

Report summary: Clovelly Park Mitchell Park Environmental Assessment

Objectives of the assessment program

- To determine the nature and extent of TCE in groundwater within the assessment area.
- To identify potential sources of TCE contamination within the assessment area.
- To determine the nature and extent of the TCE in soil vapour within the assessment area.
- To use site-specific data to undertake vapour intrusion modelling and risk assessment for TCE in the assessment area.
- To obtain sufficient information to manage the groundwater contamination via a Groundwater Prohibition Area, including a buffer zone, by the EPA in accordance with the *Environment Protection Act 1993*.

Trichloroethene (TCE)

TCE was widely used by industry as a solvent for degreasing and metal cleaning prior to the 1990s. At this time, its potentially harmful effects on human health and the environment were recognised. TCE use was then phased out in favour of less harmful chemicals.

The EPA assessment area

- The Clovelly Park Mitchell Park assessment area is 123.6 hectares in size.
- There are approximately 1400 properties (including vacant properties and reserves) in the assessment area.
- The assessment area is bounded by Main South Road to the east and south-east, Alawoona Avenue and the former Mitsubishi Motors Australia (Mitsubishi) property to the north, Sturt River to the west and Sturt Road to the south.

Industrial sites in the assessment area

Three areas of existing/former industrial land use have been identified within the Assessment Area:

- The current Monroe site, previously owned/operated by WH Wylie, has been used to manufacture motor vehicle parts since the 1950s.
- The former Mitsubishi site was used to manufacture motor vehicles from the early 1960s until 2009. The site was sold in 2010 and is currently being redeveloped by the South Australian Government (Renewal SA).
- An area of land to the west of the Monroe property and south of the Mitsubishi site was owned/occupied by Reckitt and Colman, a chemical manufacturer, from 1963 to 1969. It was then purchased by Chrysler Australia Limited (which later became Mitsubishi).

Soil conditions

are similar across the assessment area and are dominated by Hindmarsh Clay.

Hindmarsh Clay is predominantly mottled red brown, yellow brown and grey, heavy clay but it often contains pockets or “lenses” of sandy, silty, or gravelly materials.

Fractures and voids in the clay

do not have a significant influence on upward vapour migration.

The **sand and gravel lenses** also do not influence upward vapour migration but could be enabling some sideways vapour movement in Clovelly Park.



Groundwater depth

across the assessment area ranges from 9 -13 metres below ground level. The flow direction is in a west to north-westerly direction.

All wells were installed within the same aquifer. Salinity levels of 400 - 13,100 milligrams per litre were found (this is quite “salty”).

Scope of work

The program of works in the assessment area took place between August and November 2014 and included the following:

- Installation of 34 groundwater wells – locations included roadways, council verges, reserves and the relocation area.
- Sampling of 66 groundwater wells, including new and existing wells. 7 wells were dry and could not be sampled.
- Installation of 171 soil vapour probes at 103 locations at depths between 2 and 10 metres below ground level. These included individual, clustered and nested probes (a set of probes close to each other, at varying depths). Locations included suburban streets, council verges, reserves, service trenches associated with stormwater and sewer mains, vacant residential properties within the relocation area and the Tonsley rail corridor.
- Sampling of 135 soil vapour probes for TCE and other contaminants (36 probes could not be sampled as the clay was “too tight” to allow air movement).
- Drilling of 25 soil bores to a depth of 6 metres below ground level within the relocation area and the southern part of the former Mitsubishi site. Soil samples at a range of depths were collected from each bore.
- Analysis of selected soil samples from soil bores, groundwater monitoring wells and soil vapour bores.
- Passive indoor and outdoor air sampling to support the modelling results:
 - Indoor air sampling in selected rooms at 4 and 6 Ash Avenue and 4, 9, 15 and 16 Chestnut Court,
 - Outdoor air sampling (backyards of houses and in reserves) at 4 Ash Avenue, 4, 15 and 16 Chestnut Court, Chestnut Court Reserve (Clovelly Park) and Harken Avenue Reserve, (Mitchell Park).
- Hydrogeological (aquifer) testing of 20 monitoring wells to better understand groundwater movement (11 tests were successfully completed).
- Collection of soil samples from four additional locations for geotechnical analysis.

Key findings - groundwater and soil

Groundwater modelling

Groundwater modelling indicates the TCE is expected to move with the groundwater flow direction towards the Sturt River. Further information on the hydrogeology is needed to better understand the movement of the contaminant plume in groundwater.

The modelling assumes the industrial areas of Clovelly Park continue to be an on-going (diminishing) source of the TCE.

