



MEMORANDUM

TO EnviroWaste Services Limited

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FROM Golder Associates (NZ) Limited

DOCUMENT No. 1649508-013-M- Eel Trial

EEL TRIAL SUMMARY

PURPOSE & OBJECTIVES

A fish catch trial was undertaken at the Kopeopeo Canal (the Canal) on 22 and 23 May 2017. The objectives of the trial were to:

- Test net setting and retrieval.
- Determine indicative catch weights and numbers.
- Test two sedatives at various doses to achieve euthanasia (Aqui-S, and phenoxyethanol).
- Handling and storage of fish remains.

The trial was based at approximate NZMG coordinates 2857790E, 6353675N on the lower stop bank of the Canal, access was via Kope Canal Road. Present throughout the trial works was a field engineer and ecologist from Golder Associates (NZ) Limited (Golder), the skipper of the barge from Bay of Plenty Regional Council (BoPRC). Mahy Cranes Limited were sub-contractor to BoPRC for the trial. During the two day trial multiple stakeholders observed works including the EnviroWaste Services Limited (ESL) Project Manager, the nominated cultural monitor, independent monitors representative, and BoPRC staff/communications personnel.

METHODOLOGY

On Monday 22 May Golder staff identified and fenced off a works area on the lower stop bank for launch and net retrieval from the barge.

Setting of Nets

Early afternoon of 22 May, Golder staff and the BoPRC barge operator set out five New Zealand single-wing sampling fyke nets (Net 1 to Net 5) with 4 mm hex mesh, approximately 50 m apart, upstream (west) of the works area. A photo of the net setting is included in Figure 1. Four nets were baited with raw chicken parts and one net (Net 1) was left un-baited.

The nets were left overnight in the Canal and were retrieved between mid-morning to early afternoon on Tuesday 23 May.



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Figure 1: Setting of fyke net.

Retrieval of Nets

A holding tank was placed within the work area at the canal edge to receive the nets and was partially filled with canal water using a submersible pump. It was set on a polythene liner which was draped back into the canal to ensure any sediment and canal water dripping from the nets was directed back into the canal.

Because early catch estimates predicted potentially large catch volumes, part of the trial was to check methods for lifting full nets from the Canal. A crane was set on the vehicle track (Kope Canal Road) alongside the work zone to trial lifting a heavy net to the holding tank.

The first net (Net 5) to be checked for catch volume was closest to the work zone. As this net had a smaller than expected catch, this net was lifted by hand and the catch deposited directly into the holding tank by opening the cod end and bait cavity. The second net checked (Net 4) had a larger catch, so was lifted onto the barge and taken to the work zone, where the crane hook was attached to lift the net over the holding tank to release catch by opening the cod end and bait cavity (refer Figure 2). Because each of the two nets were opened directly above the holding tanks, individual sizes and types of fish captured in each of these nets were not recorded, and the data is presented combined for the two nets.

The holding tank contained 33 short-fin eel that were between 20 and 70 centimetres (cm) long in length. No long-fin eel were present. The majority of eels were in the range of 25 to 40 cm, with one small eel less than 10 cm.



Figure 2: Lifting of Net 4 into holding tank.

Effectiveness of Sedatives

The holding tank was dosed with AQUI-S (food grade aquatic anaesthetic used for handling and harvesting of fish, based on isoeugenol, or clove oil). The dose rate in the holding tank was 5 millilitres per cubic metre (mL/m³). The purpose of the holding tank was to sedate the fish prior to undertaking the euthanasia trials.

The eels showed no appreciable signs of agitation or stress when placed within the holding tank, and throughout the observation period (approximately one hour) showed what was considered to be normal behaviour, such as swimming, and evasion of capture when nets were placed within the holding tank. Approximately five small freshwater fish (inanga) under 10 cm long were netted from the sedation tank and released live into the canal, as they were sedated immediately and presented floating at the surface. Once returned to the canal, recovery was instant.

