ASSESSMENT 2

Lake Kate Sheppard:

An exemplar mahingā kai site?

GEO 402
Urban Development
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Lake Kate Sheppard is a man-made lake located in the East Burwood area of Christchurch. The basin of the lake was designed as a sediment trap for silt converted downstream from the Travis wetland catchment (Taylor & Blair, 2011). This lake was a spawning ground for inanga[1] and surveys in 2007 (Taylor & Blair, 2011) showed significant areas of inanga eggs in the shoreline. The seismic events of 2010 and 2011 had a considerable effect on the lake and surrounding area. Liquefaction and land movement caused severe damage to the local environment and severe damage to the residential areas to the west and east of the lake.

Environment Canterbury (ECan) commissioned a report (Taylor & Blair, 2011) to determine the effects on inanga spawning grounds on Christchurch City rivers. This report included Lake Kate Sheppard and identified that the inanga spawning ground within the lake had been severely damaged and restoration work was required. On 20 November 2013 a workshop was undertaken to develop an exemplar project that demonstrates how a mahingā kai project could be developed and what outcomes could be expected. This workshop was under the guidance of Te Rūnanga o Ngāi Tahu (TRONT), Ngāi Tūāhuriri, the Avon Otākaro Network and the Canterbury Waterways Research Centre. The authority for this was the Christchurch City Council's Natural Environment Recovery Programme for greater Christchurch with Project 17 status which is to "Act on the opportunities to restore and enhance Mahingā kai" with Ngāi Tahu (Ngā Papatipu Rūnanga and Te Rūnanga o Ngāi Tahu) as the lead agency. The objectives of this exemplar project are (Avon/Otākaro Network, 2014):

> To restore and re-develop a Mahingā kai in greater Christchurch to include recognition of cultural and heritage values, and restoration and enhancement of ecosystems, natural habitat, biodiversity, inanga spawning, pathway connections, storm water treatment, land drainage, food production and active and passive recreation.
>
> To implement a Mahingā kai exemplar project that could be applied to other ecological and recreational reserves along the Avon River/Otākaro and Heathcote River/Opāwaho corridors from the city to the sea.
>
> To use Anzac Drive reserve as an exemplar Mahingā kai site.

The purpose of this essay is to discuss what factors may be affecting inanga spawning within Lake Kate Sheppard and to define a way forward for the restoration of the lake as an exemplar mahingā kai site.

The project leads for this are TRONT, Ngāi Tūāhuriri and the Avon/Otākaro Network, however, the restoration of waterways involves multiple stakeholders and Figure 1 shows the extent of these, some additional community groups and schools are also involved in this project.

