Dalyellup Annual Environmental Report - 2023

(From Dalyellup TSF Site Spring 2022 Revegetation Monitoring Report)

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Summary

This report documents the environmental review of the Dalyellup Treated Solid Residue (TSR) disposal facility managed by Tronox Pigments Bunbury Ltd (Tronox). The report is submitted to satisfy the reporting requirements for the period January – December 2023 in accordance with:

- Closure Notice for Licence 6130/1989/12 (Appendix A) issued by the Department of Water and Environmental Regulation (DWER) under Part V of the *Environmental Protection Act 1986* (EP Act), which commenced 14 May 2013; and
- Ministerial Conditions (Appendix B) imposed under Part IV of the EP Act.

The key findings of this review are:

- Assessment of monitoring data indicates that the rehabilitation of the historical TSR facility results in minimal environmental impacts.
- Radiation levels measured at the site boundaries and in groundwater are consistent with previous years and remain at background levels. The Radiological Council of Western Australia (RCWA) have reiterated that the radiological risk to the community is low and does not require a buffer zone to the east of the site.
- No significant levels of dioxins and furans were found in the ground water samples.
- Background bore MB4 which had been previously damaged, was recommissioned in 2019 to facilitate ongoing sampling. The bore was vandalised again during 2020 and samples were not able to be collected after the January 2020 monitoring event. The bore is located outside of the TSR disposal facility in a publically accessible area. This limits Tronox's ability to continuously maintain the security/integrity of this bore.
- The Yarragadee aquifer remains unaffected by the site.
- Stage 2 Rehabilitation Plans are progressing with ponds capped, area seeded and seedlings planted. Weed and pest control and planting of *Agonis flexuosa* seedlings was undertaken during 2023. Monitoring of the rehabilitation area continued throughout the year. Data and observations from the Spring monitoring event are consistent with monitoring undertaken since 2019. Plant health generally improves after winter then declines through the summer months. After a sustained period of soil moisture and cooler temperatures, plant health improves, and growth rates increase. When consistent hot wind and lack of rainfall dries the site during summer, plant health declines. Despite the site tracking towards being self-sustaining, with data overall trending in an upward direction, a greater rate of establishment would normally be expected after 5 years (Cape Life 2023).

Since the operation ceased in 2013, monitoring bores down-gradient of the leachate plume are generally trending to lower concentrations of contaminants. The observed trends indicate that leachate generation is declining following closure of the facility. The facility continues to present minimal environmental impact and with natural attenuation contaminant concentrations are returning to background levels.

1.0 INTRODUCTION

1.1 Background of Operations and Purpose

Tronox Mineral Holdings Australia Pty Ltd (Tronox) acquired the global titanium dioxide business of The National Titanium Dioxide Company Ltd (known as Cristal) on 10 April 2019. On 25 July 2019 Cristal Pigment Australia Ltd changed its name to Tronox Pigment Bunbury Ltd (Tronox).

Tronox is one of the world's leading producers of high-quality titanium products, including titanium dioxide pigment, specialty-grade titanium dioxide products and high-purity titanium chemicals; and zircon. Tronox mines titanium-bearing mineral sands and operates upgrading facilities that produce high-grade titanium feedstock materials, pig iron and other minerals. Tronox has two manufacturing facilities in the south west region near Bunbury (see Figure 1). They are the Kemerton processing plant and the Australind finishing plant. Combined, the two plants produce nominally 110,000 tonnes of finished pigment each year. Tronox also operated a Treated Solid Residue (TSR) disposal facility at Dalyellup, 8 km south of Bunbury until 1 March 2013. Since 2013, the TSR has been sent to Cleanaway's Banksia Road Facility at Dardanup.

A Closure Notice was issued in May 2013 by the Department of Water and Environmental Regulation (DWER) and amended in August 2013. This report documents the ongoing monitoring of the TSR disposal facility as required by the Closure Notice.

Figure 1 – Site Location

1.2 Source of Treated Solid Residue (TSR)

The vast majority of TSR sent to Dalyellup was from the Kemerton Processing plant (~ 95%). The plant utilises the chloride process to produce TiO_2. The chloride process is based on the production of titanium tetrachloride (TiCl4) from the chlorination of titanium bearing ore. The purified $TiCl_4$ is subsequently oxidised, yielding titanium dioxide and allowing recycling of chlorine (Cl_2).