The EPA is likely to use this information to establish a groundwater prohibition area (where groundwater cannot be used for any purpose) in accordance with the provisions of the *Environment Protection Act 1993*.

TCE was commonly encountered within groundwater across the assessment area. Four separate source areas have been identified.

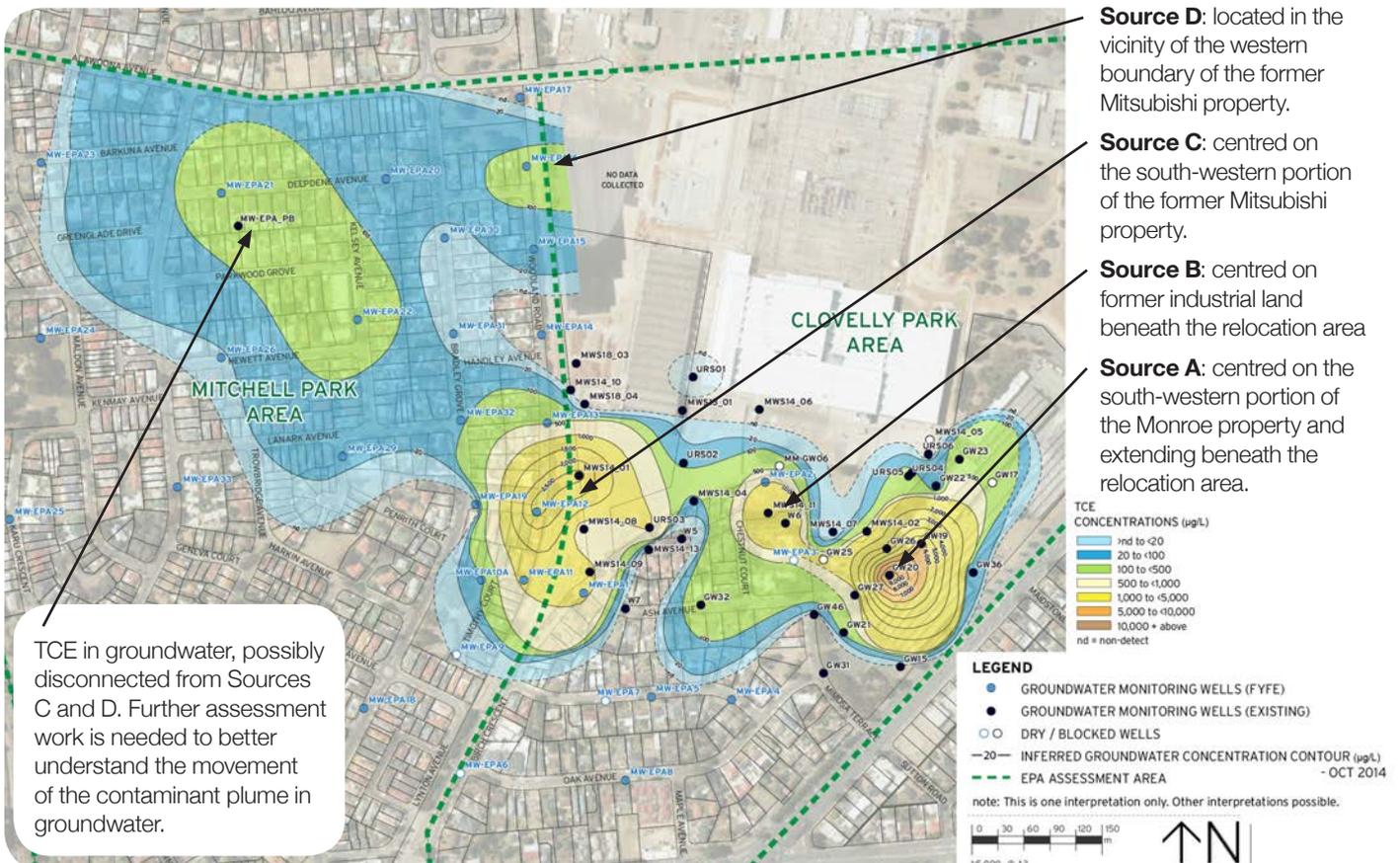
Plume movement appears to be in the same general west to north-westerly direction as groundwater flow. The plume has extended beneath adjacent residential areas of both the Clovelly Park and Mitchell Park areas.

The majority of the TCE in soil vapour appears to have come from groundwater as the concentration of TCE in the soil vapour increases with depth.

The soil testing results did not identify any detectable concentrations of TCE within the Assessment Area. This is likely to be due to the age and breakdown of the TCE.

