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**SOIL INVESTIGATION AT  
FORMER LIGHTBURN FACTORY IN  
NOVAR GARDENS, SOUTH AUSTRALIA**

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*MAY 2008*



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former Lightburn factory in  
Novar Gardens, South Australia**

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# EXECUTIVE SUMMARY

## Background

Lightburn and Co Ltd (Lightburn) operated at a site on Morphett Road in Novar Gardens from 1946 to 1986, manufacturing a variety of products. As a result of these activities, 'prescribed wastes' comprising paint residues (nitrocellulose), perchloroethylene (PCE) and kerosene were produced, for which Lightburn was issued a licence by the South Australian Waste Management Commission, under the now repealed *Waste Management Commission Act 1979*.

Following a review of the Waste Management Commission files held by the Environment Protection Authority (EPA) in January 2006, it was discovered that a portion of the area of land previously occupied by Lightburn was not flagged to the Land Title Office (LTO) for notification that the land had previously been used for a licensed activity, under the requirements of the Regulations under the *Land and Business (Sale and Conveyancing) Act 1994* (LBSC Act).

Based on this information, the EPA considered that further investigation of this matter was warranted, through site history and targeted soil sampling works.

## Soil Investigations

### *Stage 1*

Initial (Stage 1) soil investigation works were undertaken by the EPA in August 2006, and comprised the drilling of 13 soil bores (BH01–BH13) on council land (footpaths and road verges) across the former Lightburn site areas where any potential disposal of the prescribed wastes would most likely have occurred. Selected samples were analysed for nitrocellulose, PCE and Total Petroleum Hydrocarbons (TPH) as a screening tool for kerosene.

Nitrocellulose was not identified in any samples.

Kerosene was not detected in any samples. One sample, collected from the council-owned footpath in Henning Court, was found to contain degraded mineral lubricating oil, which was not listed as a prescribed waste on the site.

One sample corresponding with surface fill material situated in a flora bed at the end of a cul-de-sac contained a small concentration of PCE.

The Department of Health (DH) determined that the level of PCE detected in the one road verge sample did not pose a toxicological concern to residents, and with regards to the mineral lubricating oil, the investigated area did not pose an unacceptable risk to residents. In order to provide an additional level of certainty to the community however, it was decided by the EPA and DH that additional sampling targeting both chemicals was warranted.

### *Stage 2*

Stage 2 soil investigation works were undertaken by the EPA in March 2007. Investigations comprised the drilling of surface and near-surface fill material in the cul-de-sac and road verge areas at eight locations (BH14–BH21) in order to further characterise fill materials where PCE had previously been identified; and drilling from surface into natural soils at six locations (BH22–BH27), to delineate the extent of TPH previously identified in the footpath of Henning Court.

PCE was not detected in any samples.

TPH results indicated that the lateral extent of hydrocarbons had been restricted to the council footpath within 8 Henning Court in the northern and southern directions; the roadway

(Henning Court) in the western direction; and the council footpath, adjacent to 26 and 28 Bartlett Drive in the eastern direction. As drilling was restricted to council-owned footpaths, it could not be determined if hydrocarbon impacts extended into properties in the eastern direction (8 Henning Court and 26 Bartlett Drive). The vertical extent of TPH impact was restricted to depths below approximately 0.6 m.

## **Conclusions**

Nitrocellulose was not identified in any samples in the Stage 1 investigation.

No PCE was identified in the Stage 2 investigation. Consequently, based on the August 2006 and March 2007 results, DH determined that identified PCE in the road verge material did not pose an unacceptable risk to Novar Gardens' residents.

TPH impact was restricted to depths greater than 0.6 m, and was not volatile in nature. Lateral impacts were delineated to council footpaths and Henning Court roadway (ie outside of property boundaries) in the northern, southern and western directions. With regards to the eastern direction, it was determined that TPH impacts did not extend beyond Bartlett Drive. Although unlikely, some potential did exist for impacts to extend beneath 8 Henning Court and 26 Bartlett Drive. The EPA and DH have been in contact with the owners of these two properties to offer assistance, should they wish to investigate this matter further.

Based on the results of the EPA soil investigation, it was determined by EPA and DH that no more investigations were warranted.

Any questions relating to this investigation should be directed to the EPA Site Contamination Branch on (08) 8204 9934.

## INTRODUCTION

This report presents the methodology, results and findings of soil investigation works undertaken by the Environment Protection Authority (EPA) on a portion of land in Novar Gardens, South Australia (Figure 1).