Titanium-rich ore, together with a supply of carbon (petroleum coke), is fed into a chlorinating vessel, which operates at approximately 900 to 1100°C. Chlorine entering the vessel reacts with the TiO_2 and some of the ore impurities to form $TiCl_4$, metal chlorides as well as carbon monoxide (CO) and carbon dioxide (CO_2). The reaction is as follows:

$$3\ TiO_2 + MOx + 4\ C + 6\ Cl_2 \longrightarrow 3\ TiCl_4 + 2\ CO + 2\ CO_2 + MClx$$

In the purification process, solid and liquid impurities are separated from the hot gas. The gas is condensed and then distilled to produce pure titanium tetrachloride as an intermediate product.

The solid residue separated from the gas stream typically consists of metal chlorides, oxides, various silicates, unreacted ore and coke. Most of the ore and coke is recovered and separated prior to being reused in the production process. A neutralisation process is used to treat the remaining solid residue from the chlorinated gas stream. Lime is added to each of a series of tanks to raise the pH and precipitate the contaminants as hydroxides.

$$MCl_x + Ca(OH)_2 \longrightarrow CaCl_2 + M(OH)_x$$

Metal chlorides + lime ⟶ calcium chloride + metal hydroxides

The slurry is then sent to a clarifier where the solids settle and are separated. The solids are filtered by a vacuum filter and washed to remove a large proportion of the soluble salts. The waste was transferred as a ~ 20% solid slurry by tankers to the disposal site at Dalyellup.

The Australind residue contributed approximately 2 to 6% of the total residue sent to Dalyellup. The Australind finishing plant receives TiO_2 slurry from Kemerton via road tanker where it then undergoes surface treatment, washing, filtering, drying, final milling and packaging. Any process wastewater is captured in the drain system which is transferred to the neutralisation plant. The neutralisation process is the same as Kemerton and slurry was transported to Dalyellup in the same manner. The dried residue is an inert, insoluble, non-toxic, clay-like material.

2.0 SITE INFORMATION

2.1 Site History and Location

The disposal site is adjacent to and set within the buffer zone of the No.2 Bunbury Sewage Treatment Works and is approximately 200 m from the ocean. The disposal site is situated in the swale between the vegetated linear primary dunes and the parabolic secondary dunes, which have a maximum elevation of approximately 45 m Australian Height Datum (m AHD).

Disposal at the site commenced in March 1989 under a five-year agreement with the Shire of Capel. DWER, however, agreed to the use of the site for three years, conditional upon satisfactory environmental performance. In June 1991, the company submitted a proposal to the DWER for a two-year extension of its disposal facilities. This was consistent with the original agreement made with the Shire of Capel. In response, DWER called for a Consultative Environmental Review (CER).

The CER was released in September 1991 and, following the public review and assessment period, approval for the project to proceed was received from the Minister for the Environment on 23 January 1992. The extension, approved under Ministerial Statement No. 213, expired on 4 March 1994.

In August 1993 Tronox submitted a proposal to the DWER for continued use of the disposal site. Pursuant to section 46(1) of the EP Act, the Minister for the Environment requested DWER to inquire into and report on the proposed change to Environmental Condition M1.

The Section 46 amendment was approved in Ministerial Statement No. 332, published on 9 December 1993. Further Ministerial Conditions were set on the project (see Section 5). The extension, for the “Life of the Site”, is subject to the licensing requirements of the EP Act. Tronox was granted approval to operate this site until March 2010.

The site was registered in May 2007 as a Contaminated Site, as required under the *Contaminated Sites Act 2003* (CS Act). The registration was accompanied by copies of the licence, the Annual Environmental Reports (AERs) from previous years, and other studies and reports. The site has been classified by the DWER Contaminated Sites Branch as ‘Possibly Contaminated’ and suitable for its then current use.

In 2008 Tronox commenced community consultation for the issue of a new licence to operate the site from 2010 to 2013. The extension was requested as the facility would not be fully utilised until 2013. This was due to Tronox implementing waste reduction and recycling programs at the Kemerton facility.

During 2009, the Shire of Capel, WA Planning Commission, Radiological Council of Western Australia (RCWA) and Environmental Protection Authority (EPA) approved continued use of the site. An assessment by the DWER followed and a licence was issued on the 25th January 2010 to operate the site until March 2013, at which time the site ceased to operate.

In 2009-2010, studies on the impact of leachate to the near shore, concluded that there was no evidence of metal, chromium VI, dioxin or furan contamination found in the sediment, sediment elutriates or marine water adjacent to the Dalyellup waste disposal site, and on the basis of the results, ground water discharge adjacent to the site posed negligible risk to the marine environment and had a negligible impact on recreational uses on the beach and waters adjacent to the site.

