Department of
Environment and Conservation

Bellevue

COMMUNITY UPDATE

Work continues to determine the most effective clean-up options for the former liquid waste treatment and recycling facility at Bellevue. As the contamination is complex, extensive investigations are necessary to develop the most appropriate remedial strategy for the site.

Background

Detailed investigations have confirmed that soil and groundwater at the Bellevue site is contaminated with petroleum hydrocarbons and chlorinated solvents. Groundwater contamination extends for about 200 metres beneath several properties south-west of the site. Contamination can be attributed to both historical site operations and a fire in 2001.

A second, unrelated, off-site plume has also been detected. The general direction of contaminated groundwater movement is towards the Helena River.

On-site investigations and trials, combined with laboratory studies, are being used to determine the best way of cleaning up the site. These works are being carried out by the Department of Environment and Conservation's (DEC) consultants, Golder Associates (Golder).

Bellevue Community Consultative Committee (BCCC) Workshop 5

Golder presented the off-site remediation plan to clean up Bellevue's off-site groundwater plume to stakeholders at a workshop on 17 June 2009.

Two permeable reactive barriers (PRBs) will be built by excavating parallel trenches, approximately 75 metres long, in the path of the contaminated groundwater. These will then be filled with treatment materials – sawdust in one to deal with the nitrates in the groundwater and an iron/sand mix in the second to treat the chlorinated solvents.

The permeable barriers act like sieves, allowing groundwater to flow through. The treatment materials interact with the harmful chemicals, changing them into harmless ones, and clean groundwater flows out the other side.

Once installed, the PRBs will not be seen above ground and there is no operation of pumps, machinery or plant required that might be disruptive to the local community and surrounding businesses.

Construction of the permeable reactive barriers

The PRBs will most likely installed using a caisson construction method. This involves driving a steel tube about 9 metres into the ground and excavating the soil within. The empty caisson will be filled with sawdust or the iron/sand mix as appropriate. The steel tube will then be pulled out and the process repeated.

Excavated soil and any groundwater draining from the soil or pumped out from the caissons will be treated as being potentially contaminated and will require testing before disposal off-site. There will be appropriate measures in place to protect workers, the surrounding community and the environment.

PRB construction with secant caisson and filling of caisson with iron/sand mixture. *Courtesy of ETI.*

The BCCC was asked to consider potential areas of impact on the community and the environment and present any concerns so they could be taken into account in the final construction plan.

Preparatory works are underway so that the PRBs can be built between January and March 2010 when the site is most accessible to the heavy equipment required for the construction work.

What's happening now?

LandCorp has been appointed by DEC to manage the installation of the PRBs.

Additional works have been carried out in order to finalise the PRB design for optimum efficiency and effectiveness including:

- geotechnical investigation of the PRB footprint area; and
- laboratory testing of a range of sawdust and woodchips to identify the most suitable materials for the PRB to treat nitrates.

As conditions are very wet in the damplands in winter and early spring, an access ramp was built to allow the drilling rig to access the PRB footprint area.

On-site (source) clean up

Golder has carried out a number of on-site investigations and laboratory-based studies in an effort to determine the best way to clean up the source site at Bellevue.

Initially, *in situ* (in ground) chemical oxidation (ISCO), which involves injecting chemical oxidants into the ground to destroy the contamination, appeared to be the preferred remediation method. However, when ISCO was trialled on-site earlier this year, it was found to be suitable for treating contamination in the more permeable, sandy soil but not a viable way to deliver either gas or liquid oxidants into Bellevue's middle sandy clay zone.

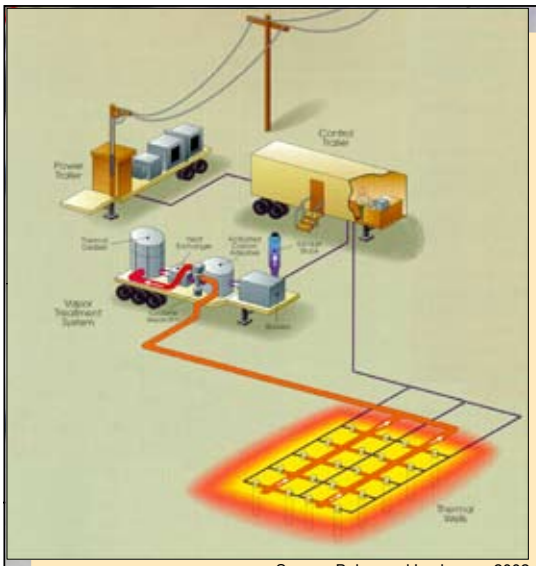
Thermal conductive heating is now being considered as an alternative clean-up option for the on-site contamination at Bellevue. This involves heating the contaminated soil through vertical steel wells. As the soil is heated, chemicals in the soil and groundwater are vapourised.

