatāne and Waimana Catchments.
- As directed by the BOPRC Flood Manager.

WDC and BOPRC staff will liaise prior to the predicted rainstorm event to determine details of the spit fuse preparation to account for flood flows.

Sufficient lead time needs to be included in the fuse-channel construction process. Machinery should be mobilised and the channel completed during daylight hours prior to the flood flow arriving at the river mouth. Machinery should be left in a safe area close to the spit to allow further adjustments to the channel if required and safe e.g. if the sea closes the fuse-channel.

2.2 Maintenance management

If the eastern end of the spit exceeds a crest level of 2.0 mRL (Moturiki Datum) or if the spit width becomes significant then pre-emptive lowering should be completed. The purpose is to reduce the volume of spit material that would need to be excavated prior to a forecast flood event and hence reduce the time required to prepare the spit fuse-channel for a forecast flood event.

WDC and BOPRC staff will monitor and liaise to determine when pre-emptive lowering is required.

Part 3: Spit Fuse Channel Construction

3.1 Channel details

The fuse-channel is excavated through the spit to connect the river to the sea (refer to Figure 1) on the western side of Statue Rock. The inland base level target range of the fuse-channel is 0.5 mRL to 1.4 mRL (Moturiki Datum) as determined by the lowest top level of the Western Spit Training Wall. The minimum width of the inland end of the fuse-channel should be the length of the 0.5 mRL section of the Western Spit Training Wall (approximately 40 metres).

Construction of the fuse-channel should start from the 1.7-to-0.5mRL step on the Western Spit Training Wall. This point provides a reference for the 0.5 mRL to 1.4 mRL (Moturiki Datum) target range base level for the fuse-channel. Also the 0.5 mRL section of the Western Spit Training Wall is a key zone where river action has the opportunity to work on opening the fuse-channel.

The Western Spit Training Wall step is 43 metres along the wall from the base of Statue Rock (refer to Figure 2). The location of the step can be determined from the eastern river bank by lining-up two marker points (refer to Figures 2 and 3). One marker is the downstream side of Plaque Rock. The second marker is the upstream end of the seat located across the road from #3 Muriwai Drive. There are two seats on the river bank in this area (one opposite #5 Muriwai Drive and one opposite #3 Muriwai Drive) with the seat to be used being located the furthest downstream opposite #3 Muriwai Drive.

The invert level of the fuse-channel should lower towards the sea side creating a grade towards the sea.

The base width of the fuse-channel should be a minimum of 10 metres at the seaward end. It is likely that the final base width will be related to the time available from machinery on site particularly when constructing the channel prior to a predicted flood event. The excavation priority should be to expose and clear the area around the 0.5 mRL section of the Western Spit Training Wall and to open the fuse-channel towards the sea. The aim is to provide an area where the river can over-top the 0.5 mRL section of the wall, flow towards the sea and connect to the sea. The 10 metre base width and connection to the sea should be excavated at first, then further widened towards the west as time allows.

Material excavated from the fuse-channel should be placed on the inland side of the spit clear of the inlet of the fuse-channel. The river side of the spit is a high energy environment during a flood event and it is expected that if the river erodes to the stockpile area it will mobilise the spit material and transport it out to sea.

3.2 Trigger levels

The trigger level for fuse-channel construction is when the eastern end of the spit exceeds a crest level of 2.0 mRL (Moturiki Datum).

The spit level will be determined using a Dumpy Level, sighting from the eastern side of the river mouth. Two reference marks have been established on the eastern river bank by BOPRC. The location details are included in Figures 4 to 6.

One plinth reference mark is located on step three of the sea wall wooden steps adjacent to #21 Muriwai Drive and has a level of 1.863 mRL (Moturiki Datum). The second plinth reference mark is located on the concrete sea wall step adjacent to #27 Muriwai Drive and has a level of 1.993 mRL (Moturiki Datum).

To assess the Spit fuse level a Dumpy Level is placed on the plinth and shots taken of the spit crest level. The total collimation height of the plinth and Dumpy Level is close to 2 mRL (Moturiki Datum) providing a suitable reference datum for the purposes of the crest level assessment. Refer to Figure 7 for further details.