Disposal ceased on 1 March 2013 and the Closure Notice, issued in May 2013 by DWER, details the ongoing monitoring requirements. The remaining TSR ponds were covered with 3-4 m of clean fill in September 2013. The site was classified as “Remediated for Restricted Use” in 2018 as it is considered to be remediated such that it is suitable for passive recreational use as endemic bushland.

Two rehabilitation options were considered in detail: redevelopment to sporting fields; and rehabilitation back to native vegetation. In May 2017, the Shire of Capel formally communicated that they were not committing to the sporting field option in the near future, and works commenced to extend previous successful revegetation efforts at the south of the site to the rest of the facility. In 2018, seeding and planting of seedlings in Stage 2 was undertaken. Weed and pest control and infill planting was undertaken during 2020, 2021, 2022 and 2023. Monitoring of the rehabilitation area continued throughout the year. Weed and pest control and planting of *Agonis flexuosa* seedlings was undertaken during 2023. Data and observations from the Spring monitoring event are consistent with monitoring undertaken since 2019. Plant health generally improves after winter then declines through the summer months. After a sustained period of soil moisture and cooler temperatures, plant health improves, and growth rates increase. When consistent hot wind and lack of rainfall dries the site during summer, plant health declines. Despite the site tracking towards being self-sustaining, with data overall trending in an upward direction, a greater rate of establishment would normally be expected after 5 years (Cape Life 2023).

In 2015, the OEPA was satisfied that ministerial conditions related to the closure had been met. The Mandatory Auditor’s Report, prepared by a DWER accredited independent auditor, was sent to DWER’s Contaminated Sites Branch in July 2015 and reviewed by DWER, Department of Health, Capel Shire and RCWA. The Site Management Plan (SMP) was updated and submitted to DWER in October 2019 for review.

In October 2017 a member of the general public reported to DWER that the proposed Greenpatch development (located to the east of the historical TSR facility) was suspected to be contaminated under the CS Act from chromium and zinc present in the groundwater and TSR beneath the site. Soil validation of the suspected areas found no evidence of TSR beneath the site. The site was reported again in 2018 due to the suspected presence of TSR associated with operations historically undertaken at the former TSR disposal site.

Two hydrogeological studies have confirmed the groundwater flow is from east to west, i.e. towards the sea rather than from the TSR disposal site towards Greenpatch. Background bores located to the south west and within the Yarragadee Aquifer (which is a source of drinking water) show no contamination. It has been over ten years since the operation closed and monitoring bores down hydraulic gradient (down-gradient) of any leachate plume are trending to lower concentrations of contaminants.

There is however, limited groundwater data available to Tronox from monitoring bores to east and south-east of the Tronox site. The Department of Biodiversity, Conservation and Attractions (DBCA) advised[1] that there are no mapped geomorphic wetlands of any management category on the Greenpatch development site. The two water bodies present have been described as a man-made 'sump' or 'dam'. These water bodies are located up hydraulic gradient (up-gradient) of the Tronox site, therefore groundwater flows from these water bodies towards the Tronox site.

[1] Hansard, Legislative Council, 29 Nov 2018

The Contaminated Sites Committee considered appeals against the classification of Lots 8019, 9076 and 9105. The Committee made its decision in respect of this Appeal against the classification on 20 October 2020 and decided the site be reclassified to *'possibly contaminated – investigation required'*. The Greenpatch developers, Satterley, engaged RPS to prepare a Preliminary Site Investigation (PSI) and Detailed Site Investigation (DSI) for the site for submission to an accredited CS auditor.

The main findings of the DSI included the following:

- With the exception of isolated exceedances of metals (Mg, Ni) and radionuclides (Th) in two of 24 locations (TP14 and TP18), soils typically complied with adopted guidelines. All guideline exceedances were observed in a dark brown clayey silt layer visually distinct from natural soils and the capping layer within Lot 9109. Based on investigation results impacted soils are suspected to be a blend (1:9 ratio TSR to sand) of TSR and sands and not straight TSR. Impacted soils at TP14 and TP18 were not considered a risk to human health in their current condition. However, soils may present a risk during the proposed development of Lot 9109 if the material is exposed during earthworks. On this basis removal of the impacted material from Lot 9109 is recommended.
- No TSR was observed elsewhere onsite based upon the site walkover and review of historical aerials. The blended TSR would also pose significantly lower radiation risk then straight TSR due to the lower concentrations of radionuclides.
- Exceedances of ecological guidelines in groundwater were observed for metals (Cr(VI) and Fe) and nutrients. With the exception of hexavalent chromium, dissolved metal concentrations are relatively consistent across the site and of those in the Perth's superficial aquifer. With the exception of Cr(VI) in one bore (DM9S) groundwater quality entering and exiting the site were comparable.
- Lot 9109 was deemed to pose low risk to the human health and local ecology based upon the current site use, i.e. public open space natural bushland, and future proposed residential use, however ongoing management is required to ensure the potential risks to human health are minimised.
- Lot 9076 and 8019 were deemed to present no risk to human health or the local ecology based on the current and future site use.

