



APPENDIX D

Historical Information



1.0 HISTORICAL INFORMATION REVIEW

A review of historical site information was undertaken to assess the potential for historical uses or activities at the Site which may have adversely impacted on the contamination status. Historical site information reviewed included certificates of title, historical photographs, key correspondence, anecdotal information obtained from CFA employees, previous assessment reports and other publically available records. A summary of the historical information which was reviewed as part of this PSA is provided in the following section.

1.1 Previous Ownership

Information relating to ownership of the Site was obtained from historical certificates of title and is summarised in Table 1. Based on reviewed information the Site is currently described on Lots 1, 2, 3 and 4 on Title Plan 845669K on Volume 03535 Folio 516. The site was previously part of:

- Crown Allotment 2, Section 15 Parish of Yaloak;
- Crown Allotments 3 and 8, Section 16 Parish of Yaloak;
- Crown Allotment 9, Section 16, Parish of Yaloak.

Copies of the certificates of title are presented in Appendix B.

The CFA has owned the Site as sole proprietor since 1982 (although it began operations at the Site in 1972), prior to that it was owned by the individual land owners listed in Table 1.

Overseas Telecommunications (Australia) Commission (OTC) owned the Site prior to CFA and operated a long range radio communication station on the Site. OTC inherited the Site in 1948 from Amalgamated Wireless (Australasia) Ltd (AWA), as part of the Act of Parliament (1946) which charged OTC with the responsibility for overseeing international telecommunications in Australia. AWA had originally purchased the Site in 1925 and operated a long range radio communication station on the Site.

Table 1: Certificates of Title Information

Certificate of Title	Date	Registered Proprietor
Vol. 03538 Fol. 516	21/12/1982	Country Fire Authority
Vol. 3390 Fol. 2157364	5/8/1948	Overseas Telecommunications Commission (Australia)
Vol. 3390 Fol. 121375	5/5/1925	Amalgamated Wireless (Australasia) Ltd.
Vol. 3390 Fol. 971789	6/11/1920	George William Stead
Vol. 3390 Fol. 667672	11/10/1911	James Isaac Watson
Vol. 3538 Fol. 707516	02/10/1911	William Frederick Coltman and Frederick Edward Sides
Vol. 3538 Fol. 279412	29/01/1910	Edward Brown

1.2 Aerial Photo Review

An aerial photograph review was undertaken to assess the potential for historical uses or activities at the Site and surrounding areas which may have adversely impacted on the Site's contamination status. Aerial photographs were obtained for review from the DSE dating back to 1970. Copies of the aerial photographs are presented in Appendix C. The site layout in 1985 is presented in Figure 4 – 1985 Site Layout in Appendix I. The site layout in 1990 is presented in Figure 5 – 1990 Site Layout in Appendix C.

A summary of the historical information relating to the Site and surrounding areas based on a review of the aerial photos is provided in Table 2.



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Table 2: Aerial Photography 1970 - 2010

Date	Photo details	Description
24 February 1970	Vic 2383 Run 6 Frame 169 Fiskville	<p>Site Observations: The building currently used as the Canteen and the houses currently used for temporary accommodation are visible in the eastern portion of the Site. The Training Centre is visible in the centre of the Site and two buildings are located directly west of the Training Centre. A road known as 'Plantation Parade' connects the Canteen Building and the Training Centre. A residential building is visible in the south western portion of site adjacent to Lake Fiskville. Remnants of the AWA radio aerials and towers are visible in the eastern portion of the Site.</p> <p>Site Surroundings Observations: A house is visible immediately south of the south. Agricultural land is located to the north, east and west of the Site.</p>
9 December 1977	Vic 3241 Run 6, Frame 228 Fiskville	<p>Site Observations: The buildings visible in 1970 are still evident. Several more buildings have been built in the area of the Canteen, including what advice from CFA personnel suggests are school buildings. Debris and materials which may include chemical drums are located directly west of the Training Centre. The initial stages of the Outdoor Fire Training Area (FTA) have been developed to the south of the Training Centre; the Fire Attack Building, Amenities Building and Storage Buildings and a concrete pad are visible. Areas of staining on open ground are evident to the south of the concrete pad. Advice from CFA personnel suggests this stained open ground is the original FLP. A dam which is now referred to as Dam 1 is visible to the south of the FLP. Two (2) areas of staining are also evident to the east the FLP, which are inferred to be the Fire Training Pits (Sludge Pits). A mound which anecdotal information suggests is a historical landfill used by OTC, is visible to the south west of Lake Fiskville. Four residential buildings are visible in the south western portion of site. An airstrip is visible along the western site boundary and a new road which is parallel to 'Plantation Parade' is also visible.</p> <p>Site Surroundings Observations: No visible changes to surrounding land use.</p>
29 January 1985	Vic 3926 Run 6, Frame 068 Fiskville	<p>Site Observations: The buildings visible in 1977 are still evident. Two additional buildings are visible immediately adjacent to the Training Centre. The inferred maintenance shed and sewage treatment tank are visible west of the Training Centre. The sewerage treatment tank is located in the area where materials were stored in 1977; however these materials are no longer evident. A dam is visible to the east of the Training Centre. The Outdoor FTA has been developed further; an additional building is visible south of the concrete pad and the area now known as the 'Prop Storage Area' appears to have been developed as materials are visible within this area. The areas of staining on the inferred FLP and Fire Training Pits are still evident. A circular tank, which advice from CFA personnel suggests is a training prop is visible north of the Fire Training Pits. Additional residential buildings and an inferred new landfill are visible in the south western portion of the Site. The current airstrip is visible along the northern site boundary. Trees have been planted in the northern and eastern areas of the Site and additional roads are visible throughout the Site. Site Surroundings Observations: No visible changes to surrounding land use.</p>
16 February	Vic 4322	<p>Site Observations: The buildings visible in 1985 are still evident; however the</p>



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Date	Photo details	Description
1990	Run 6, Frame 134 Fiskville	<p>buildings immediately west of the Training Centre had been replaced with four inferred classroom buildings. The Administration Building is now visible to north of the Training Centre and two additional maintenance/storage buildings are visible west of the Training Centre. The Outdoor FTA appears to be under development. There are inferred scoria road sub-grade outlines and current design of Dams 1 and 2 are now visible. The Fire Training Pits are covered with scoria. The areas of staining on the FLP are still evident. Four additional inferred residential buildings are visible adjacent to the western site boundary. A total of 14 residential buildings are now visible in the south western portion of the Site. The Hanger Building and concrete pad is now visible at the northern site boundary. Three (3) trenches inferred to be the 'Drum Burial Area' are visible southwest of the Hanger Building.</p> <p>Site Surroundings Observations: No visible changes to surrounding land use.</p>
2 November 1998	UPG 235, Run 21, Frame 056 Fiskville	<p>Site Observations: The buildings visible in 1990 are still evident. The Outdoor FTA has been further developed; the FLP appears to have a scoria surfacing and additional fire training props on concrete pads are visible to the south and west of Dam 1. The Amenities Building adjacent to Dam 2 is visible and Dam 3 has been developed. The inferred VUT buildings (2 No.) are also visible southeast of Dam 1. LPG ASTs are also visible in the Pad Area. Soil stockpiles inferred to be the Rio Tinto Soil Composting Area are visible east of Dam 2. The inferred 'Drum Burial Area' is still visible southwest of the Hanger Building.</p> <p>Site Surroundings Observations: No visible changes to surrounding land use.</p>
10 January 2002	UPG 338, Run 15, Frame 170-172 Fiskville	<p>Site Observations: The buildings visible in 1998 are still evident. The Outdoor FTA has been further developed to include a large concrete pad with several props in the area previously known as the FLP. A triple phase interceptor is visible adjacent to Dam 1 and diesel and petrol ASTs are visible south of the Prop Storage Area.</p> <p>Site Surroundings Observations: No visible changes to surrounding land use.</p>
12 December 2005 – 23 March 2006	VicMap Digital Imagery, Melbourne NW 15 cm, Fiskville	<p>Site Observations: The buildings visible in 2000 are still evident. The Outdoor FTA has been further developed; the VUT building has been replaced by a larger building and the Urban Training Area has been in created south west of Dam 2. Dam 4 is now visible to the west of Dam 3. Gum trees have been planted in the northern portion of the Site.</p> <p>Site Surroundings Observations: No visible changes to surrounding land use.</p>
23 February – 25 March 2010	VicMap Digital Imagery, Bacchus Marsh 50cm	<p>Site Observations: The buildings and features visible in 2005 are still evident. A 4WD area is visible in the western portion of the Outdoor FTA.</p> <p>Site Surroundings Observations: No visible changes to surrounding land use.</p>



1.3 Oblique Photo Review

An oblique photograph review was also undertaken to assess the potential for historical uses or activities at the Site which may have adversely impacted on the Site contamination status. Oblique photos were obtained for review from the Independent Fiskville Investigation team dating back to circa 1985.

Copies of the oblique photographs are presented in Appendix I.