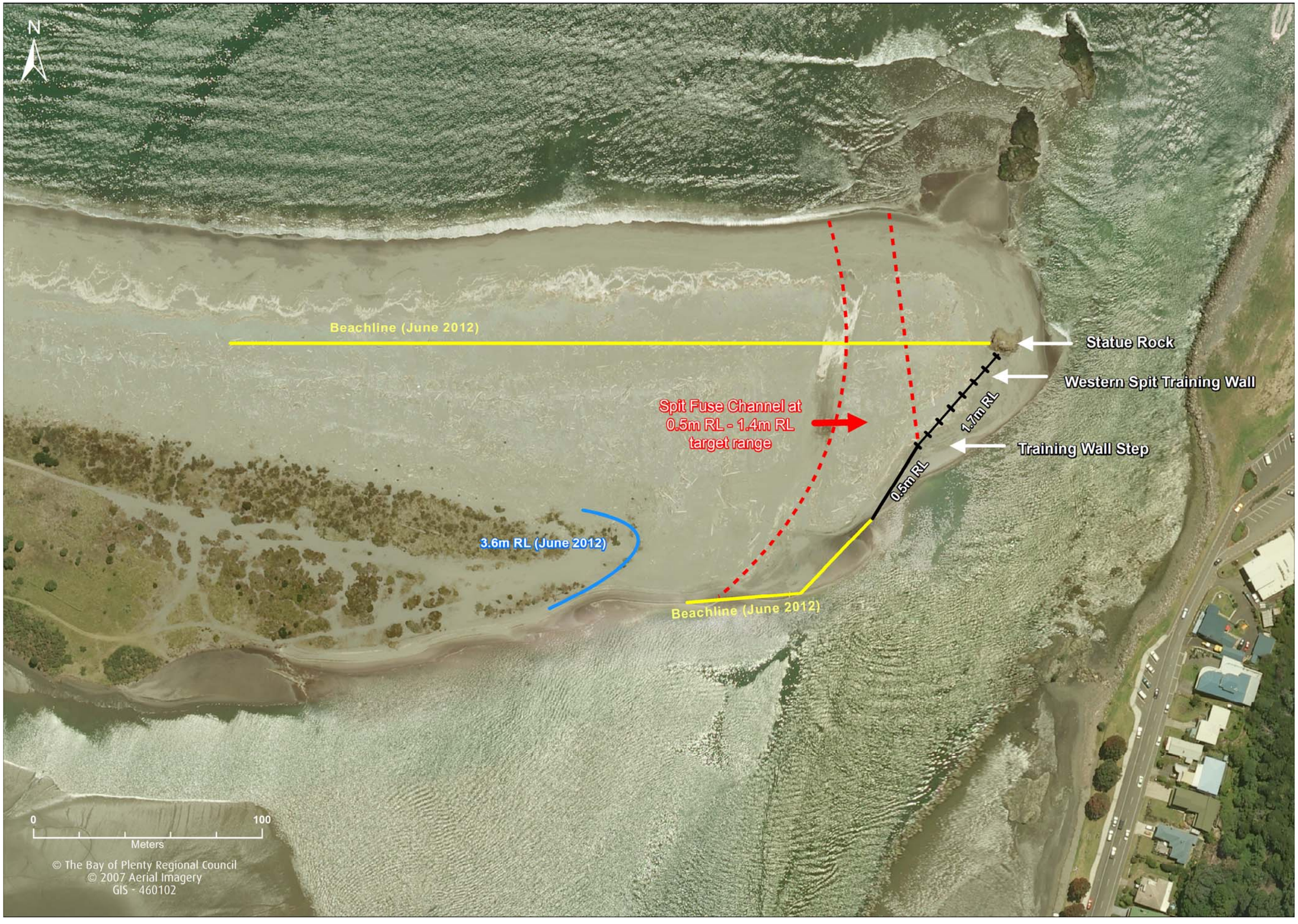

Figure 1 Spit Fuse Channel location details

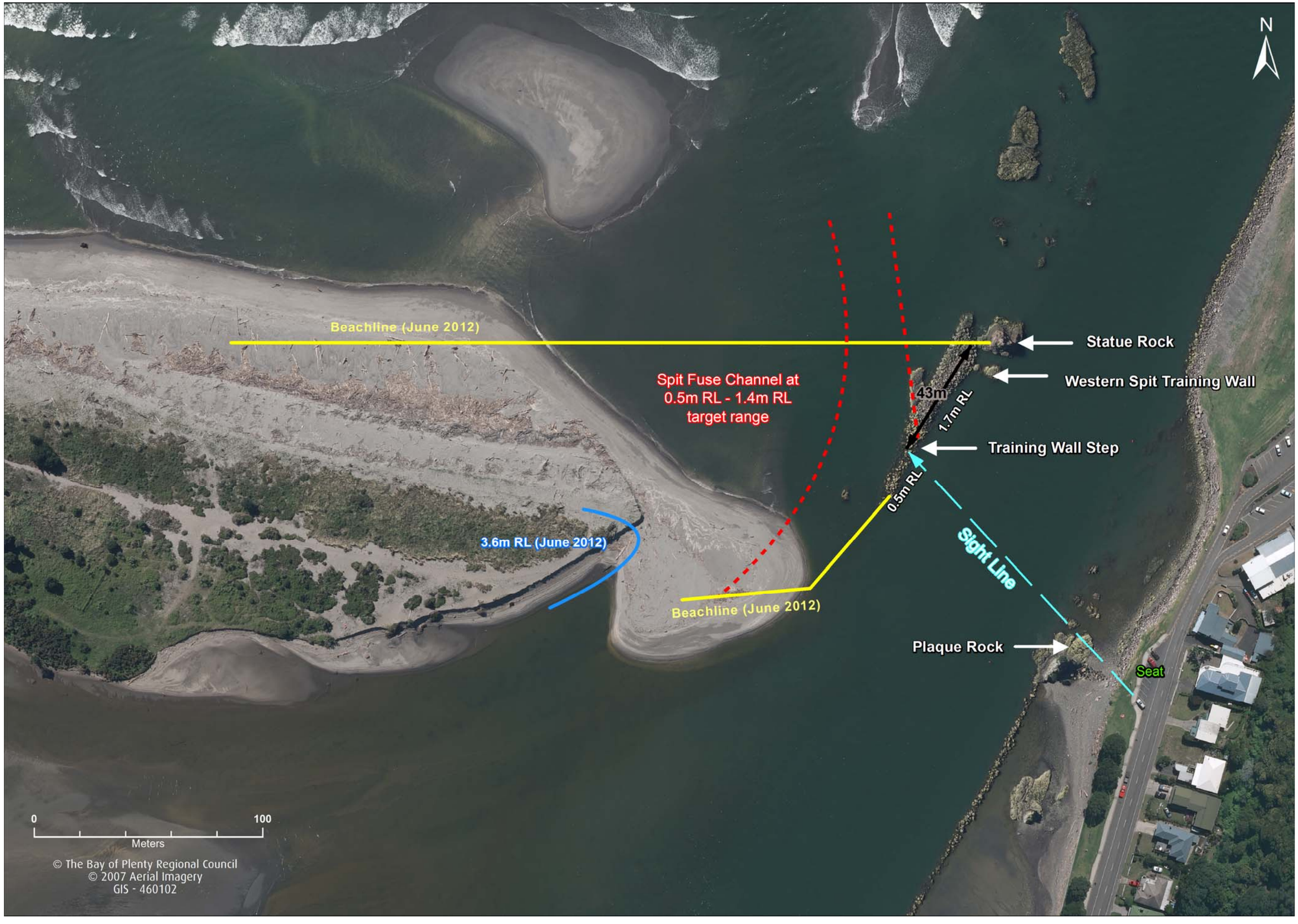

Figure 2 Western Spit Training Wall Step location details

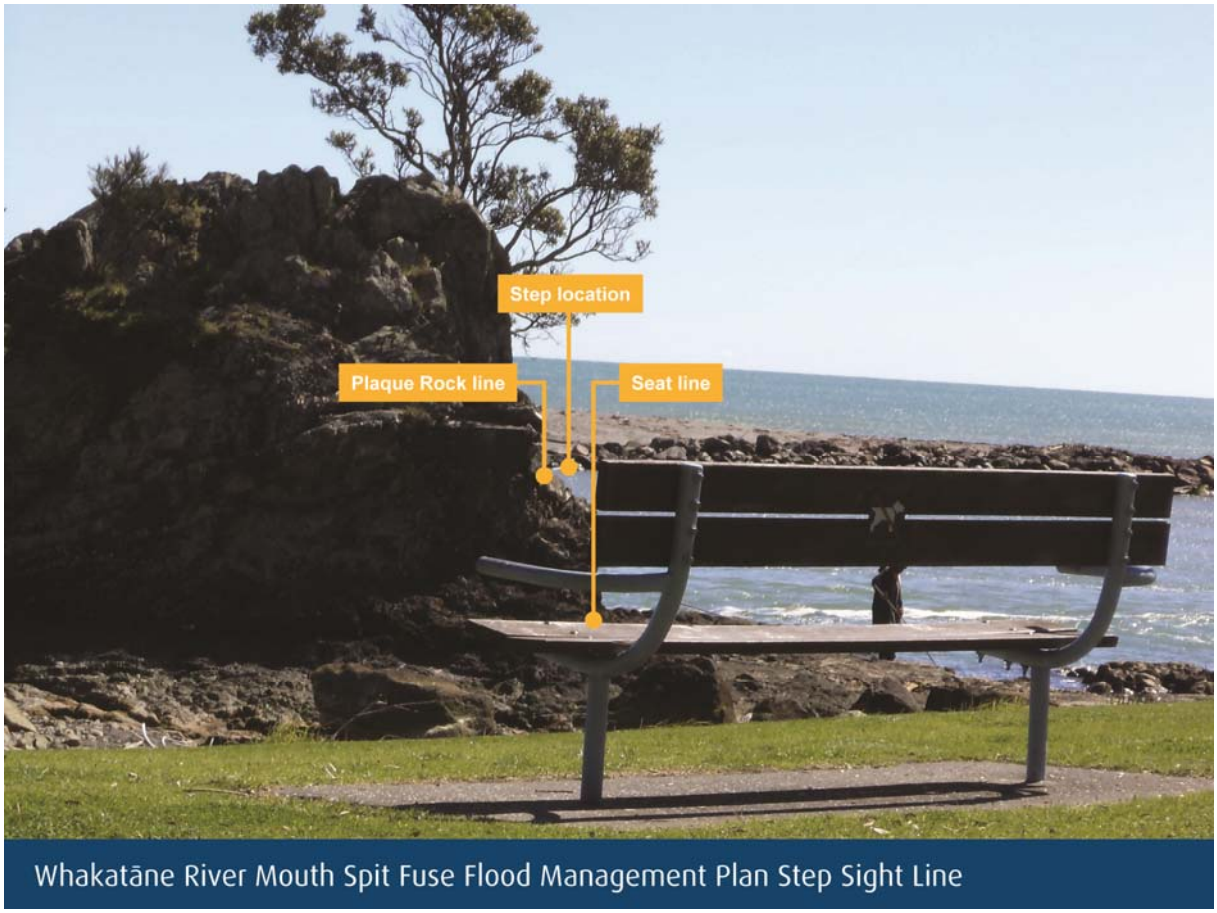

Figure 3 Western Spit Training Wall Step Sight Line Details

Figure 4 Survey Plinth location details

Figure 5 Survey Plinth at 21 Muriwai Drive location details

