Report for the Australian Defence Force

Oakey Base – Buildings C2 oil separator and storage – Report on probable leak and ground contamination.

Project Number: 7400.004
Site Name: Oakey Army Aviation Centre – Building C2
Site Location: Oakey Army Aviation Centre, Oakey

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CONTENTS

Contents .................................................................................................................. 2

Introduction ....................................................................................................... 3
  Purpose .......................................................................................................... 3
  Scope .......................................................................................................... 3

Findings ............................................................................................................ 4
  Building Description and Tank Functions ....................................................... 4
  Existing Documentation .................................................................................. 5
  Observations ................................................................................................. 5
  Causes of the leaking/seepage ....................................................................... 6
  Implications of the leaking/seepage ............................................................... 6
  Further Investigations ..................................................................................... 7

Conclusions ..................................................................................................... 8

Recommendations ............................................................................................ 9

Appendix A Photographs .................................................................................. 11

Document Control

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Revision Details</th>
<th>Typist</th>
<th>Author</th>
<th>Verifier</th>
<th>Approver</th>
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INTRODUCTION

Spotless services, on behalf of the Department of Defence, contacted Intelara to undertake an inspection of the Oil separator and storage tanks to the south of, and servicing, building C2 at the Oakey Army Aviation base, Oakey. The maintenance staff had reported that they witnessed inflow of oil into the tanks around the outlet pipe following pump out of the oil separator tank. Furthermore, the maintenance staff reported seeing oil floating in the nearby Aqueous-Film-Forming-Foam (AFFF) storage tanks. Intelara inspected the building and tanks on the 13th of March 2009.

Purpose

Determine the likely causes of the oil ingress and comment on the implications and rectification.

Scope

- Inspect the building, tanks and design documentation,
- Comment on the integrity of the pipework system and connections to the tanks,
- Determine the probable causes of the oil ingress/leaking, and
- Recommend further action.
FINDINGS

Building Description and Tank Functions

At the time of inspection, Building C2 was being used as a Helicopter hanger and maintenance facility. Within the building were two Sumps for draining used oil and petrochemicals to the oil separator. A fire suppression system utilising AFFF drained to the AFFF collection tank. A copy of the location services plan is shown on Figure 1.

![Figure 1 Building location and services plan](image)

The construction of C2 was a structural steel framed shed with reinforced concrete slabs on ground. The sumps for disposal of oils were sitting on the slab-on-ground. The pipe work to and from the oil separator appeared to be concrete pipe.

The construction of the Oil separator was reinforced concrete. The separator consists of two chambers. An orifice in the dividing concrete wall at low height allows the fluids to progress to the second chamber. The overflow outlet is located high on the southern wall of the second chamber. The outlet leads to the oil storage tank.

Like the Oil separator the Oil storage tank construction is of reinforced concrete.
The AFFF tank is a large reinforced in-ground concrete structure with three access openings.

**Existing Documentation**

Spotless did not find any existing documentation on the tanks themselves; they did however provide the services plan (Figure 1).

**Observations**

**External**

The areas of Asphaltic-Concrete (AC) pavement around the Oil Separator and the Oil Storage Tank consists of patches. The patches tend to indicate that the tanks were installed after the original AC pavement was laid. The patches extend approximately 600mm past the extents of the tanks. For the tanks to be installed the excavations would have had virtually vertical sides. The patched areas of AC pavement show signs of subsidence and wear as can be seen in Photograph 1, Photograph 2, Photograph 5, and Photograph 6.

The AC pavement over the AFFF tank is consistent, without patches or signs of undue wear or subsidence.

**Internal**

Intelara personnel inspected the interior of the tanks from the access openings and did not enter the tanks. The Oil Separator and Oil Storage Tank were pumped-out ready for inspection and the AFFF tank had a low level of fluid in it allowing adequate inspection of the walls.

Spotless staff reported that none of the fluids in the tanks appear to drop in level when the fluid levels are lower than the inlet and outlet pipes.

**Oil Separator**

There is evidence that fluids are entering and exiting the chamber wall in one location (Photograph 12). The inlet and outlet pipes are cracked and the seals between the tank walls and the pipes are loose and show signs of fluids seeping into the tank.
Oil Storage Tank

There is evidence of seepage around the eastern entry pipe.

AFFF Tank

There is evidence of seepage into the tank from a small inlet pipe to the eastern side of the tank (Photograph 19).

Causes of the leaking/seepage

The pipes to and from the oil separator and oil tank have probably cracked due to insufficient allowance for ground movements at the joins and poor bedding and compaction. Furthermore the Oil Separator has a crack in one chamber which allows in and outflow of fluids.

A pipe to the AFFF tank appears to have a broken seal to the tank, thereby allowing the inflow of fluids.

Implications of the leaking/seepage

The ground conditions around the tanks are probably saturated with petrochemicals. It is probable that the areas where the petrochemicals are concentrated is around pipes and past excavations. As these areas would be backfilled with granular materials and thereby provide the least resistance for fluid flow. The implications of the leaking/seepage can be broadly classed in three areas; Structural, environmental and operational.