The methodologies used for this

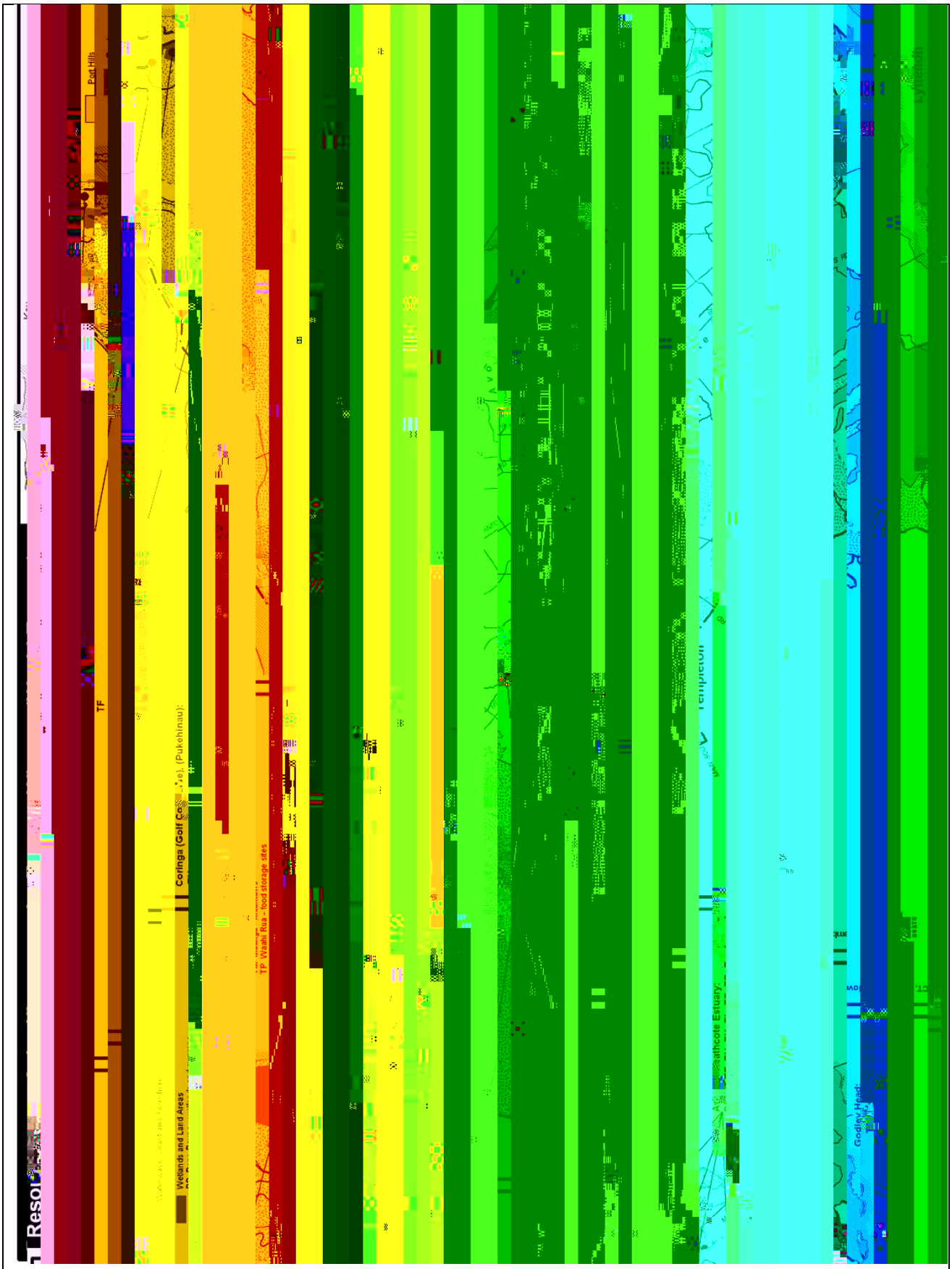


Fig 2. Resource areas of significance. (CCC, 2014)