A summary of the historical information relating to the Site based on a review of the oblique photos is provided in Table 3. The exact dates of the photos are unknown; the dates given below have been inferred by comparison with the aerial photos reviewed in Section 1.2.

Table 3: Oblique Photos 1985 - 1989

Date	Photo details	Description
Circa 1985	Photo #1	The oblique photo shows a northerly view of the Training Centre and Outdoor FTA. The sewage treatment system and material and debris are visible west of the Training Centre. In the Outdoor FTA the Fire Attack Building, Amenities Building, FLP, Fire Training Pits, fire training props and several storage buildings are visible. The FLP appears to have gravel surfacing and staining is evident around several of fire training props. Staining is also evident around the inferred Flammable Mixing Area to the south of the green storage building and also around the Fire Training Pits and tank. Liquid is visible in the Fire Training Pits. An open drain which is inferred to collect surface water runoff from the FLP is visible to the east of the FLP. This drain appears to flow into Dam 1 which is visible to the south of the FLP. Drums and materials are visible in the area now known as the Prop Storage Area.
Circa 1985	Photo #2	The oblique photo shows an easterly view of the Training Centre and Outdoor FTA. It is inferred that this photo was taken on the same day as Photo #1. The maintenance workshop is visible west of the Training Centre. Liquid and staining is visible on open ground southeast of the Fire Training Pits. Numerous drums and several ASTS are visible in the Prop Storage Area.
Circa 1985	Photo #3	The oblique photo shows a north-easterly view of the Training Centre and Outdoor FTA. It is inferred that this photo was taken circa 1985 but on a different date to Photo #1 and #2. The structures and materials visible in Photo 1 & 2 are still evident. The only notable difference in this photo is that Dam 1 appears to be full with water.
Circa 1989	Photo #4	The oblique photo shows a south-easterly view of the Training Centre and Outdoor FTA. Four classrooms have been built to the west of the Training Centre. A pile of logs are evident to the north of the classrooms. The layout of the Outdoor FTA appears to be generally unchanged since 1985. An LPG AST and control booth are evident to the east of the Fire Attack Building. Overhead services are evident immediately east of the Fire Training Pits. Dam 1 appears to be overflowing in a south-easterly direction.
Circa 1989	Photo #5	The oblique photo shows a north-westerly view of the Training Centre and Outdoor FTA. It is inferred that this photo was taken on the same date as Photo #4. The sewerage treatment tank and two maintenance/storage buildings are visible west of the Training Centre. The Administration Building is now visible to north of the Training Centre Staining is evident around drums and props in the centre of the FLP. The LPG AST appears to be connected to a number of props in the FTA.



1.4 Key Correspondence

A review of available correspondence relating to the Site was undertaken and key correspondence is summarised in Table 4. All correspondence was obtained from the Independent Fiskville Investigation Team.

Table 4: Key Correspondence

Date	Description
9 May 1996	<p>Subject: <i>Pad water pollution at Fiskville</i></p> <p>The letter contains a brief overview of environmental issues relating to Dam 1 in the Outdoor FTA. The following key points were raised:</p> <ul style="list-style-type: none"> ▪ Dam 1 supplies the water used for a safety line; ▪ A form of hydrocarbon product was visible in water coming from the safety line used and it was observed running back into Dam 1; ▪ Fuel product is burnt off Dam 1; ▪ Petrol was used for the purpose of igniting the hydrocarbon sludge (in Dam 1). A series of photo's were attached to the letter which showed petrol being added to the Dam 1 and ignited. A fire developed on the surface of Dam 1 and continued to burn for approximately 4 hours; ▪ People have an extremely high risk of ingesting water from Dam 1 during drills on the FLP and Gas Pads. Under certain conditions students are drenched with this water; ▪ Risk of water from Dam 1 getting into the Barwon Water Catchment Area, taking into consideration the rainfall levels in the area; ▪ There is a rush to get the new interceptor system in place to meet Dangerous Good Regulations and reduce environmental impact. However if the proposed water treatment system was constructed it may be a waste funds as an interceptor system was not designed to handle the flow of fuel that was placed into the props; and ▪ Recommendation to close the FLP and implement a long term strategy for the environmental and financial benefit of Fiskville.
13 September 1996	<p><i>Response to Site Contamination Report</i></p> <p>The letter is response a site audit report from the EPA (dated 21 August 1996 and summarised in Section 2.0) and provided confirmation of their verbal discussion.</p> <p>The letter states the following:</p> <ul style="list-style-type: none"> ▪ As per a suggestion by the EPA, four (4) deep groundwater bores and four (4) shallow groundwater bore were installed onsite; and ▪ Flammable liquids training has ceased with only minor fires of straw and pallets being allowed. This process will also be concluded by mid November and the necessary clean up of the FLP will commence. <p><u>Sewage Treatment Plant</u></p> <p>Problems with the Sewage Treatment Plant were identified 18 months ago and since then the following has been carried out:</p> <ul style="list-style-type: none"> ▪ Installation of earthen spoon drain alongside the plant to catch runoff and re-pipe into final treatment stage; ▪ Water samples were assessed by Central Highland Water to ensure they were not allowing contaminants into the water course. Eighteen months ago there was blue algae bloom in the water course and it was treated with copper sulphate. The water was retested on two occasions with no reoccurrence; ▪ A specialist consultant verified the plant is capable of treating effluent and



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	<p>can cope with maximum usage;</p> <ul style="list-style-type: none">▪ Plant had concrete spoon drain installed around the base of the tank to ensure no runoff between the tank and drain;▪ All solids are capture in holding tanks and emptied yearly as a minimum but are checked biannually; and▪ The earthen spoon drain is checked weekly or more regularly in periods of heavy rainfall to ensure there is no run-off; and▪ Welcome assistance in arranging for the Sewage Treatment Plant to be licensed at the earliest convenience. <p><u>Landfill</u></p> <p>The following items are raised regarding the landfill:</p> <ul style="list-style-type: none">▪ In the past the landfill was used to bury scrapings from the old FLP, this process and the dumping of any items has ceased. This procedure was implemented two to three months ago and the only exception to this is the dumping of grass clippings and garden pruning;▪ Any items from the FLP i.e. plastic off-cuts, burnt scraps from the fire building or pallets will be disposed of through our waste collection contractor; and▪ Will not pursue the licensing of the landfill as procedures now ban the use of this area.
27 November 1996	<p><i>Final Environmental Report</i></p> <p>The memorandum (memo) refers to the Coffey and CRA Environmental Site Assessment (ESA) reports published between August and November 1996. (These reports are summarised in Section 2.0).</p> <p>The memo states that the results of the ESA indicate that there is no contamination to the groundwater table. The memo makes reference to the proposed remediation strategy plan for the FLP</p> <p>The memo also refers to proposed upgrades for the FLP which include:</p> <ul style="list-style-type: none">▪ Laying of gas pipelines and control booths for both LPG and flammable liquid;▪ Donations of props; and▪ Sourcing an appropriate catchment/filtration systems (as opposed to the triple interceptor), which is suitable for hydrocarbons but also residues from foam products as they seem to be greatest cause of contamination in Dam 1.▪ The use of a new fuel called TEKFLAME which has several benefits including more intense fire, significant smoke reduction and improved waste water (95% reduction in aromatics).
23 June 1997	<p>Flammable Liquids Pad Re-Instatement</p> <p>CFA noted that the fuel reticulation system has not been utilised for approximately 12 months following fears of contamination to the local and surrounding area's water system. The letter states the fuel reticulation system has been reinstalled and comprises of the following unleaded petrol and diesel equipment:</p> <ul style="list-style-type: none">▪ Fuel inlets (2 No.);▪ ASTs (2 No.);▪ Fuel bowsers (2 No.);



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	<ul style="list-style-type: none">▪ Fuel/water delivery lines (12 No.); and▪ A water inlet fed from towns mains <p>CFA states the ASTS and bowsers have been inspected by an independent company, Petroleum Environmental Services Pty Ltd and the whole fuel reticulation system was successfully integrity tested by Brown's Valve Services Pty Ltd.</p> <p>The CFA outline the revised design of four training props in the FLP. They states that fuel is introduced to the four props via underground pipe work. The volume of fuel utilised by the props has been reduced and any unburnt fuel will be contained in concrete pits prior to disposal by an authorised contactor. If run-off does occur from the props it would be captured in an initial pond upstream of the interceptors, where it would be totally burnt away.</p> <p>A copy of the FLP procedures is attached to the letter.</p>
15 October 1997	Upcoming Development of FLP <p>The facsimile (fax) outlines that proposed layout for the FLP redevelopment and the provision of LPG, in conjunction with flammable liquids to a number of props. It is stated that props would be supplied with LPG from the existing storage facility of 3 x 7.5 kL ASTs located near the LPG pad.</p>
16 October 1997	Contamination Levels – Fiskville Dams <p>The fax provides a comparison of BODs, Suspended Solids, Oil and Grease concentrations in Dam 1, Dam 2 and Lake Fiskville (Dam 3) prior to and post the installation of an aerator in Dam 1. They report that concentrations have reduced substantially since the installation of the system. It is reported that Dam 1 would still have some residual run-off from the FLP.</p> <p>It is reported that the suspended solids level in Lake Fiskville indicates fouling probably from water birds but is possibly an indication of blue green algae bloom and that copper sulphate will be added to this area in the next week.</p>
8 December 1997	FLP – Water Treatment System <p>The fax provides a project scope for the design and construction of an appropriate interceptor/separator to replace the existing interceptor for the FLP. The CFA state that objective of the project is to have a water catchment system that protects the CFA from contamination and possible breaches of EPA and other legal requirements and to have a water treatment facility that allows the CFA to become self sufficient in their water supply.</p>
23 December 1997	Flammable Liquids Contamination – Update <p>The memo refers to the results they have achieved over the last 12 months in reducing the high level of contamination on the FLP. The memo states that water test results show the levels are now acceptable world standard release levels. The memo states that water from Dam 1 can be legally discharged and used to flood irrigate the property or allow to flow into the Barwon River Catchment. They have chosen to utilise the water in the soil composting programme that commences on 5th January 1998.</p>



1.5 Waste Collection Information

A review of available waste collection information relating to the Site was undertaken and key information is summarised in Table 5. All correspondence was obtained from the Independent Fiskville Investigation.