The DSI stated that to manage the potential increased risk to human health should impacted soils at TP14 and TP18 be exposed during development or groundwater abstracted RPS recommends:

- Impacted soils at and adjacent to TP14 and TP18 are excavated and disposed of at an appropriate landfill.
- A moratorium on groundwater abstraction from the shallow aquifer is acquired to prevent potable / nonpotable groundwater use.

The DSI recommended Lot 9076 and Lot 8019 can be reclassified as "not contaminated – unrestricted use" under the Contaminated Site Act 2003, without any remedial action. After remediation, it is recommended that Lot 9109 is classified as "Decontaminated" under the Contaminated Site Act 2003 and suitable for the proposed land end use as residential and open space.

2.2 Site Hydrogeology

2.2.1 Superficial Formations

The sediments below the site area are calcareous, fine to medium grained sands. They range in depth from 10 to 20 m. Limestone, sand and sandy clays occur in the area at depths between 10 to 30 m. Below these sediments are dark grey, silty, micaceous clays. Some heavy minerals and silty organic matter occur throughout the profile. The secondary dunes are overlain by about 0.5 to 1.0 m of topsoil.

The area is underlain by superficial formations, which range in depth from sea level to about 10 m AHD above sea level. The superficial formations form an anisotropic unconfined aquifer, comprising sand and limestone, with a basal section of less permeable silty sand and sandy clay. The depth to the water table is about 10 m beneath the base of the tailings storage lagoons and varies with topographic elevation and mounding effects. Seasonal fluctuation is estimated to be 1 to 1.5 m.

The superficial aquifer has a saturated thickness at about 10 m beneath the disposal site. Groundwater flow through the superficial formation is towards the ocean where discharge occurs across a seawater interface. The hydraulic gradient is about 1:100. Baseline studies, prior to commissioning the site, recorded electrical conductivities in the order of 1,350 µS/cm, equivalent to about 800 mg/L TDS. Figure 2 shows a hydrogeological conceptual model of the site.

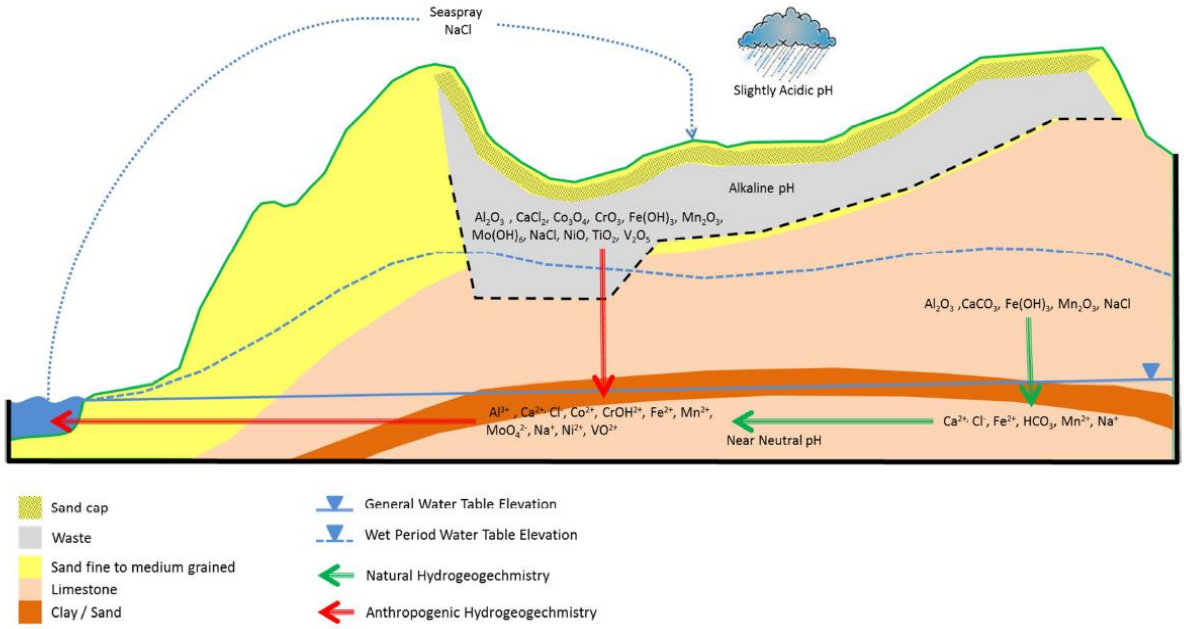

Figure 2 – Conceptual Model of the Site[2]