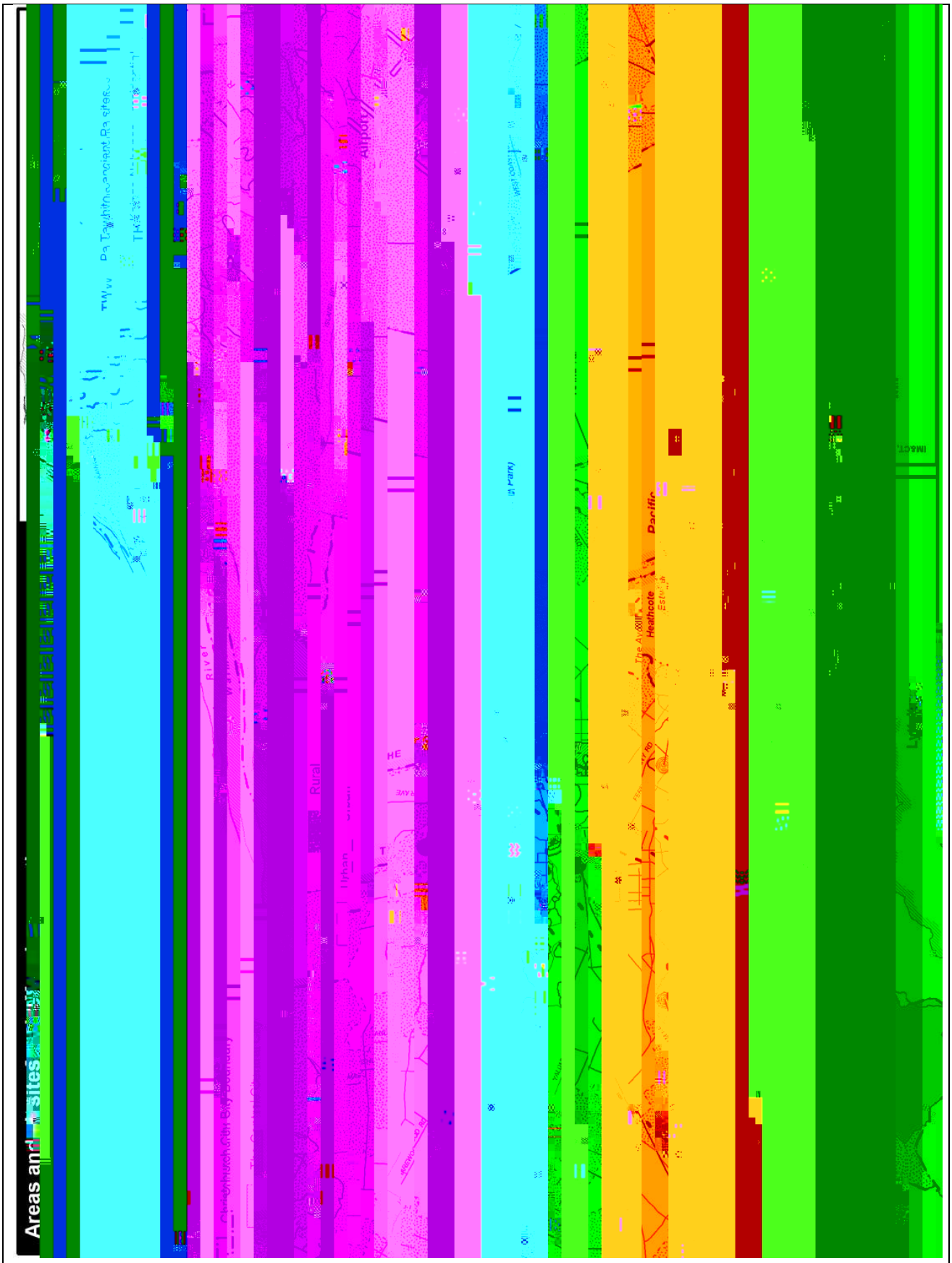


Fig 3. Areas and sites of early Māori occupation. (CCC, 2014)

The physical layout of Lake Kate Sheppard is shown in Figure 4 with key aspects annotated in the key.

The Canterbury Earthquake Recovery Authority (CERA) has graded the residential areas to the west and east of Lake Kate Sheppard as Red Zone properties. Residential property which has been zoned red is so badly damaged by the earthquakes it is unlikely it can be rebuilt on for a prolonged period and properties within this zone are removed or demolished leaving vacant areas.

The criteria for defining areas as residential red zone are:

there is significant and extensive area wide land damage;
the success of engineering solutions may be uncertain in terms of design, its success and possible commencement, given the ongoing seismic activity; and
any repair would be disruptive and protracted for landowners.

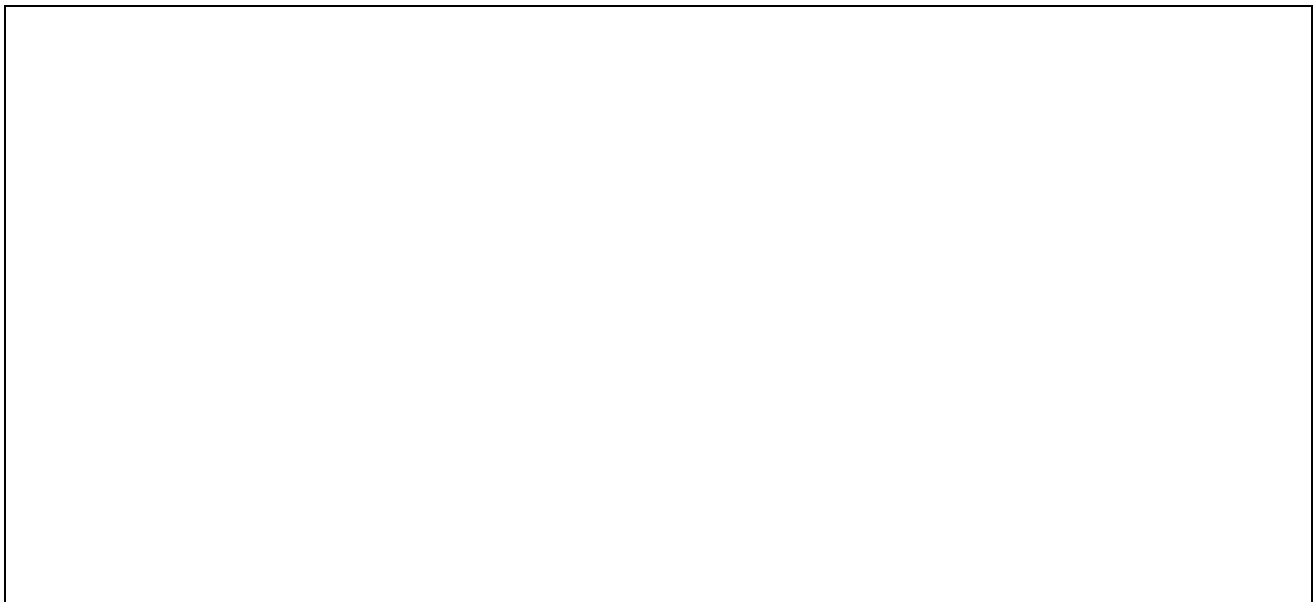
As this land will become vacant it should be included within the scoping of Lake Kate Sheppard as significant storm water runoff will flow from these areas towards the lake. The area to the west of Anzac Drive could be utilised as a storm water detention/treatment area to cater for stormwater run-