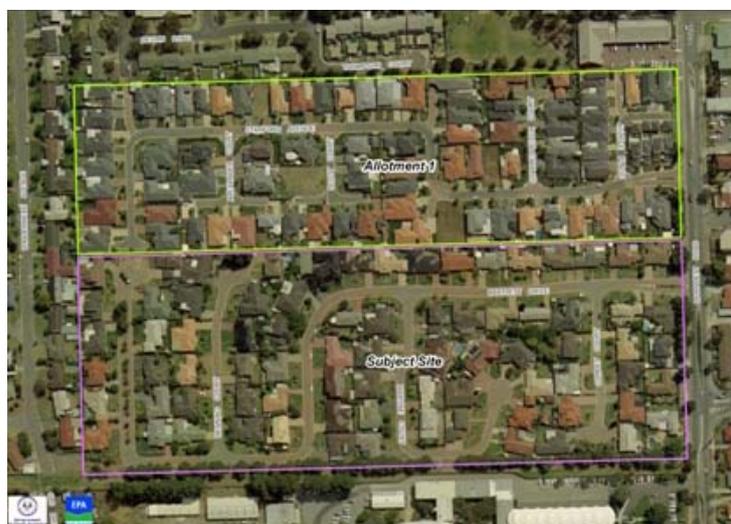


Figure 1 Novar Gardens site location plan

### Background

Lightburn and Co Ltd (Lightburn) operated a site on Morphett Road, Novar Gardens from 1946 until 1986. During this time it manufactured a variety of products including washing machines and small motor vehicles.

Between 1981 and 1986, Lightburn was issued with a licence by the former South Australian Waste Management Commission (SAWMC) under the repealed *Waste Management Commission Act 1979* for the production of certain 'prescribed wastes' at the site. Copies of the most recent licences for the site (3/5/1984–2/5/1986) are attached as Appendix A.

This area of land (subject site) was developed for residential use in the late 1980s.

In January 2006 following a review of SAWMC files held by the EPA it was discovered that a portion of the Lightburn site was not flagged to the Land Title Office (LTO) under the requirements of the Regulations under the *Land and Business (Sale and Conveyancing) Act 1994* (LBSC Act).

The EPA has a statutory obligation under the LBSC Act to provide a variety of information relating to the history of land which includes whether a licence to produce waste of a prescribed kind was ever issued under the repealed South Australian Waste Management Commission Act. As the site was not flagged to the LTO, it was not possible to provide information under the above-mentioned requirements.

A total of 79 residential premises now occupy the portion of site that had not been previously flagged.

Based on this information, the EPA considered that further investigation of the subject site was warranted.

## Site history information

The aim of the site history investigation was to obtain more information relating to activities undertaken by Lightburn, in order to determine if intrusive investigations (soil bore drilling) would be required on the subject site.

The site history investigation comprised a desktop study and information was collected from the following sources:

- review of the SAWMC Licence File for the Lightburn site
- review of historical Certificates of Title, aerial photographs and State Library records
- discussions with former employees
- discussions with the City of West Torrens (council), Department of Health (DH) and Safework SA as to whether they hold any information
- review of any relevant environmental site assessment reports undertaken in the vicinity of the subject site.

## Site location and setting

The subject site comprises 79 properties bound by Morphett Road to the east, Immanuel College to the south, Bartlett Drive to the west and residential properties to the north.

The subject site formed the southern portion of the greater former Lightburn site. Following closure of Lightburn operations, the northern portion of the Lightburn site (Allotment 1) was subsequently occupied by SA Police Department (SAPOL) before being developed for residential use at a later date.

The site location plan is displayed in Figure 1. The subject site is outlined in purple and Allotment 1 is outlined in green.

## Lightburn activities

Lightburn manufactured a variety of products at the site which included the following:

- washing machines
- hydraulic jacks
- cars and car components
- concrete mixers
- fibreglass boats.

Review of the former SAWMC licence identified that wastes produced on site included water from spray booths, paint residues (including nitrocellulose residue), the solvent perchloroethylene (PCE) and kerosene. Information contained within the licence indicated the following disposal methods were likely to have been undertaken:

- disposal of spray booth water to lawns within the premise
- collection of wastes by a private contractor—Bosisto Consolidated
- collection of waste kerosene by company personnel for personal (domestic) use

## Subsequent land uses

The greater Lightburn site was split into the two separate areas (the subject site and Allotment 1) following cessation of company operations in 1986. The subject site was divided into 79 allotments for residential purposes.