Table 5: Waste Collection Information

Date	Description
4 March 2002	Waste Collection Docket This is a manifest for excavator hire, labour, labour supervision, paint and solvent. It details work of locating, excavating and removing drums from soil.
5 March 2002	Invoice for Works Completed This invoice details the works completed and the associated cost. It refers to drums and soil having been removed from various trenches, where removed drums were noted to mostly be damaged or crushed.
5 March 2002	Waste Collection Docket This is a manifest for skip hire. Soils contaminated with hydrocarbons are detailed as being disposed of in a lined skip.
6 March 2002	Waste Collection Docket This is a manifest for labour supervision, excavator hire, labour, paint and solvent. It details work of locating, excavating and removing drums from soil.
7 March 2002	Waste Collection Docket This is a manifest for labour supervision, excavator hire, labour, paint and solvent. It details work of locating, excavating and removing drums from soil.
14 March 2002	Waste Collection Docket This is a manifest for the disposal of contaminated soil. The contaminated soil disposed of is detailed as having low levels of contamination.



2.0 SUMMARY OF PREVIOUS REPORTS

2.1 A.S James – Geotechnical Investigation (July 1988)

A.S. James Pty Ltd (A.S James) were commissioned by CFA to conduct a geotechnical investigation in May 1988, the findings of which are provided in the following report, A.S. James Pty Ltd '*Geotechnical Investigation - Waste Disposal Site, Fiskville Training Centre*', dated 7 July 1988 (Reference No. 72024).

A copy of this report is provided in Appendix D.

A.S. James stated that the objective of the investigation was to determine the nature of industrial waste which was reported to have been buried in a small area near the airstrip at the Site and to recommend an appropriate long term approach to future utilisation of the area.

A.S. James reported from site observations that it appeared disposal had been in a series of three trenches, approximately 20 to 30 m in length and the (waste) drums were placed in these trenches. Typical drums were pierced and/or removed when damaged. A.S. James collected soil samples at nine locations within the trenches and one sample was collected from a test pit excavated approximately 3 to 4 m from the trenches.

The collected samples were submitted to East Melbourne Laboratory for qualitative volatile organic compounds (VOCs) analysis by infra red spectroscopy. The laboratory reported that aromatic organic compounds i.e. resins or solvents and may include benzene, toluene, xylene and phenol were detected in the nine trench samples; however no VOCs were detected in the test pit sample. The laboratory recommend that this type of materials biodegrade slowly and their presence would normally constitute an environmental problem.

An Atterberg Limit geotechnical test was conducted on the soil sample collected from test pit and the soil was confirmed to be clay with low permeability.

No groundwater was encountered during soil sampling at depths up to 2.5 m below ground level (bgl).

A.S James concluded that it appeared that little significant contamination of the adjacent soil had occurred. However if the chemicals remain in place, there will be long term break down of the containers. They recommended that an impermeable membrane with welded or glued joints could be placed over the drums to restrict drum degradation. However, they noted that this approach would not prevent leachate into groundwater and that this risk should be recognised. If the risk to groundwater is unacceptable, the materials should be removed from the Site and disposed of in a suitable manner. A.S. James recommended a waste disposal company, Cleanaway, who operate a disposal system near Tullamarine Airport.

A.S James stated that they understand that concern has been expressed as to the influence of the material on human contact and comment that this is not within their area of expertise and medical and or legal advice should be sought.

2.2 Minenco Environmental Services CFA Site Visit (May 1996)

Minenco Environmental Services Pty Ltd (Minenco) previously called Bioremediation Services were engaged by CFA to conduct a site visit on 14 May 1996, the findings of which are provided in the report, Minenco Environmental Services Pty Ltd '*CRA Site Visit by Phillip Peck, 14 May 1996*', dated 31 May 1996. (Reference No. CFA 599).

A copy of this report is provided in Appendix D.

The report includes the following:

- Summary of the observations of general nature and distribution of contamination at the Site;
- Briefly canvasses remediation options that may be applicable to the Site; and
- Makes recommendations for immediate actions required by the CFA to characterise the Site sufficiently for remediation planning to take place.



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Minenco concluded the FLP and FMA appear to represent the major areas of hydrocarbon contamination at the Site. Chronic releases of diesel and petrol mixture during fire training activities have occurred over a period of approximately 25 years. The current arrangements have been in place for approximately 15 years. Flammable liquid fuel usage over the past 12 month was reported to be in the range of 150,000 to 160,000L. It is estimated that as much as 25% of this product may have been lost to the ground during fire fighting activities (verbal communication, Dave Clancy CFA 16 May 1996). Minenco concluded that if the current fuel usage is representative of that over the operational life of the outdoor FTA, approximately 40,000L of fuel may have been lost to ground at the Site every year since the installation of the FLP.

FLP & FMA

Contamination issues identified at the FLP and FMA include:

- Extensive areas of ground have been saturated with hydrocarbons;
- There are pools of free phase hydrocarbons;
- Free phase hydrocarbons have collected in sumps and drains in the FMA;
- The perimeter drains filled with water and fuels in the FLP;
- It is likely that soils at the Site are contaminated in the deeper subsurface;
- There is potential for migration of hydrocarbon contamination to the groundwater;
- Dam 1 received all surface run-off from the FLP and is heavily contaminated with hydrocarbons (contamination includes both free product and contaminated water). Accumulation of free hydrocarbons is a common occurrence. Dam1 is reported to have been constructed to a rock base;
- There is no bunding of the FLP or FMA facilities with the exception of localised pits around various props; and
- Unsealed surfaces (in the FLP & FMA) provide a direct conduit to the subsurface.

Minenco concluded that the FLP and FMA areas in their current condition represent ongoing sources of soil and groundwater contamination.

Minenco recommended that the following upgrades to the FLP and FMA areas:

- Remove and ex-situ biotreatment of contaminated soils from the FLP and FMA areas;
- Engineer full bunding and drainage control, if fire fighting activities are to continue in the areas. All drainage needs to be directed to a suitable product/water separation facility;
- Seal all surfaces that are subject to inundation with fuel or fire fighting foams; and
- Engineer a product interception facility for the protection of environmental receptors downstream.

Underground Storage Tanks (USTs)

The following USTS were identified:

- Diesel and petrol USTs at the ablution block (Amenities Building);
- Diesel UST at the ablution block, capacity ~2,000L, current status decommissioned, known to have leaked; and
- Diesel UST at the training centre, current status decommissioned.



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Minenco reported that there was potential soil and groundwater contamination associated with some or all of these USTs. The impacts of the USTs on the subsurface should be assessed subsequent to their removal.

Drum Burial Pits

Minenco reported that three drum burial pits are located north of Deep Creek Road, adjacent to the 'East – West' Airstrip. These pits were reported to have been excavated approximately 12 years ago (1984). Three parallel trenches were excavated to a depth of approximately 1 metre. Waste drums were then placed in the trenches. The drums contained residual solvent sludges, thinners and paint sludges. The original contents of the drums had been used in fire training exercises in burning pits adjacent to the FLP. Residual material in the drums reportedly ran into the bottom of the trenches. The trenches were then lit and allowed to burn. The pits locations remain evident due to reduced grass growth along the lines of the pit. Anecdotal evidence of excavation since the drum burial exercise suggests that the drums may have been rusted away completely since burial.

Minenco concluded that it is highly likely that there is residual soil contamination at the drum burial site. Contamination of the groundwater in the area may have occurred. It is also known that waste material from paint manufacture was dumped at the Site. Due to the unknown mixture of materials burnt in the pits, there is the potential for a wide range of potential contaminants, including Benzene, Toluene, Ethylbenzene and Xylene (BTEX) compounds, chlorinated solvents and heavy metals in the vicinity of the pits.