untreated. It directly flows into streams, rivers, and finally estuaries and the sea. As mentioned earlier, the land level in Lake Kate Sheppard has settled since the earthquake. This causes stormwater runoff from the surrounding area to readily flow into the lake and is shown in Figure 7. The red arrows represent the stormwater runoff from residential area and the blue arrow represents the stormwater runoff from Anzac Drive and surrounding roadways.

Fig 7. Probable stormwater runoff flow direction.

Usually, stormwater carries a large number of contaminants which are collected on the road and grassland. These contaminants include littered solid rubbish, such as broken glass, cigarette butts, packing paper; and heavy metals from vehicles, roofs and roads.

upon the lake. The differences include water flow rate, water flow velocity, turbidity/clarity, water quantity (water level). After the



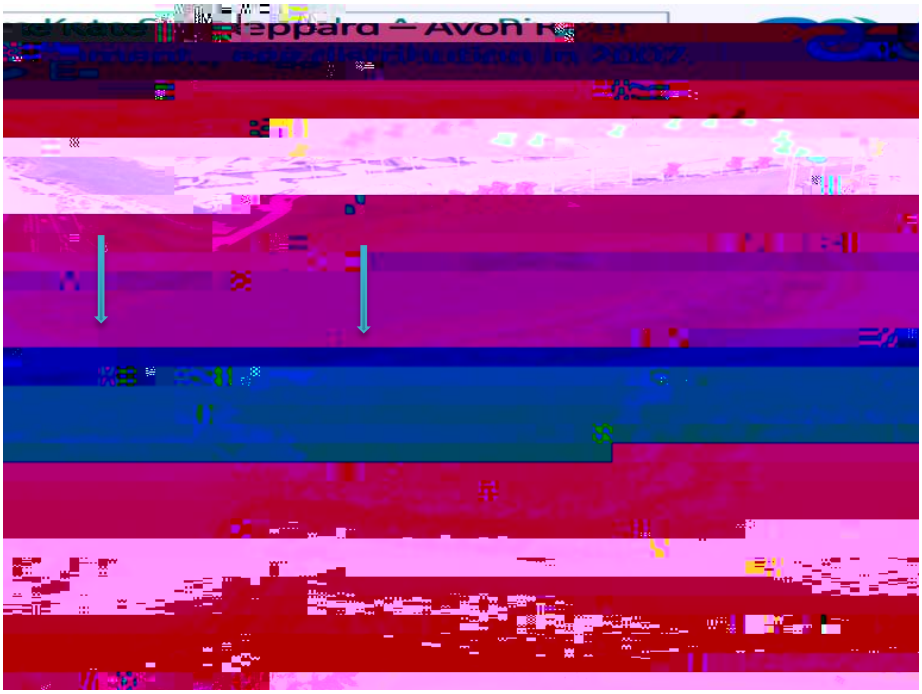


Fig 14 Pre and post-earthquake aerial view of Lake Kate Sheppard showing different water colour and a shelf/ledge around the lake in the top view which is missing the bottom view.