No information could be obtained from council relating to the subdivision of the subject site. Discussions with a former SAPOL employee indicated that the subject site was developed by Mr Wolf Blass, and a real estate agent subsequently managed the sale of the site.

Following the split, SAPOL occupied Allotment 1 as a transport depot until 1995. This was subsequently developed for residential purposes in approximately 1996. An environmental auditor (contaminated land) was engaged to sign-off Allotment 1 as suitable for residential development. This practice reflected the recommendations of the EPA at the time. Consequently, Allotment 1 was not subject to the EPA investigation.

Anecdotal information suggested that sandfill sourced from natural sand hills to the west of Allenby Gardens was deposited on the site during the 1940s.

### **Summary of findings**

The site history investigation indicated that Lightburn was a well-managed facility from an environmental perspective, and ‘prescribed wastes’ were disposed of appropriately.

### **Purpose of soil investigation**

Following review of the site history information and discussions with the South Australian Government Captive Insurance Corporation (SAICORP), it was decided that a soil-sampling program targeting the ‘prescribed wastes’ would be undertaken in order to provide the subject-site landowners and residents with an additional level of comfort that the former production of these prescribed wastes has not resulted in an unacceptable health risk to residents.

### **Scope of works for soil investigation**

The scope of works for the soil investigation comprised the following:

- drilling of a total of 27 soil bores (in two stages) on council land across the former Lightburn site
- logging of soil cores and collection of soil samples
- laboratory analysis of selected soil samples for the following ‘prescribed wastes’:
  - nitrocellulose (paint sludge residue)
  - PCE (also known as or tetrachloroethylene or tetrachloroethene)
  - total petroleum hydrocarbons/kerosene.
- review of field and laboratory results by the EPA and DH in order to allow for an assessment of risks to residents to be made.

Field works were undertaken in two stages. Initial (Stage 1) investigations were undertaken in August 2006 and comprised the drilling of 13 soil bores across the site. Based on the information obtained from this initial investigation, additional (Stage 2) works were undertaken in March 2007 and comprised the drilling of a further 14 bores in targeted areas.

## FIELDWORK METHODOLOGY

### Stage 1 investigation (August 2006)

#### Soil bore locations

Stage 1 soil investigations comprised the drilling of 13 soil bores (BH01–BH13) on council land (footpaths, cul-de-sacs and road verges) across the subject site. By overlaying the current residential plans over historical aerial photographs, drilling locations were selected based on areas where any potential disposal of the prescribed wastes could most likely have occurred (eg the rear of former site buildings).

An overlay of current residential allotments over the 1985 aerial photo for the Lightburn site, and Stage 1 borehole locations are displayed in Figure 2.



Figure 2 Stage 1 borehole locations (10/8/2006)

#### Drilling and sampling methodology

All drilling locations were cleared of underground services by a professional service locator prior to drilling.

Boreholes were drilled with a truck-mounted ezi-probe rig using 50-mm pushtubes, which were decontaminated with water and environmental cleaning fluid between locations.

Soil bores were advanced into natural soils and the recovered cores were logged in accordance with the Unified Soil Classification (USC) system by an experienced EPA scientist. Soil lithological logs are attached as Appendix B.

Samples were collected in clean, laboratory supplied jars; at each change of lithology, where visual/olfactory evidence of contamination was identified, and at a minimum of one metre intervals. Samples were labelled and placed on ice prior to delivery to Leeder Consulting (Leeder), a National Association of Testing Authorities (NATA) accredited laboratory for chemical analysis. Appropriate chain of custody (COC) documentation was sent with the samples.

A copy of the COC documentation is attached as Appendix C.

## Chemical analysis

The following chemical analysis was undertaken:

- 17 primary samples (and two field duplicate samples) were analysed for PCE
- 17 primary samples (and two field duplicate samples) were analysed for total petroleum hydrocarbons (TPH) as a screening tool for kerosene
- 15 primary samples (and two field duplicate samples) were analysed for nitrocellulose (paint sludge residue).

Samples were selected for analysis based on the likely site surface levels corresponding with former Lightburn operations, and where field observations (eg odour, staining) identified potential contamination.

Following receipt of TPH results, a ‘fingerprint’ analysis was conducted on one sample, in order to determine if identified TPH was consistent with kerosene.

## Stage 2 investigation (May 2007)

Following review of Stage 1 investigation results by the EPA and DH, it was decided that additional soil investigations were warranted, specifically targeting the following:

- identified PCE in surface soils located in road verges and cul-de-sacs (based on results for BH13)
- identified TPH in Henning Court (based on results for BH10).