Effectiveness of Euthanising Process

Four 250 litre (L) drums were filled with approximately 100 L of canal water and the captured eels were netted from the holding tank and carried in plastic bags to be distributed more or less equally within these four drums (refer Figure 3). Initially two drums were dosed with different sedatives at concentrations expected to be approximately four times the upper recommended anaesthetic dose and timed to check effectiveness for euthanising the eels. Eels were checked at 10 to 15 minute intervals for responsiveness and respiration. Both sedatives provided similar responses in the eels, after 15 minutes the majority of the eels had lost their capacity to evade capture, although respiration was still evident in almost all eels. In both sedatives the smaller eels appeared to be less affected by the sedative.



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Figure 3: Trailer with 250 L drums used to euthanise fish species.

After one hour, only approximately 50 % of the eels in both drums were euthanised (judged by no visible sign of respiration or response to external stimuli).

Two additional drums (referred hereafter as the third and fourth drums) were dosed with approximately 10 times the recommended anaesthetic dose. After approximately 25 minutes, eels in drums three and four showed no evidence of respiration or response to external stimuli.

Table 1 summarises doses and types of sedative in holding tank and euthanising drums.

Table 1: Sedative concentrations.

Sedative	Holding tank sedation dose	Euthanasia drum initial dose	Euthanasia drum second dose
Aqui-S	5 mL/1,000 L	20 mL/1,000 L	40 mL/1,000 L
Phenoxyethanol	-	300 mL/1,000 L	600 mL/1,000 L



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Fish Volumes, Sizes and Disposal

The three remaining nets not used for the euthanising trial were manually lifted to the barge, where catch numbers, species and sizes were recorded before being released back into the canal. Net 2 and Net 3 yielded 25 and seven fish respectively, Net 1 (un-baited) caught no fish. Total catch yield over four baited nets was 70 fish, comprising 54 short-fin eel and 16 inanga. No long-fin eel were identified in the trial. A breakdown of the number of fish caught in each net is summarised in Table 2.

Table 2: Net catch yield and description.

Net 1 (un-baited)	Net 2	Net 3	Net 4	Net 5
Nil catch	6 inanga 8 small short-fin eel 11 medium-large short-fin eel	5 inanga 2 small-medium short-fin eel	5 inanga 33 short-fin eel (Catch combined)	

Eels from drums 1 to 4 were subsequently netted and taken down to the canal edge and placed on plastic sheeting to be measured. A record of the eel sizes was collected by BoPRC staff. Weights of eels were not recorded, an estimated weight of eels recovered from the holding tank (total of Nets 4 and 5) was approximately 5 kilograms (kg).

During the measuring process two eels (believed to have been in either drum one or two for approximately 90 minutes by that time) showed evidence of respiration, and after a few minutes were recovered and allowed to make their way back into the canal. The remaining captured eels showed no sign of recovery and were placed inside a sealed plastic bag with air excluded and transferred into a freezer at Golder's Auckland offices. These eels will be included in the pulverisation process at the containment sites at the commencement of the dredge works.

Waste Management

At the completion of the trial works the barge deck was washed down within the canal with canal water.

Holding tank water which contained a low dose of Aqui-S was transferred to an IBC on the trailer for hazardous waste disposal, along with the euthanising solutions in the four drums. Liquid wastes were disposed at the Chemwaste facility in Onehunga. All equipment from the site including site zone tape and stakes, ropes, nets, and tyvek suits and gloves were bagged for disposal at the ESL facility, Te Maunga.

TRIAL FINDINGS

The trial yielded the following findings:

- Use of barge worked well on the canal with no difficulty setting and retrieving nets.
- The catch volumes in nets were far less than predicted, estimated average catch (per baited net) of 15 eel and four inanga, equating roughly to an estimated 2.5 kg of fish.
- By mass, the catch was almost exclusively short-fin eel. No long-fin eel were identified in the nets.
- A crane is unlikely to be necessary for lifting netted catches to a sedative holding tank.
- The two sedatives trialled seemed to work similarly in terms of time taken for fish to respond. Dosing at approximately four times the recommended anaesthetic dose did not result in 100 % effective euthanasia even after approximately 90 minutes. Increasing the dose to 10 times the recommended anaesthetic dose completed euthanasia in under 25 minutes without apparent distress to fish.