The seismic events of 2010 and 2011 also had major effects on the structure of the banks and the shoreline plantings. The liquefaction not only placed significant amounts of silt through the plants but also damaged large areas of plants. A comparison of the shoreline for pre and post seismic events can be seen in Figures 15 and 16. Remedial action needs to be completed to replace/restore the shoreline planting to provide a suitable habitat for inanga to lay their eggs. This needs to cater for a mean water level and the plants chosen require some resilience for the fluctuating water level from high water events, tidal surges and flooding as well as low water events. Planting should also incorporate plants to reduce the impact of Canadian geese and the residue that they create as this can be prolific and further reduce water quality.

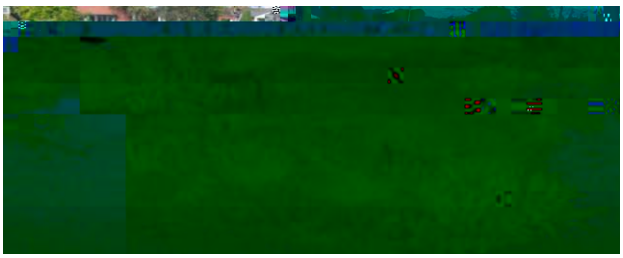


Fig 15. Shoreline pre earthquake

Fig 16. Shoreline post eartquake

An observation on the eastern side of the lake shows that the lack of flow within the lake in Mar

2014 created a buildup of surface matter which may not be conducive to healthy water (Figure 17).

Fig 17. Eastern side of lake with surface growth on 22 Mar 14.

A comparison of this location between Mar and May 2014 can be seen where there is no surface matter in Figure 18 and the brown sludge has gone. The surface matter has been flushed as a result of heavy rain. This requires to be monitored to rule out algae bloom and any potential negative elements.

Fig 18. High water level with surface scum flushed.

set with current conditions.

There is the requirement to establish a robust water monitoring programme which includes testing

Bibliography

Avon/Otakaro Network. (2014, June 1). Retrieved June 12, 2014, from Avon/Otakaro Network: http://resources.ccc.govt.nz/files/EnvironmentalTrends2003-docs.pdf

CCC. (2014, Jun 12). Retrieved from Cityplans.ccc.govt.nz: http://www.cityplan.ccc.govt.nz/NXT/gateway.dll?f=xhitlist$xhitlist_x=Advanced$xhitlist_vpc=first$xhitlist_xsl=objectlink.xsl$xhitlist_sel=title;path;content-type;home-title$xhitlist_d={CCCPLAN}$xhitlist_q=[field folio-object-name:'Maorisitesv25490Screen'

CCC. (2014, Jun 12). Retrieved from Cityplans.ccc.govt.nz: http://www.cityplan.ccc.govt.nz/NXT/gateway.dll?f=xhitlist$xhitlist_x=Advanced$xhitlist_vpc=first$xhitlist_xsl=objectlink.xsl$xhitlist_sel=title;path;content-type;home-title$xhitlist_d={CCCPLAN}$xhitlist_q=[field folio-object-name:'Tangwhv25290Screen']$xh

council, e. c. (n.d.). christchurch: environmental canterbury regional council.

Ellin Spenser Port Blakely Mill Company. (1993, September). Unites States: United States Environmental Protection Agency.

environmental canterbury regional council. (n.d). christchurch: environmental canterbury regional council.

Environmental Canterbury Regional Council. (n.d). christchurch: Environmental Canterbury Regional Council.

Environmental Trends Monitoring Group. (2003, June 1). Retrieved June 12, 2014, from Environmental Trends Monitoring Group: http://resources.ccc.govt.nz/files/EnvironmentalTrends2003-docs.pdf

MAYORAL FLOOD TASKFORCE. (2014). christchurch: christchurch city council.

Ngai Tahu. (2014, Jun 12). Retrieved from Ngaitahu.iwi.nz: http://ngaitahu.iwi.nz/ngai-tahu/the-settlement/settlement-offer/cultural-redress/ownership-and-control/mahinga-kai/

Tau, T., Goodall, A., Palmer, D., & Tau, R. (1990). Christchurch, NZ: Aoraki Press.

Taylor, M. J. (2004). Christchurch: Aquatic Ecology Limited.