2.2.2 Yarragadee Formation

The Yarragadee formation directly underlies the superficial formation in this area and forms a confined multi layered aquifer, comprising interbedded sandstone, siltstone and shale. In 1996 it was determined that the potentiometric head in the confined aquifer was about 1 m higher than in the superficial formations. Consequently, there is upward recharge into the superficial formations. This upward head prevents leachate entering the Yarragadee Aquifer. Regional groundwater flow in the Yarragadee formation is in a North West direction and discharge is via the superficial formation into the ocean. Beneath the disposal site, the groundwater salinity in the Yarragadee formation ranges between 600 and 1,000 mg/L TDS.

[2] Dalyellup Waste Residue Facility – Hydrogeological Assessment, GHD, April 2015

3.0 GROUNDWATER MONITORING

3.1 Monitoring Bore Network

Fifteen monitoring bores have been installed around the Dalyellup disposal facility (see Figure 3) including a bore to monitor the Yarragadee (YB).

The monitoring bores on the site are cased with Class 9 PVC, ranging in size from 50 to 100 mm. Construction details of the monitoring bores are given in Appendix C. The bores can be divided into two main groups, background monitoring bores and site monitoring bores.

- The background monitoring bores are constructed of 100 mm PVC and are slotted against the entire aquifer thickness. These are designated by the MB (monitoring bore) prefix.
- The site monitoring bores are located in pairs, one deep (A) and one shallow (C); these are designated by the DM (Dalyellup monitoring) prefix e.g. DM2A and DM2C. Monitoring at two depths in the aquifer is conducted to identify any stratification that may be occurring in the leachate plume. DM1R and DM9R are up hydraulic gradient of the historical TSR ponds and are considered to be representative of background conditions.