Decommissioned Fire Training Pits (FTP)

Minenco reported anecdotal evidence suggests that a wide range of petrochemicals were burnt in fire training pits that were located immediately to the east of the FLP. These pits were reportedly excavated and backfilled in the late 1980s. There was no visual evidence of their existence at the time of the Minenco site visit. Minenco report that the pits were unlined and that staining and visual evidence of contamination was present for less than 150mm into the clay soil surfaces in the pit. It is believed the pits were in use for nearly 20 years.

Minenco concluded that the unlined FTP were likely to have been serious contamination sources during their operational phase. Despite the visual evidence to the contrary it was highly probable that they have contributed to soil and potential groundwater contamination. The pits were excavated when decommissioned. Due to the unknown mixture of materials burnt in the pits, there is the potential for a wide range of potential contaminants in vicinity of the pits.

Sludge Burial Pit

Minenco reported that material excavated from the FTP was buried in a deep hole excavated approximately 40 meters to the east of the pits. The exact location of the Sludge Burial Pit is unknown. The hole was reportedly the full extent of a KATO excavator arm which suggests the hole was approximately 6 m deep.

Minenco concluded that the Sludge Burial Pit represents a significant potential source for groundwater contamination and the contents buried in the pit may contain mobile contaminants.

Fuel Storage Facility

Minenco reported that no contamination had been reported in this area. However the tanks and lines should be pressure tested and fuel metering system should be installed on all fuel transfer lines.

Sewage Treatment Plant

It was noted the tank at the sewage treatment plant had subsided and cracked. Sewage had leaked into the ground and into open drain. It was reported that blue-green algae have been observed in water bodies receiving drainage from this area. Minenco recommended that the sewage treatment plant should be addressed to minimise risks of downstream impacts from sewage effluent

OH&S Considerations

Minenco reported that some Occupation Health and Safety issues were raised during site visit which included:



- The volumes of fuel lying around represented a hazard;
- Water in Dam 1 which was used for fire training could pose a potential health risk as it contained hydrocarbons; and
- Improved housekeeping would minimise environmental impacts of fuels and chemicals stored and used on site.

Minenco recommended the following actions for the Site:

- An initial investigation (*Stage I Investigation*) is urgently required to identify key site characteristics and focus more detailed investigations of site contamination and its associated risks;
- A secondary investigation (*Stage II Investigation*) after the initial investigation to fully determine the extent of all contamination. A secondary investigation targeted at key parameters of concern would provide the information essential to a structured risk management and remediation plan; and
- Hydrocarbon contamination of soil and water can be remediated by a range of technologies, including both *in situ* and *ex situ* technologies.

Minenco concluded that urgent action was required to commence investigation of contamination at the Site.

2.3 Diomides – Environmental Site Assessment (June 1996)

Diomides & Associates (Diomides) was commissioned to conduct an Environmental Site Assessment (ESA) in 1996, the findings of which are provided in the report, Diomides & Associates Pty Ltd '*Environmental Site Assessment*', dated 27 June 1996 (Reference DA11087/SD3000).

A copy of this report was not obtained during this ESA however the findings of the report are summarised in the CRA report '*Review of Site Investigations at Fiskville, Vic*, (Reference CRA5991rpt1). The summary below has been compiled from this CRA report.

Diomides reported that their scope of work included the inspection of the following areas; areas of buried drums containing solvents and other flammable liquids, decommissioned fire training pits, sludge burial pits, areas of ground saturated with petroleum hydrocarbons, contaminated sediment in a dam near the FLP.

The scope of work consisted of soil sampling, sediment sampling and surface water sampling.

Soil Samples

Soil samples were collected at the following locations:

- Nine soil boreholes were drilled to a maximum depth of 2.6m bgl in the FLP area;
- Three soil boreholes drilled to a maximum depth of 1.0m bgl in the drum burial pits near the Airstrip; and
- Four boreholes to a maximum of 2.8m bgl near the underground storage tanks (USTs) near the Training Centre and Administration Building.

Soil samples were collected at each borehole at depths of 0.5, 1.0 and 2.5 m bgl. In total, 46 discrete soil samples and 12 composite soil samples were analysed for the following compounds:

- Total Petroleum Hydrocarbons (TPH);
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX);
- Polynuclear Aromatic Hydrocarbons (PAH);
- Phenols;



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- Organochlorine Pesticides (OCPs);
- Polychlorinated biphenyls (PCBs); and
- Selected Metals.

Sediment Samples

- Three sediment samples were collected from Dam 1 and were analysed for TPH, BTEX, PAH and selected metals.

Surface Water Samples

- Surface water samples were collected from Dam 1 and Dam 2 and were analysed for TPH, BTEX, PAH, phenols, OCPs, PCBs and selected metals.

Assessment Criteria

Soil & Sediment

Reported soil and sediment analytical results were compared against the guidelines values published by the Australian and New Zealand Environmental Conservation Council (*ANZECC, 1992*), which are recognised by the Victorian EPA. In the absence of guidelines values for specific contaminants ANZECC recommended Dutch B levels. However, since the ANZECC guidelines were published 1992 the Dutch guidelines were revised and the original Dutch B was replaced with the following two sets of guideline values:

- A 'target value', above which there is considered to be pollution (sometimes referred to as Dutch B); and
- An 'intervention value', above which requires management and/or remediation (sometimes referred to as Dutch C).

Surface Water

Reported surface water analytical results were compared against the ANZECC and ARMCANZ (2000) WQG, for the protection of aquatic ecosystems and drinking water (*ANZECC 1992a aquatic, drink*) and the Victorian EPA SEPP (WoV, GoV, 2003). In the absence of guidelines values for specific contaminants the Victorian EPA has used Dutch levels. The Dutch guideline values for water were as follows:

- Dutch B = value for potable water above which further investigation is warranted;
- Dutch C = value for potable water above which the Victoria EPA requires notification.

Results

Soil Samples

It was reported that the following analytes were detected at concentrations exceeding the assessment criteria:

- TPH and lead concentrations in one (1) sample from Fire Training Pits exceeded the Dutch C Value;
- TPH concentrations in two (2) samples from FLP exceeded the Dutch B Value;
- TPH concentrations in two (2) samples from the Drum Burial Area (south of the Airstrip) exceeded the Dutch B Value;
- TPH and BTEX concentrations in one (1) sample from Drum Burial Area (south of the Airstrip) exceeded the Dutch C Value;
- Chromium concentrations in nine (9) of the 11 composite samples exceeded the ANZECC Guideline Value; and



- Phenol concentrations in the two (2) composite samples from the Drum Burial Area (south of the Airstrip) exceeded the Dutch B Value.

The reported concentrations of all other analytes were below the assessment criteria.

Sediment Samples

It was reported that the TPH concentrations in all three sediment samples collected from Dam 1 exceeded the Dutch C Value.

The reported concentrations of all other analytes were below the assessment criteria.

Surface Water Samples

It was reported that the TPH and Zinc concentrations in the surface water samples collected from Dam 1 exceeded the Dutch B Value.

The reported concentrations of all other analytes were below the assessment criteria.

2.4 Coffey – Field Site Appraisal and Sampling (August 1996)

Coffey were commissioned by CFA to conduct an ESA in July 1996, the findings of which are provided in the report, Coffey Partners International Pty Ltd 'Field Site Appraisal and Sampling, Ballan, VIC', dated 7 August 1996 (Reference E3517/1-AD).

A copy of this report is provided in Appendix D.

Coffey stated that the objectives of the ESA were:

- To delineate former buried sludge pits (previously referred to as the Fire Training Pits by Minenco) which were reportedly present on the Site; and
- Assess the contaminant distribution within the soil profile in the vicinity of the Fire Training Pits.

Coffey reported that the area under investigation contains two Fire Training Pits where flammable liquid fire training was undertaken. They reported that anecdotal reports suggested that a black diesel sludge covered this area until approximately 1989. They reported that a review of aerial photos which were held by the CFA, revealed a significant spillage at the eastern end of the pits toward the golf course. In approximately 1990, the spillage area and sludge pits were covered with approximately 0.3m of scoria fill which could be seen on the aerial photos as having been dumped on the former roadway located between the Fire Training Pits. In some places a superficial covering of clay was also reportedly used to level lower lying areas so that mowing of grass could be undertaken with greater ease.

Coffey reported that soil sampling locations were selected in the field following discussions with Mr. David Clancy of the CFA Training College. Anecdotal reports suggested the sludge from the former Fire Training Pits was scraped and dumped in a more recent excavation between the sludge pits and the golf course. However test pit excavations did not reveal any evidence of this disposal pit and in accordance with Mr. Clancy's directions, attention was focussed in the former Fire Training Pits area which was visually contaminated.

The site works included the excavation of 20 test pits in the former Fire Training Pits areas and also in the area of the suspected sludge disposal pit (test pits TP1-TP4). The test pits were excavated to a minimum depth of 0.5 m bgl and a maximum depth of 2.8 m bgl (where they terminated on basalt rock). A total of 12 soil samples were collected from seven test pits and analysed for TPH, BTEX at NATA accredited National Analytical Laboratories.