Groundwater TCE concentrations

Four separate groundwater TCE sources have been identified as shown on the map.



TCE in groundwater, possibly disconnected from Sources C and D. Further assessment work is needed to better understand the movement of the contaminant plume in groundwater.

Key findings - soil vapour

The Vapour Intrusion Risk Assessment (VIRA) involved a two-stage approach. Tier 1 compared the measured soil vapour TCE concentrations to an adopted guideline value (an agreed level based on the ASC NEPM to provide protection of human health). The Tier 2 risk assessment applied the US EPA (2004) Johnson and Ettinger vapour intrusion model to predict indoor air TCE concentrations for residences in the assessment area identified at the Tier 1 risk assessment stage as being above the guideline value.

The predicted indoor air TCE concentrations were then assessed against the indoor air response ranges developed by the EPA and SA Health.

Outside of the relocation area, the following results were found:

- One residential property on Ash Avenue, Clovelly Park: 2 to less than 20 micrograms of TCE per cubic metre ($\mu\text{g}/\text{m}^3$) predicted indoor air response level.
- Two residential properties on Mimosa Terrace, Clovelly Park: nothing detected to less than 2 $\mu\text{g}/\text{m}^3$ of TCE predicted indoor air response level.
- 14 residential properties along Woodland Avenue, Mitchell Park: nothing detected to less than 2 $\mu\text{g}/\text{m}^3$ of TCE predicted indoor air response level.

The predicted levels of TCE in indoor air for the remaining properties in Clovelly Park and Mitchell Park areas correspond to the safe (nothing detected) predicted indoor air response level.

Concentrations of TCE within soil vapour at sub-slab locations on Chestnut Court and Ash Ave were also consistent with those obtained from road verges and reserves elsewhere within the relocation area, further verifying the modelling results.

Passive indoor and outdoor air sampling showed consistent outcomes between the predicted indoor air concentrations from the VIRA modelling and the measured indoor air concentrations. This supported the computer modelling results.

There is a strong link between the shape of the groundwater TCE plumes and the location of the soil vapour concentrations.

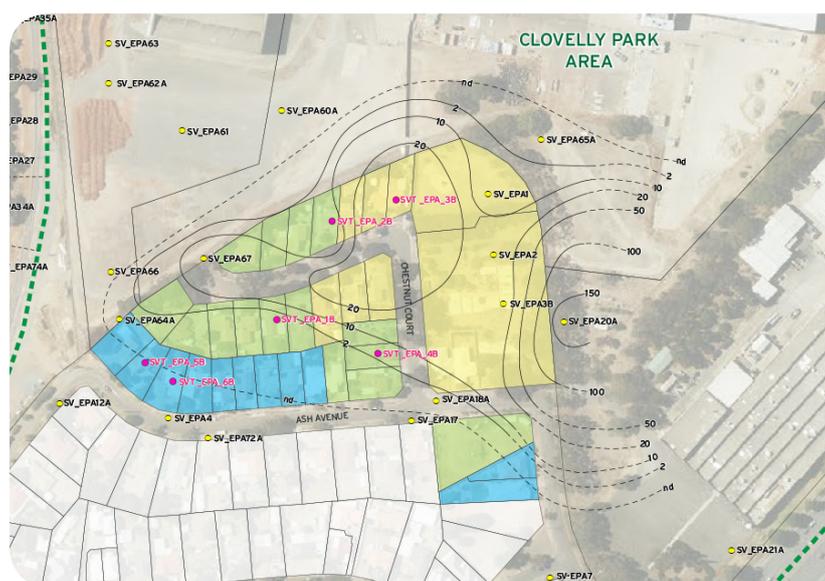
Soil vapour concentrations generally increase with depth through the soil, further indicating that groundwater is the primary source of the TCE.

Concentrations closer to the ground surface are generally much lower than they are at depths of 8 to 10 metres.

There were higher soil vapour concentrations reported within the Monroe area at shallower depths that are potentially due to the combined effect of shallow soil impacts as well as underlying groundwater.

Soil vapour investigations along sewer and stormwater mains have identified the associated service trenches are not significant preferential pathways for soil vapour migration.

Relocation area results



The results for predicted indoor air concentrations of TCE within the Clovelly Park relocation area indicated the following:

- Six residential properties: 20 to less than 200 $\mu\text{g}/\text{m}^3$ of TCE response level.
- 14 residential properties: 2 to less than 20 $\mu\text{g}/\text{m}^3$ of TCE response level.
- Nine residential properties: non-detect to less than 2 $\mu\text{g}/\text{m}^3$ of TCE response level.