## Soil bore locations

Stage 2 investigations comprised the following:

- drilling of surface and near-surface fill material in the cul-de-sac and road verge areas at eight locations (BH14–BH21)
- drilling from surface into natural soils at six locations (BH22–BH27).

Boreholes BH14 to BH21 were drilled in order to further characterise fill materials where PCE had previously been identified.

Boreholes BH22 to BH27 were drilled to delineate the extent of TPH previously identified in the footpath of Henning Court. Five boreholes were drilled on Henning Court and one borehole was drilled on Bartlett Drive.

Stage 2 drilling locations are displayed in Figure 3.



Figure 3 Stage 2 borehole locations (22/3/2007)

### Drilling and sampling methodology

As per the Stage 1 investigation, all drilling locations were cleared of underground services prior to drilling, and were drilled with a truck-mounted ezi-probe rig using 50-mm pushtubes which were decontaminated between sampling locations.

Boreholes BH14 to BH21 were drilled to an approximate depth of one metre, with samples collected from soils consistent in appearance with PCE-impacted soil identified from Stage 1 investigations.

Boreholes BH22 to BH27 were drilled into natural soils to depths ranging from two to three metres, with samples collected; from each identified lithology, where field observations (odour/staining) identified hydrocarbon impacts, and at depths immediately above these hydrocarbon impacted areas.

Soil bores were logged in accordance with the USC system and lithological logs are attached as Appendix B.

Samples were collected in clean, laboratory supplied jars, which were labelled and placed on ice prior to delivery to Leeder for chemical analysis. COC documentation was sent with the samples and is attached as Appendix C.

### Chemical analysis

The following chemical analysis was undertaken:

- nine primary samples (and one field duplicate sample) were analysed for PCE and a suite of volatile organic compounds (VOCs)
- eight primary samples (and one duplicate sample) were analysed for TPH.

No samples collected from borehole BH17 were analysed for PCE, based on the observed lithology at this borehole being different to PCE-impacted soils identified from Stage 1 investigations.

## RESULTS AND CONCLUSIONS

### Geology and hydrogeology

Fill material was identified in all bores to a minimum depth of 0.4 m. Surface fill in footpath locations generally comprised brown to dark brown, low plasticity, fine-grained sandy clays/clayey sands. This was underlain by coarse-grained gravelly sands in a number of these bores.

Surface fill in cul-de-sac areas and road verges located at the western portion of the site generally comprised brown, fine- to coarse-grained gravelly sands, with occasional black slaggy gravels and ballast gravels. As this distinct fill type was restricted to cul-de-sac and road verge areas and was found at shallow depths, suggesting that this material may have been imported on-site during or after land redevelopment (ie after the closure of Lightburn operations).

At a number of locations, a deeper fill layer of fine-grained 'beach' sand ranging from pale yellow to pale brown was identified, which may represent sandfill believed to be imported on the site during the 1940s. Consequently, this layer potentially represents the approximate site surface levels during former Lightburn operations.

Natural soils beneath the fill layers consisted of low plasticity, brown sandy clays with various mottling.

Stage 1 investigations identified hydrocarbon odour and grey staining in borehole BH10 at an approximate depth range of 1.8–2.5 m. Stage 2 investigations undertaken in the vicinity of BH10 identified hydrocarbon odour and grey staining in boreholes BH22 and BH24 at depths greater than approximately 0.6 m.

Soil moisture increased in a number of bores at depths greater than one metre and water was identified at the base of boreholes BH02, BH07 and BH10, which indicates a potential shallow 'perched' groundwater zone beneath the site.

### Stage 1 analytical results and interpretation

A copy of the laboratory reports for the Stage 1 investigation is included as Appendix C.

#### PCE

One sample, QA07\_10/8/06 (the field duplicate sample of BH13 collected at a depth of 0.0–0.1 m) reported a PCE concentration of 1.1 mg/kg.

No PCE was detected in the remaining samples analysed during Stage 1 investigations.

DH determined that the level of PCE detected in the one road verge sample (QA07\_10/8/06) was not considered to pose a toxicological concern to residents. It was decided however, that additional sampling and analysis of this distinct shallow cul-de-sac and road verge fill material was warranted, in order to provide an additional level of certainty to the community.

#### TPH/Kerosene

One sample collected from the area of observed hydrocarbon impact (BH10\_1.9-2.0 m) reported a TPH concentration of 4,400 mg/kg in the C<sub>10</sub>–C<sub>36</sub> carbon chain fraction.