Given sufficient heating, most of the contamination (more than 95 per cent) is destroyed as the vapours pass through the superheated soil. Remaining vapours and gases are collected by extraction wells and piped to equipment on the ground surface for cleanup.

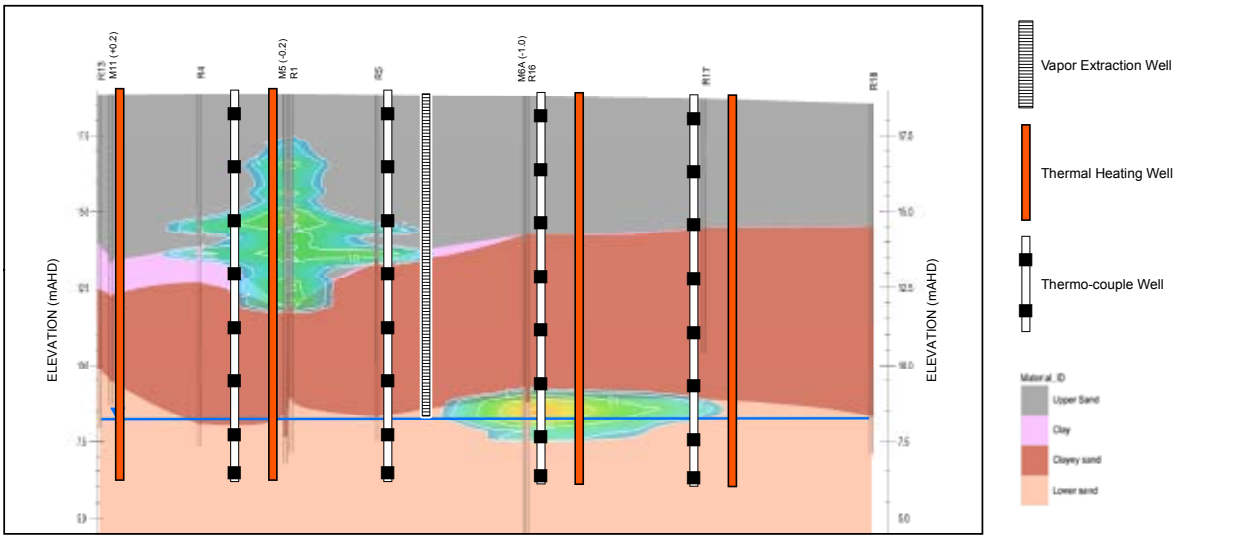
Thermal treatment methods are particularly useful for targeting contaminants held in clays and silts similar to the soils at Bellevue. The heat causes the soil to dry and crack, releasing the contamination.

Image courtesy TerraTherm

Once the heating and extraction wells are installed, the surface of the site is sealed to keep the heat in, the rainwater out and prevent the release of vapours.The seal also prevents generation of any surface dusts.



Source: Baker and Lachance, 2002



CLIENT	Department of Environment and Conservation
PROJECT	087643011 078 R REV0
DATE	Jul 2009
DRAWN	SR
APPROVED	

Thermal Heating Well
Vapor Extraction Well
Thermo-couple Well

Wells

AQUIFER TYPE

Base of Guildford
Guildford (Regional)
Shallow

TEST LOCATION

MIPS
ROST
Core Hole
Contaminated Zone
Site Boundaries
Cadastre

Former Waste Control Site, Bellevue

SCHEMATIC LAYOUT OF THERMAL OPTION

DRAFT

Figure **6**

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Contamination not destroyed by the heat treatment within the soil will be removed from the extracted vapour in the above ground air quality control system. Used in conjunction with the conductive heating, this system may include carbon beds, thermal oxidizers, a heat exchanger, discharge blowers and a continuous emission monitoring system.

Pilot test

Golder will be carrying out a thermal conductive heating trial at Bellevue. This will involve installing a single cell thermal well system with five or six heater wells surrounding a single vapour extraction well. Temperature monitoring wells will be installed at various depths, inside and outside the cell.

The cell will be installed in an uncontaminated area so vapour risks are minimised. Gas treatment at the surface will be carried out as a precaution only.

Monitoring the Helena River

Trace levels of the chlorinated solvent trichloroethene (TCE) were discovered for the first time in the April 2009 groundwater monitoring of the Helena River. The levels detected were low – well below human health and ecological guideline levels. Re-sampling in June 2009 did not detect chlorinated solvents in the river, however, a trace of TCE was found at one location in water obtained from a river sediment sample. The river will continue to be monitored and new groundwater monitoring wells installed, to track contaminant levels.

New information sheets online

Two new information sheets have been posted to the Bellevue webpage **http://www.dec.wa.gov.au/bellevue**

Assessing the risk – describes the human health and ecological risk assessment that has been carried out at the former Bellevue Waste Control Site and neighbouring properties.

Groundwater monitoring – describes the ongoing monitoring work at the site, including surrounding properties and the Helena River.

Contaminated Sites Hotline 1300 762 982