Assessment Criteria

Reported soil analytical results were compared against the ANZECC 1992 guidelines values and the Dutch (B&C) guidelines values and the Victorian EPA criteria (VicEPA, 1995) for off-site disposal of contaminated soils as clean fill or low level contaminated fill.



Results

It was reported that the following analytes were detected at concentrations exceeding the assessment criteria:

- TPH concentrations in one (1) sample from test pit TP8 exceeded the Dutch C Value;
- TPH concentrations in two (2) samples from test pits TP6 and TP14 exceeded the Dutch B Value;
- TPH concentrations for samples collected from TP8, TP6 and TP14 were commensurate with VicEPA off-site disposal low level contaminated soil.

BTEX concentrations were detected above the limit of reporting (LOR) in test pits (TP6, TP8 and TP14) but were below the Dutch B criteria.

Coffey concluded that the sludge was found in an area of approximately 1200 m² as a relatively thin layer at the interface between the scoria cover and underlying topsoil. The thickness was generally 20 to 50mm to a maximum of 100mm observed in the vicinity of TP8. Coffey concluded that based on the observed thickness of hydrocarbon sludge, the estimated volume of sludge in the investigation area is likely to be in the range of 20 to 60 m³.

2.5 EPA – CFA Fiskville – Site Contamination (August 1996)

The EPA (South West Region) conducted a site inspection on 23 July 1996 at the Site, the findings of which are provided in the report, EPA South West Region 'CFA Training College, Fiskville – Site Contamination', dated 21 August 1996 (Reference 25151).

A copy of this report is provided in Appendix D.

The letter report includes a copy of the *Site Inspection Report*.

The report stated that the inspections focused on several areas of the Site and covered a number of issues relating to recent and past activities at the Site. They noted that fire fighting exercises at the Site have given rise to a number of issues but that the disposal of waste associated with these exercises and the general running of the Site have contributed significantly to these issues.

Waste Treatment and Disposal

Under the heading Waste Treatment and Disposal, the EPA discusses the following 3 areas of the Site:

■ Drum Burial Pits

The EPA noted that three drum burial pits were identified in an area lying to the north of the training area (approximately 500m), adjacent to the Airstrip. They noted the burial pits were located approximately 100m east of a small water course which drained southward into a lake (Lake Fiskville). The areas were discernible by the lack of longer grass growing on the surface covering the drums. The EPA noted that was explained that the drums could contain a variety of compounds (understood to be solvent sludges, thinner and paint sludges, including waste from paint manufacture). They noted that flammable liquid wastes from a number of sources (known and unknown) had been used in the past for fire fighting exercises but the practice was now ceased.

■ Landfill

The EPA reported that at the far west of the Site, a landfill had been established for the burial of burnt and partially burnt plastics, furniture and other debris used in fire fighting exercises, along with some scrapings of contaminated soil from the bottom of the fire pits (used for holding flammable liquids which are ignited). The landfill consists of holes dug to a depth of approximately 1.5-2m for placement of waste. It was estimated that waste is deposited five (5) times per year in volumes of 4-5 m³.



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They noted the landfill is situated close to another landfill which had been used for the burial of various unknown materials by a previous occupier of the Site. The EPA noted the area is situated immediately adjacent to a small watercourse which is the outlet of the Lake Fiskville.

■ Sewage Treatment System

The EPA noted that sewage from residential houses, temporary accommodation and Canteen and administrative blocks was conveyed to an onsite sewage treatment plant. The residential units were serviced by a holding tank for settling solids. The liquid effluent from the tank was pumped to the sewage treatment plant and the solids are cleaned out annually. The EPA noted the treatment tank was not been maintained particularly well and it needed attention. The EPA noted that the CFA were in the process of repairing the tank so that it can be restored to meet the needs of the Site.

The EPA note that discharge from the treatment plant is to the land. The effluent is discharged via a pipe at a point about 100m from watercourse which drains into Lake Fiskville. The EPA concluded that the sewer line from the houses run under the Lake Fiskville or watercourse draining into Lake Fiskville and they question the integrity of the line. They also noted that an algae bloom occurred in the lake in early 1995 but there was none since.

Training Areas and Activities

The EPA reported that the FLP was used for fire fighting exercises using props which have been ignited using flammable liquids. They noted some of the FLP was sealed but the surface was extensively cracked and broken. They also noted that fuel and burnt residue from the FLP had been allowed escape to the soil surrounding and beneath the FLP, as clearly evident by gross black oily contamination of these areas. They noted the FLP is serviced by a relatively small interceptor sump which drains into Dam 1. The sump is clearly overwhelmed by hydrocarbon loading and does not prevent discharge of contaminants to the Dam 1. The liquid within the interceptor was thick and black being heavily contaminated with fuel and oil. The EPA noted that soil around the interceptor was highly contaminated suggesting the system had overflowed. They also noted that there were signs of direct run-off from the pad to the pond.

The EPA noted that training in this area had now ceased due to concern for the contamination of surrounding soils, water and sediments.

The EPA noted that Dam 2 is a relatively new area of the FLP and that training is controlled in this area so that no flammable liquids are used. Vehicles used in training exercises are drained of all oil and fuels prior to use and LPG is used for fuelling fires.

The EPA also noted that some concern was expressed regarding the contamination of the waterbodies by fire fighting foams as they are not biodegradable.

The EPA noted that adjacent to the FLP is a grassed area which had been used in the past as Fire Training Pits. Liquids fuels were poured into this pits and ignited for fire training excises. When these pits were not longer required they were covered in without the removal of any residues.

Cover Letter Conclusions

The EPA reported that site is likely to be contaminated due to poor practices in the past. This is supported by the results of the initial site investigation commissioned by the CFA.

The EPA noted they were encouraged by CFA's proactive approach to determining the extent of contamination of the Fiskville site.

The EPA recommended that further site investigations should be carried out in-line with that suggested by in the consultant's report and that this should cover groundwater, surface water quality and further soil testing. They also recommend that measures should be considered at this point for ensuring that activities do not cause similar problems in the future (e.g. construction of a bunded FLP with satisfactory treatment of run-off before discharge).



The EPA stated that if no further action is taken on the contamination issues already identified, the EPA may require further investigation and clean up to be undertaken through the issue of a pollution abatement notice and/or clean up notice.

Also the EPA stated the discharge of effluent from the sewage treatment plant and landfilling activities needed to be addressed as this activities are listed as scheduled premises under *Table A – Schedule Premises, Sections 1 (d) and 1 (e)*, of the *Environmental Protection (Schedule Premises and Exemptions) Regulations 1996*. Therefore these activities needed to be licensed if the CFA intends continuing their use. They noted that current practices associated with these activities may not meet with licensing requirements.

2.6 Coffey – Sediment and Surface Water Sampling (October 1996)

Coffey were commissioned by CFA to conduct sediment and surface water sampling in September 1996, the findings of which are provided in the report, Coffey Partners International Pty Ltd ‘*Sediment and Surface Water Sampling, Ballan Vic*, dated 15 October 1996 (Reference E3523/2-AD)

A copy of this report is provided in Appendix D.

As stated by Coffey the primary objective of the sampling was to undertake a preliminary assessment of water and sediment contamination status in the drainage system of the Site.

The scope of work consisted of sampling surface water at seven (7) locations across the Site and sediment sampling at three (3) locations.

Surface Water Samples

Surface water samples were collected from the following locations:

- Dam 1 – inlet;
- Dam 2 – inlet and outlet;
- Lake Fiskville – 2 inlets and 1 outlet; and
- Beremboke Creek - down gradient of Lake Fiskville and landfill.

The collected surface water samples were analysed for TPH, Metals (As, Cd, Cu, Cr, Ni, Pb, Zn, Hg and total P), pH, total dissolved solids (TDS), total suspended solids (TSS), nitrate (NO₃-N), total nitrogen and ammonia (NH₃), total phenols and biological oxygen demand (BOD).

The reported analytical results were compared against the Victorian EPA SEPP (WoV, GoV, 2003) and the ANZECC (1992a aquatic, drinking water). The Dutch Criteria (B and C) were used where no Australian criteria were available.

In surface water samples collected from Dam 1 and Dam 2, the following analytes were detected at concentrations exceeding the assessment criteria:

- Suspended Solids in samples Dam 1–inlet, Dam 2–outlet and Lake Fiskville-inlet (from Dam 2) exceeded the SEPP (GoV, 2003) criteria;
- BOD concentrations in sample Dam 1-inlet exceeded the SEPP (GoV, 2003) criteria;
- TPH concentrations in sample Dam 1-inlet exceeded the Dutch C criteria, while TPH concentrations in Dam 2–inlet and Dam 2–outlet exceeded the Dutch B criteria; and
- Copper concentrations in all surface water samples and nickel, lead and zinc concentrations in samples from Dam 1, Dam 2 and Lake Fiskville exceeded the ANZECC (1992a aquatic) criteria.

The reported concentrations of all other analytes were below the assessment criteria.



Sediment Samples

Sediment samples were collected from three (3) locations adjacent to the edge of Dam 2.