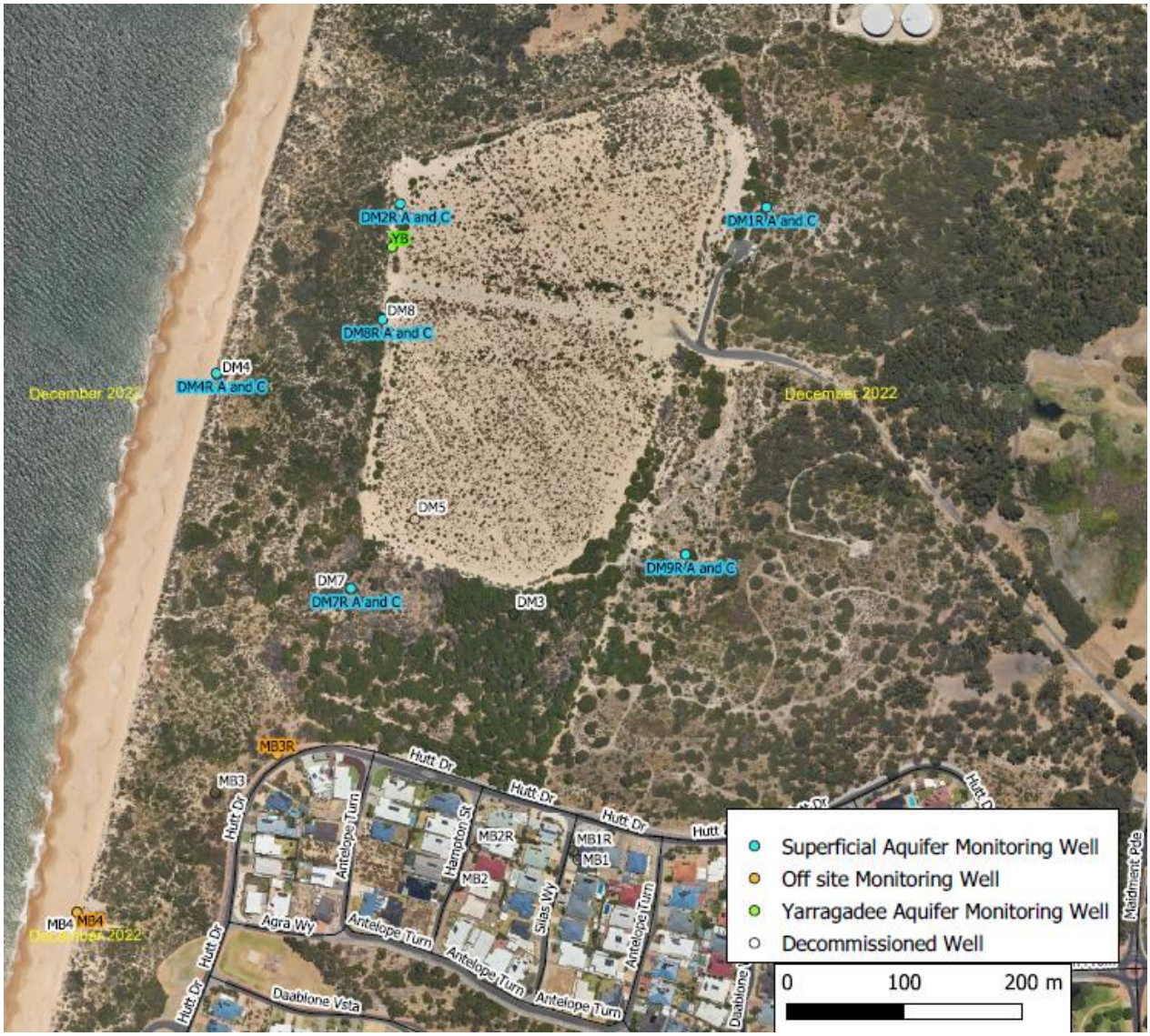

Figure 3 - Monitoring Bore Locations

Bores range in depth from around 15 to 50 m below ground level and monitor groundwater in the Superficial Formations (quaternary aged shallow aquifer system). Since the monitoring bore network was constructed in 1989, several bores have been replaced. Bores DM1(R) and DM4(R) were replaced in 1992 and 1996 respectively as part of earth works on the site. MB1, MB2 and MB3 were replaced in February 2001 due to earthworks associated with the Dalyellup residential sub-division, which borders the southern boundary of the disposal area. In May 2004, MB1 and MB2 were decommissioned due to further earthworks. This was discussed with DWER at the time and the licence was amended to reflect the changes in July 2005.

The southern ponds were rehabilitated in 2002. DM3A and DM3C were located in the southern ponds and have now been decommissioned. Some sand was also removed from the southwest part of the central pond to help build a separating wall in the pond. This unintentionally created some erosion around bores DM5A and DM5C and made sampling of these bores unsafe. These bores were subsequently decommissioned.

Background monitoring bore, MB4, has been damaged a number of times since 1989. The bore was vandalised in 2018 and recommissioned in 2019 to enable recommencement of the sampling program. The bore was vandalised again during 2020 and samples were not able to be collected after the January 2020 monitoring event. The bore is on the beach's high water mark outside of the TSR disposal site boundary and is subject to both storm damage and acts of vandalism which restricts Tronox's ability to maintain integrity of this bore.

3.2 Superficial Aquifer Monitoring Bores

As required by Section 1.3 of the Closure Notice, a report was prepared on the groundwater beneath the site for the period 4 March 2013 to 4 March 2015 [2]. The full report was provided in the 2015, 2016 and 2017 AER's.

Groundwater discharges directly into the nearby Indian Ocean. As such, ANZECC 2000 Marine Water 95% species protection criteria (Marine Criteria) was adopted for the assessment. In summary the report concluded:

a) Geology underlying the Site comprised calcareous, fine to medium grained sands, ranging in depth from 10 to 20 m. Limestone, sand and sandy clays occur in the area at depths between 10 to 50 m. Below these sediments are dark grey, silty, micaceous clays. The clays appear from 20 to 40 m, and occasionally occur above or within the sandy limestone layers.

b) Groundwater standing water level (SWL) resides in the superficial formation between 0.8 to 2.5 m AHD. Yarragadee aquifer SWL level resides between 1.5 to 2.5 m AHD.

c) The monitoring network incorporating 15 bores was sufficient to complete the hydrogeological review;

d) Groundwater quality investigations reported exceedances of select trace metals. Of these, it was concluded that lead, cobalt, copper and zinc are likely to be due to natural background conditions.

e) Chromium and vanadium were the only two detected trace metals that appear to be linked to the TSR as their concentration shows an increase between the up and down-gradient bores.

f) Mobility of hexavalent chromium and vanadium is dependent on anionic sorption processes with the main anion attracting sites being ferric hydroxide minerals. Therefore, dissolution of these metals is dependent on pH. The pulsed nature of mobility would likely result in very slow transport velocities with these metals only migrating during periods when the pH is in a narrow window where sorption and precipitation are not occurring.

g) The TSR is generating saline leachate that is increasing the TDS of the superficial groundwater along the flow path.

h) The most likely mineral responsible for the majority of the observed effect on the major ion composition of the groundwater is calcium chloride. The source of this mineral is considered to be anthropogenic and probably associated with the TSR.

i) The hydro-geochemical character at the down-gradient bore (DM4(4R)) is influenced by mixing of fresh groundwater discharge, impacted by leachate from the TSR and seawater interface, which would be anticipated, given the position of the bore near the beach.