Figure 6 Survey Plinth at 27 Muriwai Drive location details

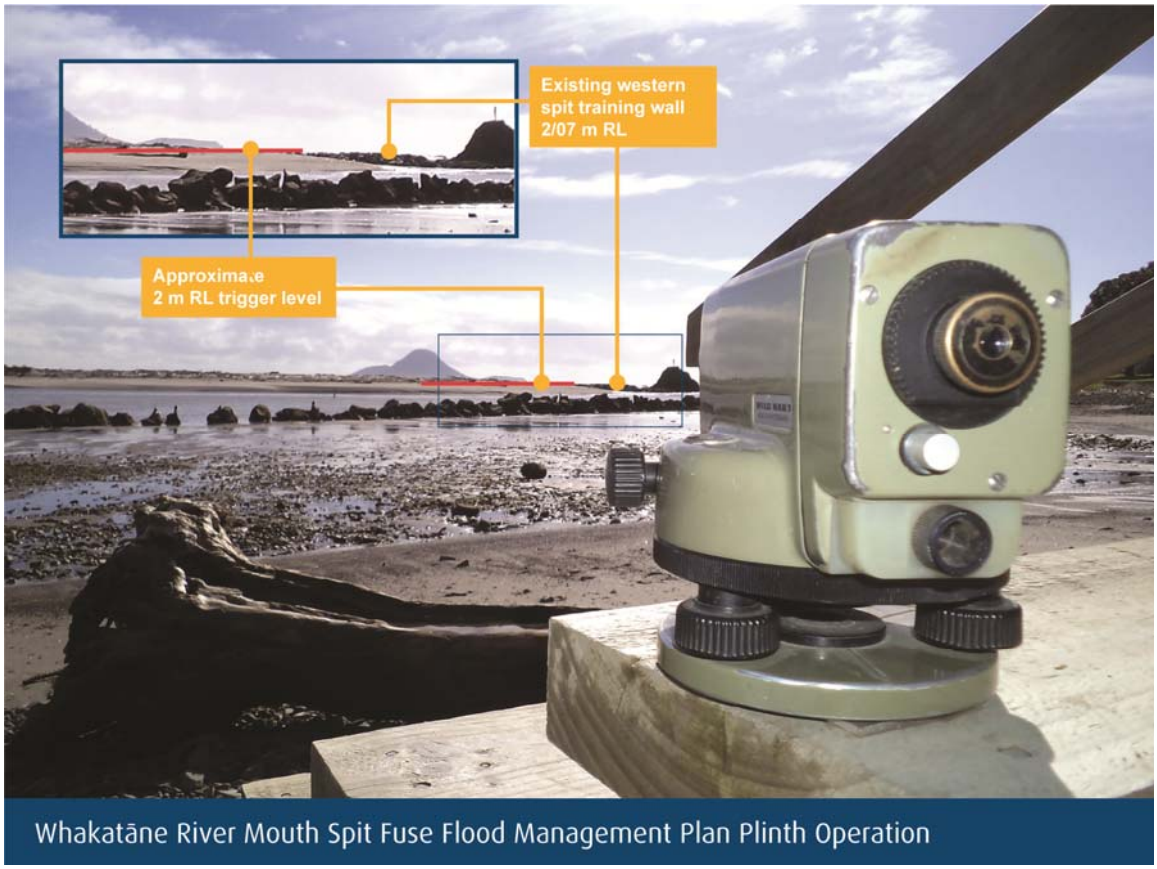

Figure 7 Survey Plinth operation details

Part 4: Responsibility

WDC have the responsibility to maintain the fuse-channel. This responsibility is defined under Condition Number 10 of Resource Consent Number 62893 for which WDC is the consent holder.

However, during the flood warning phase for the Whakatāne River system the BOPRC flood manager will work in conjunction with WDC to ensure that the spit has been prepared correctly.

Also both WDC and BOPRC will monitor sand build-up on the spit and liaise with regard to maintenance management requirements. It is WDC responsibility to undertake pre-emptive spit lowering construction works.

Part 5: Adaptive management

The proposed Whakatāne Spit Fuse Flood Management Plan will be monitored and refined as required. It is possible that refinements may be required depending on successes, failures and the dynamic nature of the Whakatāne River mouth. Also the outcome of the WDC Whakatāne River Entrance Improvement Project may create an entirely new river mouth configuration requiring a new flood management protocol.

WDC and BOPRC will monitor, liaise and refine this Plan as required.