The collected sediment samples were analysed for Total Petroleum Hydrocarbons and Metals and total phenols. Results of analytical testing were compared to ANZECC (1992b) and Dutch Criteria (B and C) soil assessment criteria.

In sediment samples collected from Dam 2, the following analytes were detected at concentrations exceeding the assessment criteria:

- Chromium concentrations in all three (3) samples exceeded the ANZECC (1992b) criteria; and
- TPH concentrations in sample Dam 2 A-P collected adjacent to the inlet to Dam 2 exceeded the Dutch B criteria.

The reported concentrations of all other analytes were below the assessment criteria.

Overall, the Coffey report concluded that:

- Hydrocarbon contamination was impacting on the water quality in Dam 1 and Dam 2;
- The spatial distribution of measured heavy metals concentrations detected in surface water samples was not indicative of any specific source. The measured values were commensurate with concentrations in limited groundwater samples. Therefore, heavy metal concentrations were likely to be typical of normal “background” conditions in the area rather than as a result of onsite activities; and
- The presence of significant volumes of hydrocarbon contaminants Dam 2 sediments may be providing a source of secondary contaminant source.

2.7 Coffey – Groundwater Monitoring Network (1996)

Coffey were commissioned by CFA to install a groundwater monitoring network at the Site in August 1996, the findings of which are provided in the report, Coffey Partners International Pty Ltd ‘*Groundwater Monitoring Network Installation, Ballan Vic*, dated 15 October 1996 (Reference E3523/1-AK).

A copy of this report is provided in Appendix D.

As stated by Coffey the objectives of the Site investigation were to:

- Provide a network of groundwater sampling points on the Site that would be adequate in terms of establishing overall groundwater quality and flow characteristics; assess localised contaminant occurrence around nominated Areas of Environmental Concern (AEC); and provide an assessment of gross water quality changes associated with the Site; and
- Allow for on-going monitoring over the projected life of the Site.

The scope of works included the drilling and installation of eight (8) groundwater monitoring bores at the AEC, soil core and groundwater sampling and analysis. The eight AEC were identified as follows:

- Fuel mix areas (FMA);
- Flammable liquid pad (FLP);
- Dam 1;
- Underground storage tank (UST) facilities;
- Drum burial pits;
- Sludge burial pit; and



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- Landfill.

A summary of the well construction details is summarised in below:

Table 2: Summary of Borehole Construction

Borehole No	AEC Targeted	Drilled Depth (m)	Surface Water Level (mpvc)	Surface Water Level (RL m AHD)*
BH1	UST	25	dry	-
BH2	flammable liquid pad	17	14.8	426.18
BH3	Landfill	21	dry	-
BH4	drum burial pits	20	dry	-
BH5	drum burial pits	1.8	0.3	442.18
BH6	flammable liquid pad	2.0	dry	-
BH7	sludge burial pit	2.8	dry	-
BH8	fuel mix areas	2.3	dry	-

* MPVC = metres below polyvinyl chloride pipe, RL = Relative Level, AHD = Australian Height Datum

Soil Samples

Soil samples were collected from each borehole at selected intervals and analysed for TPH, BTEX and metals.

Reported analytical results for soil were compared to ANZECC (1992b) and Dutch (B and C) Criteria soil assessment criteria. Concentrations of chromium in soil samples collected from BH1 and BH4 exceeded the ANZECC criteria.

The reported concentrations of all other analytes were below the assessment criteria.

Groundwater Samples

Groundwater samples were collected from BH2 (basalt aquifer) and BH5 (residual clay aquifer). All other boreholes were found to be dry.

The reported analytical results were compared against the Victorian EPA SEPP (WoV, GoV, 2003) and the ANZECC (1992a aquatic, drink) guideline values. The Dutch Criteria (B and C) were used where no Australian criteria was available.

In groundwater samples collected, the following analytes were detected at concentrations exceeding the assessment criteria:

- Copper and zinc concentrations in samples from BH2 and BH5 exceeded the ANZECC (1992a aquatic) criteria and nickel concentrations in BH2 also exceeded the ANZECC (1992a aquatic) criteria; and
- TPH concentration in BH5 exceeded the Dutch B criteria.



The reported concentrations of all other analytes were below the assessment criteria and LOR.

Overall, the Coffey report concluded that:

- The drilling and bore installation programme indicated a general absence of significant groundwater resources on the Site;
- Where groundwater was encountered it appeared to be of limited extent and the water bearing zones were of low permeability;
- The investigations indicated a low potential for contaminant migration either on or off-site via subsurface groundwater systems;
- The single deep bore (BH2) which intersected groundwater showed no indication of hydrocarbon contamination and detected heavy metals were considered to commensurate with likely 'background' conditions;
- Shallow groundwater intersected in BH5 which was located immediately adjacent to the backfilled drum burial trenches. Water intersected in this borehole was probably a consequence of locally enhanced recharge occurring in the trench backfill materials. Reported TPH contamination in this borehole was commensurate with this recharge scenario;
- The hydrocarbon contamination found in groundwater sample BH5 was likely to represent a localised effect;
- Given the nature of residual clays at BH5, significant contaminant migration from such localised contaminant sources was unlikely unless local permeability conditions are enhanced by clay fissuring or man-made features such as service trench backfill. Management of such localised effects would be best achieved by removing the contaminants at source; and
- Primary site cleanup goals should be the identification and clean up of localised area of upper soil profile contamination such as has already been identified in the former buried sludge pits.

2.8 CRA ATD - Review of Site Investigations at Fiskville (November 1996)

CRA ATD Pty Ltd (CRA) were commissioned by CFA to review the environmental status of the Site and evaluate remediation options in April 1996, the findings of which are provided in the report, CRA ATD Pty Ltd 'Review of Site Investigations at Fiskville, Vic, dated 19 November 1996 (Reference CRA5991rpt1).

A copy of this report is provided in Appendix D.

This report reviewed and summarised the investigations undertaken by Diomedes and Coffey in 1996, and which are discussed in Section 2.3 to Section 2.7 above. A figure showing Coffey's sample locations from 1996 is presented as Figure 6 – 1990's Sample Location Plan in Appendix C.

CRA concluded that the investigations revealed localised soil, sediment and surface water contamination at the Site, which was principally the result of storage and handling of fuels, fire training activities and disposal of fuel residues.

CRA reported that levels of soil contamination at the Site exceeded soil investigation guidelines for TPH at several locations, including the FLP, the Fire Training Pits and the Drum Burial Pits. Significant hydrocarbon was also evident in sediments in Dam 1 and near the inlet in Dam 2. No significant groundwater contamination was identified. Some low levels soil contamination of phenols, BTEX and lead were also encountered, but only where TPH concentrations were also above investigation. Slightly elevated levels of chromium detected in most soils, were considered to represent site background.



CRA concluded that onsite bioremediation should achieve soil remediation objectives at low cost for hydrocarbon impacted soil from the FLP, FMA and Fire Training Pits.

CRA also concluded that soil from the Drum Burial Pits may contain drums and other containers, so onsite treatment would be difficult. Thus offsite disposal is likely to be the most appropriate remedial action for this area.

The total estimated volume of contaminated soil requiring treatment appeared to be in excess of 2000m³.

CRA recommended that:

- The FLP/FMA area be reviewed and improvements to prop design, firewater collection, draining and water treatment be implemented as soon as practical to prevent further contamination of soil and dam sediment;
- Contaminated soils from the FLP/FMA and fire training pits be excavated for onsite treatment and the area be backfilled with clean fill;
- Once the improvements have been made and hydrocarbons are being intercepted and removed from surface waters, Dam 1 may be rehabilitated;
- Contaminated soils from Drum Burial Pits be excavated and subject to the presence of drums, be treated onsite or otherwise disposed of off-site to an appropriate landfill. The trenches should be backfilled with clean soil;
- Surface water monitoring be continued at appropriate intervals, including at least one more round of monitoring before the FLP/FMA improvements above are implemented; and
- Groundwater monitoring wells be dipped and sampled annually.

2.9 Rio Tinto – Remediation Action Plan (1997)

Rio Tinto Pty Ltd (Rio Tinto) (formerly Bioremediation Services, Minenco and CRA ATD) were commissioned by CFA to prepare a remedial action plan (RAP) for the Site in 1997 the details of which are provided in the report, Rio Tinto Pty Ltd '*Remediation Action Plan*', dated 11 December 1997 (Reference A912B).

A copy of this report is provided in Appendix D.

Rio Tinto reported that their previous report '*Review of Site Investigations at Fiskville*' (Reference CRA5991rpt1) was provided to the EPA and the EPA indicated their agreement with the conclusions of this review and to the proposed remedial actions.

Rio Tinto stated that the purpose of the RAP was to review contamination present onsite, provide details of the remediation objectives and methodology, and outline the management plans for various aspects of the remedial works.

The RAP considered the following two areas of soil contamination:

- The Flammable Liquids Pad; and
- The Fire Training Pits.

The FLP were described as a large area containing obvious superficial soil contaminations with fuel residues from fire training activities. Crushed rock fill is contaminated with hydrocarbons at depths of 0.1-0.5m, but generally no deeper than 0.8m. Total petroleum hydrocarbon concentrations range up to 1600 mg/kg.