The report recommended that Tronox:

a) Maintain the monitoring program as currently described in the Closure Notice.

b) Periodically re-evaluate the hydro-geochemical data to establish that conditions remain stable and provide a series of actions and measures to be adopted should any future monitoring identify potential changes in hydro-geochemical conditions and / or risk profile of the TSR to the environment.

c) Store and manage data in a program which can be updated and analysed easily.

Data (refer to Appendices D and E) is transferred into an environmental database (ESDAT), which is Tronox's site tool for storing and managing the data.

As reported in the 2018 AER, Tronox undertook an evaluation of the dataset to identify statistically significant changes using the Mann-Kendall test. From this test Tronox was able to identify whether there had been an upward or downward trends in the analytical suite over the 10 year period from 2008-2018.

The 2018 AER identified a number of "trends of interest" relating to individual bores and the associated suite of analytes. The 2023 analytical data has been compared against the "trends of interest" and reported in Table 1.

Table 1 – Trends of Interest

BORE	ATTRIBUTE	COMMENT (Refer to graphs in Appendix D and bore locations in Figure 3.)
DM1A	Pb	Deep bore NE corner. This bore is up hydraulic gradient of the historical TSR ponds. Spike in August 2012. Concentrations were below level of detection in 2023. These values are considered to be reflective of ambient groundwater conditions. Action: No further action.
DM1C	EC, TDS	Shallow bore NE corner. This bore is up hydraulic gradient of the historical TSR ponds. Levels returned to near previous high levels in June 2021 and October 2022 before dropping to longer term average value in 2023. EC and TDS levels indicate that there has not been any impact resulting from saline TSR leachate on this bore confirming that this bore is up hydraulic gradient of the historical ponds. Action: No further action.
	Fe	Peaked in 2015-2016. 2023 levels significantly less than the peak values recorded in 2015-2016. These values are considered to be reflective of ambient groundwater conditions. Action: No further action.
	Pb	Peaked in 2012 -2016 with seasonal fluctuations. The concentrations over the last five years' were significantly below the peak values recorded and levels have been below ANZECC marine water quality guideline (95% trigger) from 2019. Action: No further action.
	Mn	Peaked in 2012 -2018 with seasonal fluctuations. The concentrations over the last five years' were significantly below the peak values recorded. Action: No further action.
	Na/Cl	Results over the last five years were around 1 indicating no impact from the Cl leachate from the TSR. Action: No further action.
	Mg, Na, SO_4	Major constituents (Mg, SO_4, Na) were similar to long term averages. Action: No further action.
DM2A	Cr(VI)	Deep bore on NW corner of the historical TSR facility. Levels peaked in 2014. 2019 levels increased to similar peak value before decreasing in 2020 and further decreasing in 2022. Levels have fluctuated over 2023 and were slightly above ANZECC marine quality water guidelines (95% trigger). Action: Refer to Section 3.2 (f). Action: Continue to monitor.
	Pb	Peaked in 2012 -2016 with seasonal fluctuations. Levels stabilised below the ANZECC marine water quality guidelines (95% trigger). Action: No further action.
	Mn	Peaked in 2014. Concentrations have stabilised at low levels over the last few years. Action: No further action.
	Ni	Spike in April 2014. However, levels have remained below the ANZECC marine water quality guidelines (95% trigger) and have stabilised well below the maximum concentration recorded. Action: No further action.