Structural

The continued flow of the fluids throughout the soil would be causing localised underground erosion as fine particles are drained into the tanks. This would lead to further subsidence of the pavements and increased damage to the underground pipes.

The crack in the Oil Separator is of minor structural concern, however it contributes to flow of fluids and it is unlikely that the crack can be repaired satisfactorily.
Environmental

The area must be classified as contaminated. The extent of the contamination was unknown at the time of writing this report. The contaminants might propagate thorough the soil and either into the water table or into other infrastructure such as the sewer nearby. (The water table is deep in the area so it is unlikely that contamination of ground water has/will occurred.)

Any excavated material from this area will need to be disposed of in strict accordance with the Environmental Protection Agency (EPA) and Defence guidelines.

The contamination of the AFFF can make disposal of the AFFF difficult, as certain disposal methods require the oil to be removed before disposal.

Operational

The major operational implication relates to the treatment and disposal of the contaminated AFFF. There will also be an increased requirement for pavement rectification.

Further Investigations

A detailed investigation into the ground conditions is required to ascertain the extent of contamination. A decision on whether the contaminants could be safely left in place or require removal would be made based on the investigation’s recommendations. Intelara requested a quotation off a local environmental consultant and the cost of this investigation is in the order of $17,000.00.
CONCLUSIONS

Pipe work to and from the oil separator has cracked at the junctions with the separator and tanks.

The Oil separator has a crack in one chamber, which appears to allow fluid to leek out and seep into the chamber.

The Oil separator and associated pipe work has been leaking oil into the surrounding ground thereby contaminating an unknown extent of land. When the tanks are drained, some of the oil seeps back into the tanks.

The oil in the ground has seeped through cracked seals around pipes into the AFFF storage tank contaminating the AFFF.

The contamination presents structural, environmental and operational issues, which will persist and worsen if the leaking and seepage is not rectified.

An environmental investigation to determine the extent and implications of the contamination is required before a detailed scope of works for rectifications can be formulated.
RECOMMENDATIONS

The following recommendations do not constitute a scope of works. We recommend that

1. Further investigation into the extent of the contamination is carried out. An Environmental consultant should be contracted to undertake soil sampling, testing, investigation of ground water level, and reporting the results.

2. Dependent on the recommendations of the environmental consultant either:

   2.1 Contaminated material is to be removed:

      2.1.1 Dig out all contaminated material and dispose of in accordance with EPA requirements.

      2.1.2 Have area tested to ensure all material removed and passes EPA requirements.

      2.1.3 Replace Oil separator with a proprietary Oil separator.

      2.1.4 Replace pipe work from the edge of Building C2 to the oil separator and oil storage tanks.

      2.1.5 Install new flexible connections to the Oil separator, oil storage tank and eastern side pipes of the AFFF tank.

      2.1.6 Patch connections of pipe work to all tanks (internal and external).

      2.1.7 Backfill area with approved material and compact.

      2.1.8 Lay new AC pavement.

   2.2 Contaminated material may remain:

      2.2.1 Dig out required contaminated material to do works listed below and store in accordance with EPA Requirements.

      2.2.2 Replace Oil separator with a proprietary Oil separator.

      2.2.3 Replace pipe work from the edge of Building C2 to the oil separator and oil storage tanks.
2.2.4 Install new flexible connections to the Oil separator, oil storage tank and eastern side pipes of the AFFF tank.

2.2.5 Patch connections of pipe work to all tanks (internal and external).

2.2.6 Backfill area with stored contaminated material if it is proven adequate, if not with approved material and compact.

2.2.7 Lay new AC pavement.

2.2.8 Have contaminated area mapped and register a plan with the EPA contaminated land register and with defence protocols.
APPENDIX A PHOTOGRAPHS

Photograph 1  Oil Separator – AC Pavement around Tank

Photograph 2  Oil Separator – AC Pavement around Tank
Photograph 3  
AFFF Tank – AC Pavement around Tank

Photograph 4  
AFFF Tank – AC Pavement around Tank
Photograph 5  Oil Storage Tank – Lid and AC pavement surround

Photograph 6  Oil Storage Tank – Lid and AC pavement surround
Photograph 7  Oil Separator – Inlet sump one

Photograph 8  Oil Separator – Inlet sump two
Photograph 9  Oil Separator – Chamber one, oil seepage

Photograph 10  Oil Separator – Chamber one, oil seepage
Photograph 11  Oil Separator – Chamber one, oil seepage

Photograph 12  Oil Separator – Chamber one, oil seepage
Photograph 13  Oil Separator – Chamber two, oil seepage

Photograph 14  Oil Separator – Chamber two, oil seepage
Photograph 15  Oil Separator – Chamber two, oil seepage

Photograph 16  Oil Storage tank – seepage
Photograph 17  Oil Storage tank – seepage
APPENDIX A CONTINUED

Photograph 18  Oil Storage tank – seepage

Photograph 19  AFFF Tank – Seapage