The Fire Training Pits were described as two decommissioned fire training pits, east of the FLP which contained a thin layer (less than 10cm) of black hydrocarbon sludge at a depth of 0.1 to 0.6m bgl. The sludge was covered by a 0.1m to 0.8m thick layer of surface fill comprising of silty clay, silt and gravel. High



concentrations of TPH up to 88,000 mg/kg were found in the sludge layer and soil from 0.6 to 1.0m bgl. Elevated lead levels (710 mg/kg) were found in one sample.

They also noted that no groundwater contamination was identified requiring remedial action. Rio Tinto concluded that the depth to groundwater in the basalt (greater than 20-25 m), and relative impermeability of the residual silty clay soil affords a high degree of protection to any groundwater resource which might be present.

Rio Tinto noted that the Drum Burial Pits and contaminated sediments in Dam 1 have not been included in the RAP and will be the subject of a future RAP.

Rio Tinto proposed that the remediation would occur in two phases:

- All contaminated soil will be excavated and removed to a treatment facility to be established onsite. The excavations will be backfilled with clean fill although not as part of the present RAP; and
- Excavated soil, contaminated with hydrocarbons, phenols and BTEX, will be treated onsite by a process of soil composting in windrows.

The RAP outlined the methodologies for soil excavation; soil treatment and disposal; and validation and the health, safety and environment management plan.

The proposed adopted criteria for the excavation phase were the Victorian EPA guidelines for off-site disposal of contaminated soil as clean fill, EPA Publication 448 "*Classification of Wastes*", September 1995.

Rio Tinto outlined that the proposed/agreed actions for each of the participatory organisations are as follows:

- Rio Tinto will provide design and operational support for the composting process, including turning of the windrows; and
- CRA will procure inputs for the process and carry out the field work required for executing the process.

2.10 Coffey – Soil Remediation and Validation Program Report (1998)

Coffey were commissioned by CFA for remediation activities at the FLP at the Site on 19 December 1997, the findings of which are provided in the report, Coffey Partners International Pty Ltd '*Soil Remediation and Validation Program, Fiskville Near Ballan, Vic*', dated March 1998 (Reference E3523/3-A1).

A copy of this report is provided in Appendix D.

As stated by Coffey the primary objective of the objective of the Site study was to facilitate the implementation of the Draft Remediation Action Plan prepared by Rio Tinto in December 1997, and to conduct a validation sampling and analytical program in areas where contaminated soil had been excavated.

The scope of the works completed during the course of the remediation activities included:

- Overseeing construction of the on-site bioremediation facility.
- Overseeing contaminated soil excavation in each of the two identified areas of environmental concern, i.e. the FLP and the old FTP.
- Conducting field observations and undertaking photo ionisation detector measurements to screen soil samples for volatile ionisable hydrocarbons.
- Collection of soil samples from the base and sides of the excavations to validate the soil condition after soil excavation.
- Overseeing cartage of contaminated soil and stockpiling of soil in the on-site bioremediation facility.
- Liaison with Rio Tinto with regard to windrow management.



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During the Stage I works, Coffey reported that approximately 4 300 m³ of contaminated soil was excavated from the FLP, an area approximately 90 m (east-west) by 80 m (north-south). The depth of excavation was generally 0.6 m bgl, excepting areas in the vicinity of FTPs and the fuel mixing area where excavation was up to 1.2 m bgl.

Evidence of soil staining and hydrocarbon odour (mainly diesel), indicative of soil hydrocarbon contamination, was observed in the field.

Following the break-up and removal of surface concrete structures and pipework, the fill layers were removed to a depth of approximately 0.5 m to 0.6 m. An excavator and trucks were used to remove the contaminated soil and pipework to a depth of 0.7 m to 0.8 m in some areas, and up to 1.2 m in the most heavily contaminated areas.

Agricultural drains resided at a depth of approximately 0.7 m to 0.8 m and contained residual fuel oil with associated diesel odour, causing substantial soil contamination in the FLP area. The general drainage direction was towards Dam 1 from beneath the FLP area. Consequently, significant excavation works were required in the vicinity of these drains.

Approximately 1,000 m³ of contaminated spoil was excavated from the old FTP during Stage I works. The area of excavation was approximately 55 m long by 40 m wide and located to the east of University Road. The approximate depth of excavation was 0.4 m bgl along the eastern part of the excavated area and up to 1.2 m depth in the western parts near University Road. These deeper excavations occurred in the vicinity of the former fire training pits, and areas further to the east where the scoria cover and the black sludge layer were substantially thinner were excavated due to possible overflow spillage from the former pits.

Soil contamination was visually identified as a black sludge, only millimetres thick but for in the deeper parts of the excavation where it ranged up to tens of centimetres thick. The black sludge layer had since been covered with red scoria gravel. Residual clay associated with basalt occurred below the contaminated soil. The black sludge was most commonly associated with the buried topsoil beneath the scoria fill, and occasionally with the residual clay below. The depth of the scoria layer ranged from 0.2 m to 0.6 m.

Coffey reported that the test results generally indicated that petroleum hydrocarbons (TPH), BTEX, lead and total phenol concentrations were below EPA guidelines for off-site disposal as "clean" fill, except for the following samples that exhibited TPH (>C9) concentrations greater than 1000 mg/kg:

- FLP3S-O.1P, blue metal fill sample, excavation depth of 0.3 m, eastern wall of the easternmost extent of the FLP excavation abutting University Road (approximately 20 m north of the southern boundary and approximately 15 m north of the interceptor), exhibited TPH (>C9) concentrations of 1450 mg/kg.
- FLP40-O.1P, residual clay sample, excavation depth of 1.2 m, base of the excavation in the fuel mixing area located in the north western corner of the FLP adjacent to the green shed, exhibited TPH (>C9) concentrations of 2350 mg/kg.
- FTP14-O.1P, residual clay sample, excavation depth of 0.4 m, western side of the westernmost extent of the FTP excavation abutting University Road, exhibited TPH (>C9) concentrations of 1070 mg/kg.

Coffey reported that the Stage II activities involved additional excavations in the vicinity of FTP14. An area approximately 6m by 10 m located between sample location FTP14 and University Road was excavated to 1.2 m depth, thereby extending the former excavation to the same depth in a westerly direction to University Road. In the northern part of this excavation, the excavation works proceeded to 2.5 m depth where hydrocarbon contaminated waste material had been dumped in a deeper part of the old fire training pits. The contaminated material was subsequently excavated resulting in a small (2 m by 2 m) excavation of 2.5 m depth.

Coffey reported that the test results generally indicated TPH, BTEX, lead and total phenol concentrations were at or below laboratory detection limits, except for a sample collected from the fire training pit location



FTP17 where minor TPH (>C9) concentrations were detected. TPH concentrations at this location, however, were below VICEPA guidelines for off-site disposal as "clean" fill.

Coffey concluded that the results of the validation sampling and analytical program confirmed the absence of contaminants, at levels exceeding the target concentrations adopted in the RAP (RioTinto, 1997), in soil profile samples collected from the base and sides of the FLP and FTP excavations. On this basis Coffey recommend the excavations be backfilled with clean fill.

2.11 GHD – Report on Upgrade of Flammable Liquids Pad (May 1998)

GHD PTY LTD (GHD) were commissioned by CFA to prepare a functional design for an upgrade of the Flammable Liquids Pad in May 1998, the details of which are provided in the report, GHD Pty Ltd '*Report on the upgrade of the Flammable Liquid Pad*, dated May 1998 (Reference MIW10258).

A copy of this report is provided in Appendix D.

GHD reported that the original FLP had reached the end of its life and had been sitting on a depth of contaminated soil. The soil had been removed and at the time of the GHD report was undergoing remediation by Rio Tinto.

GHD set out options and provided recommendations on:

- The most appropriate arrangement and construction of a new FLP and extinguisher training pad (ETP); and
- The most appropriate collection and treatment system for pad run off.

GHD reported that requirements of the EPA applied to the possible discharge of water to watercourses and groundwater.

To meet EPA requirements, GHD proposed that design included:

- Either surface treatments or a subsurface layer to prevent seepage from the FLP reaching groundwater; and
- A treatment system to bring the runoff from the FLP to comply with quality requirements of the SEPP (WoV, GoV, 2003).