Following identification of TPH, 'fingerprint' analysis was undertaken on this sample BH10\_1.9-2.0, which determined that the impact was consistent with a 'degraded mineral lubricating oil' and not kerosene.

A minor TPH concentration of 83 mg/kg ( $C_6$ - $C_{36}$  fraction) was reported in sample QA07\_10/8/06 (field duplicate sample of BH13\_0.0-0.1).

No TPH was detected in the remaining samples analysed during Stage 1 investigations.

With regards to the identified mineral lubricating oil, DH recommended that additional sampling be undertaken to delineate the extent of TPH impact and provide an additional level of certainty that this material did not pose an unacceptable health risk to residents.

### **Nitrocellulose**

Nitrocellulose was not detected in any analysed samples. Consequently, no further investigation of nitrocellulose was considered warranted by the EPA and DH.

## **Stage 2 analytical results and interpretation**

A copy of the laboratory reports for the Stage 2 investigation is included as Appendix C.

### **PCE**

No PCE was detected in the nine primary samples and one duplicate sample, collected from the seven boreholes drilled at cul-de-sac and road verge areas.

These results indicated that PCE impact in shallow fill material located in cul-de-sac and road verge areas was not widespread and limited to a low concentration in one sample only. Furthermore, because of the high volatility of PCE, its presence in surficial soils is typically short-lived.

### **TPH/Kerosene**

One sample collected from BH22 at a depth of 0.7–0.8 m (where staining and hydrocarbon odour was identified) reported a total TPH concentration of 12,000 mg/kg in the  $C_{10}$ - $C_{36}$  fraction. No TPH was reported in the  $C_6$ - $C_9$  fraction. The sample located above this, BH22\_0.3-05, did not contain TPH.

Sample BH24 collected from 0.5–0.7 m, which was directly above a zone of staining and hydrocarbon odour, reported a minor concentration (72 mg/kg) of TPH in the  $C_{15}$ - $C_{28}$  fraction range.

No other samples reported TPH concentrations above laboratory detection limits. This was consistent with field observations in these bores with no odour or staining noted.

These results indicated that the lateral extent of hydrocarbons was restricted to the council footpath within 8 Henning Court in the northern and southern directions; the roadway (Henning Court) in the western direction; and the council footpath, adjacent to 26 and 28 Bartlett Drive in the eastern direction. As drilling was restricted to council owned footpaths however, it could not be determined if hydrocarbon impacts extended into 8 Henning Court and 26 Bartlett Drive.

Investigations also indicated that the vertical extent of impact was restricted to depths greater than approximately 0.6 m.

## **Summary and conclusions**

The prescribed waste nitrocellulose was not identified in any samples.

During the Stage 1 investigation one sample corresponding with surface fill material situated within a flora bed at the end of a cul-de-sac contained a small concentration of the prescribed waste PCE. The shallow depth of this fill material, and its presence in council-land flora beds, suggested that it may have been placed on-site during land redevelopment (ie post Lightburn operations). No PCE was identified in the Stage 2 investigation however and

consequently, DH determined that PCE in road verge material did not pose an unacceptable risk to Novar Gardens' residents, particularly as PCE is highly volatile and hence short-lived in surficial soils.

Although the prescribed waste kerosene was not identified during the Stage 1 investigation, TPH in the form of a 'degraded mineral lubricating oil' was identified. As a duty of care, the Stage 2 investigation included further assessment of this oil, and these investigations determined that TPH impact was restricted to depths greater than 0.6 m, and was not volatile in nature. Lateral impacts were delineated to council footpaths and Henning Court roadway (ie outside of property boundaries) in the northern, southern and western directions. With regards to the eastern direction, it was determined that TPH impacts did not extend beyond Bartlett Drive; although unlikely, some potential did exist for impacts to extend beneath 8 Henning Court and 26 Bartlett Drive. The EPA and DH has been in contact with the owners of these two properties to offer assistance, should they wish to investigate this matter further.

Based on the results of the EPA soil investigation, it was determined by EPA and DH that no more investigations were warranted.

Any questions relating to this investigation should be directed to the EPA Site Contamination Branch on (08) 8204 9934.

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National Environment Protection Council (1999), *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*, NEPC, Adelaide, viewed 19 May 2008, <[www.ephc.gov.au/nepms/cs/con\\_sites.html](http://www.ephc.gov.au/nepms/cs/con_sites.html)>.

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