GHD made the following recommendations for the new FLP:

- Fire fuels to be used on the FLP include diesel, petrol (unleaded) and LPG. LPG will provide the major proportion of all fuel burnt;
- The main retardant foam to be used on the FLTP is "B" class foam which is primarily used for "B" class (flammable liquids) fires. The occasional use of 3M Aqueous Film Forming Foam (AFFF) may occur;
- The upgraded PAD is proposed to include nine sites for props on an area of 70 x 80 m;
- Runoff will be controlled by bunds and a drainage system. The bunded areas will be constructed with heat resistant concrete. In order to control shrinkage cracks, the slab will have to be jointed at regular intervals or heavily reinforced;
- The bund will include a valved drainage system so that the drainage outlet valves can be closed to retain water during the training exercises. Each area will be connected to a main spoon drain system leading to a surge pit and interceptor pit. The surge pit will have a capacity of 34m³;
- Cooling water for props was previously drawn from Dam 1. For the new FLP and ETP, cooling water will be supplied from the backup supply;



- The new fire water reticulation system will be provided from Dam 2; and
- The recommended wastewater treatment system will comprise of the following:
 - Interceptor – Required to remove floating hydrocarbons and debris from wastewater from FLP prior to discharge into Dam 1. Designed to cater for an average flow with 3 equal compartments, each 2.5 m wide by 2.7 m long and 1.7 m deep;
 - Dam 1 – Designed to breakdown dissolved hydrocarbons and emulsions with the assistance of mechanical aeration. The volume of Dam 1 is estimate to be 1700 kL and the average detention time for wastewater is 10 days; and
 - Dam 2 – Design to collect effluent from Dam 1. The volume of Dam 2 is estimated to 6100 kL and the average detention time for waste water is 36 days.

Recommendations for the design of control booths and area lighting were also included in the report.

2.12 Rio Tinto – Remediation of Hydrocarbon Contaminated Soil, CFA (1999)

Rio Tinto reported that the remediation at site was carried out in two stages. The excavation, validation and reinstatement of two contaminated areas was carried out and reported by Coffey. While Rio Tinto was commissioned in February 1998 to manage the onsite treatment of this excavated soil. The details of the treatment works and the results of the final validation sampling in early 1999 are provided in the report, Rio Tinto Pty Ltd '*Remediation of Hydrocarbon Contaminated Soil*, dated 03 June 1999 (Reference TR00025).

A copy of this report is provided in Appendix D.

Rio Tinto reported that contaminated soil from the Flammable Liquids Pad and Fire Training Pits was excavated as per Coffey's original recommendations and the soil was stockpiled onsite.

The total volume of contaminated soil (i.e. TPH concentration >1,000 mg/kg) was 4,300m³. The soil was placed into four (4) windrow piles in a bunded area onsite. Approximately 35% (by volume) of raw materials (green tree waste, cow manure, gypsum and nutrients) were added to initiate composting. The windrows were kept moist during the summer months, but no other maintenance was performed.

Two months after composting was initiated, the windrows were sampled and a second round of sampling was conducted after 6 months. The soil samples were analysed for TPH, BTEX, phenols and lead. The average reported TPH concentrations (730 mg/kg) from this second round of validation sampling met the Victorian EPA clean fill criteria. No other contaminants of significance were reported in the treated material.

Rio Tinto reported that the CFA indicated the soil within the compost windrows would be left in place (i.e. stockpiled in the bunded and drained area) for the foreseeable future.

Rio Tinto concluded that the treated material did not pose an unacceptable risk to human health or the environment and they suggested the following disposal options for the treated materials:

- The treated material could be used as fill under the new training pad;
- The treatment area could be levelled to allow revegetation to take place; and
- The treated material could be spread over the surrounding paddocks to provide organic enhancement.



2.13 Wynsafe – Perfluorochemicals in Fire fighting Water at CFA Fiskville

Wynsafe Occupational Health Services Pty Ltd (Wynsafe) were commissioned by CFA to determine if fire fighting water at the Site contains Perfluorooctyl Sulfonate (PFOS) or Perfluorooctanoic Acid (PFOA) and if so at in what concentrations. The details of their assessment are provided in the report, Wynsafe Occupational Health Services 'Perfluorochemicals in Fire fighting Water at CFA Fiskville', dated June 2010 (Reference: no reference number provided).

A copy of this report is provided in Appendix D.

Wynsafe reported that the 3M Company after discussions the United States EPA (USEPA) decided to discontinue its AFFF product line with effective end of production occurring around November 2001. The reason for this withdrawal was based on results that determined that a base material used in the production process of PFOS is considered to be Persistent, Bio-accumulative and Toxic (PBT) and as such further use would be harmful to the environment.

As foams containing PFOS were previously used at CFA Fiskville, it was decided that fire fighting water would be analysed for the presence of PFOS and PFOA and determine if concentrations present pose of a risk to site personnel.

Wynsafe collected water samples on 7 June 2010 from the following locations:

- Pit – supplies water to the main hydrant on the FLP;
- Dam 2 – supplies water to the backup hydrant on the FLP; and
- Fiskville Pumper 3 (MYT 543) – used for training and has been onsite for many years.

A sample was also analysed for BOD, Pseudomonas and E.coli, although results were not presented in the report supplied to Golder Associates.

The reported analytical results are summarised in Table 3.

Table 3: Wynsafe Analytical Results 2010

Location	PFOS (ug/L)	PFOA (ug/L)
Criteria	0.2*	0.4*
Pit	5.5	17
Dam 2	0.6	11
Pumper 3	0.5	9.9

- Sample not analysed
- * USEPA health advisory level only (drinking water)

Water Quality Criteria

In August 2009, following a recommendation from Ecowise and supported by Wynsafe, the water quality criteria for the Site were revised to:

- E Coli = < 150 orgs per 100ml;
- BOD = < 10 mg/L;
- pH = 6.0 – 9.0;
- Suspended Solids = <5 mg/L; and
- Pseudomonas Aeruginosa = <10 organisms (orgs) per 100mL.



APPENDIX D

Historical Information Review

Wynsafe reported that the Victorian EPA and DHS have no objections to the revised water quality criteria.

Wynsafe reported that the USEPA has recommended a provisional drinking water advisory for PFOA and PFOS of 0.4 ug/L and 0.2 ug/l respectively. While the United Kingdom (UK) Committee for Chemicals in Food, Consumer Products and the Environment (COT) has recommended a Tolerable Daily Intake of 0.3 ug/kg for PFOS and 3 ug/kg for PFOA. There are currently no Australian Standards or guidelines for either PFOS and PFOA in drinking water or occupational exposures to PFOS or PFOA.

Wynsafe reported that the fire fighting foam currently used at the Site (Tridol 3-6 ATF) does not contain PFOS or PFOA according to their product information and material safety data sheets (MSDS).

Wynsafe concluded that although the reported concentrations of PFOS and PFOA were above the USEPA advisory levels for drinking water, the normal exposure pathway for CFA personnel would be by the ingestion or inhalation of water and spray during training. The National Water Commission document "Quantitative chemical exposure assessment for water recycling schemes" estimates that the median ingestion of water and spray for a fire fighter is 20ml per fire. Thus the estimated exposures will produce daily intakes several hundred times lower than the recommended Tolerable Daily Intake (TDI) for both PFOS and PFOA.

Wynsafe concluded that if current Standard Operating Procedures (SOPs) are followed and related Personal Protective Equipment (PPE) is used, personnel will suffer no adverse health effects from exposure to PFOS and/or PFOA in the fire fighting water.

Wynsafe made the following recommendations:

- CFA should monitor closely further research on the health effects of fluorosurfactants in fire fighting foams to determine whether the current foam (Tridol) remains recommended with no potential risks to personnel;
- CFA should also monitor any changes in current advisory levels for drinking water or the introduction of any new (particularly Australian) standards or guidelines for occupational exposure to PFOA or PFOS; and
- Water samples should be collected from Pit, Dam2 and Pumper 3 on a bi-annual basis. This will monitor any change in PFOA/PFOS concentrations and help to determine whether the compound is being flushed from the system or whether a 'cleanup' is required.



3.0 INFORMATION FROM FISKVILLE INVESTIGATION TEAM AND CFA PERSONNEL

Information provided by CFA personnel to the Independent Fiskville Investigation Team during this PSA which may be relevant to the Site contamination status is summarised in Table 4.

Table 4: Information from Fiskville Investigation Team and CFA Personnel

Information Source	Description
CFA Personnel	In 1972 theoretical fire fighting training commenced at the Site.
CFA Personnel	In 1973 practical fire fighting training commenced at the Site.
CFA Personnel	Between approximately 1977 and 1985 drums of flammable liquids were stored in an area directly west of the Training Centre. On the 22 nd December 1982, several drums stored in this area ignited. The fire was reportedly quickly extinguished but approximately 20 to 30 drums were damaged in the fire. The following day (23 December 1982), CFA personnel were overcome by vapours while moving the 'fire damaged drums. The drums were subsequently moved and buried at a later date. The exact drum burial location is unknown however CFA personnel have indicated to the Independent Investigation Team that the drums may have been buried in a treed area north of the Administration Building.
CFA Personnel	A further 100 drums remained in the area west of the Training Centre after the fire affected drums were buried. CFA personnel have advised the Independent Investigation Team that these drums were buried in 3 trenches to the east of the Administration Building, sometime between 1983 and 1984. The golf course is now located in this area.
CFA Personnel	CFA personnel reported to the Independent Investigation Team, that drums were also buried in an area to the south of the Airstrip during the 1980s, the exact date of the burial is unknown
CFA Personnel	In 2002, an excavator driver was exposed to fumes during the ripping of soil for tree planting in the vicinity of the Drum Burial Area to the south of the Airstrip.