BORE	ATTRIBUTE	COMMENT (Refer to graphs in Appendix D and bore locations in Figure 3.)
	V	Spike in April 2014, however levels returned below the ANZECC marine water quality guidelines (95% trigger) at the end of 2017 and remained have below the adopted guideline since then. Action: No further action.
DM2C	Cl	Shallow bore on NW corner down-gradient of tailings. Levels have varied over the monitoring period from 1988 in response to when TSR was deposited in the historical ponds closest to this bore. Levels have gradually declined from the last peak recorded in 2015. Action: Continue to monitor.
	Cr(VI)	Spike in April 2014, again in October 2020 and highest concentration was recorded in November 2023. Levels remain above ANZECC marine quality water guidelines (95% trigger). Action: Refer to Section 3.2 (f). Action: Continue to monitor.
	Fe, Ni, Pb, Mn, V	Spike in May 2017. Levels returned to be lower than ANZECC marine quality water guidelines (95% trigger) for Pb, Ni and V. Refer to Section 3.2 (f). All parameters are trending down and have stabilised at low levels. Action: Refer to Section 3.2 (f). Action: Continue to monitor.
	Na/Cl EC	2023 NA/Cl ratio remains low (down to 0.26) with natural Na/Cl ratio (0.7 to1.0). EC relatively high, indicating leachate plume impacting this bore with chlorides still present, however is trending down. Action: Continue to monitor.
	Redox	Oxidising conditions recorded over 2023. Action: No further action.
	SO_4	Levels recorded during 2022 and 2023 were slightly higher than previous few years however were lower than the peak value recorded in 2010. SO_4 is indicative of oxidation of sulphur in the TSR. Action: Continue to monitor.
DM7A	Pb	Deep bore near the SW boundary. Spike in April 2018. Levels have continued to decrease from 2019. Levels less than limit of reporting in 2023 and well below ANZECC marine quality water guidelines (95% trigger). Action: No further action.
DM7C	Mn	Maximum value (2.0 mg/L) recorded in 1996. 2023 levels were significantly less than the historical maximum. Action: No further action.
	Mo	Levels have decreased from values recorded in 2018 and remain similar to concentrations recorded in background bores. Action: No further action.
	Ra^{226}	A spike in 2015. 2023 levels were significantly below historic maximum and well below radiological trigger (500 mBq/L). Refer to Appendix F. Action: No further action.
	V	Levels have remained well below the ANZECC marine quality water guidelines (95% trigger) since 2002. Action: No further action.

BORE	ATTRIBUTE	COMMENT (Refer to graphs in Appendix D and bore locations in Figure 3.)
DM8A	Fe, pH, Mn	Deep bore on the western site boundary directly down-gradient of the last filled tailings dams. The pH has stabilised to a more neutral level. Iron and manganese levels were within historical ranges. Levels do not pose a significant ecological risk. Action: No further action.
DM8C	Mo	Shallow bore on the western site boundary directly down-gradient of the last filled tailings dams. Levels in 2023 remained lower than historical maximums after fluctuating levels from 2017-2019. Action: No further action.
	Redox	Conditions fluctuated from slightly oxidising to slightly reducing conditions in 2023. Considered to be similar to ambient groundwater conditions. Action: No further action.
DM9A	Cl, Na	Deep bore on eastern side of the historical TSR disposal ponds. Values recorded during 2023 were within historical ranges. Considered to be reflective of background conditions. These levels indicate that there has not been any impact resulting from saline TSR leachate on this bore confirming that this bore is up hydraulic gradient of the historical ponds. Action: No further action.
	Fe	Levels fluctuated from 2012 to 2021 however have been stabilised close to zero over the last few years. This bore is up hydraulic gradient of the historical TSR ponds and this fluctuation is likely a result of off-site influences. Refer to Section 3.2 (f). Action: No further action.
	Mn, SO_4, pH	Slight increase in pH level in 2022 to their highest historical values before decreasing to closer to long term average in October 2022 and stabilising over 2023. SO_4 decreased from historical maximum value recorded in 2021 to closer to long term average. Mn values have decreased to well below historical maximum values. This bore is up hydraulic gradient of the historical TSR ponds and these values are considered to be reflective of ambient groundwater conditions. Action: No further action.
DM9C	Cr(VI)	Shallow bore on eastern side of the historical TSR disposal ponds. This bore is up hydraulic gradient of the historical TSR ponds. Levels peaked in 2012-14, 2016 and 2020. 2021 and 2022 results were below LOR. 2023 results were slightly above (April 2023) and below (November 2023) LOR. The DSI completed for this lot states that the elevated hexavalent chromium concentrations at this location may be associated with an isolated remnant layer of TSR blend that was identified in a test pit during investigations. Action: Continue to monitor.
	EC	EC (Field) decreased slightly to below historical values over 2022 before returning to historical range, however, considered to be reflective of natural variation in ambient groundwater conditions. Action: No further action.
	Fe	Spike in 2010. Levels spiked again in 2021 and 2023. This bore is up hydraulic gradient of the historical TSR ponds and this increase is likely a result of off-site influences. Action: No further action.

BORE	ATTRIBUTE	COMMENT (Refer to graphs in Appendix D and bore locations in Figure 3.)
	SO_4	Values recorded during 2021 - 2023 decreased from the slightly elevated values recorded in 2020. This bore is up hydraulic gradient of the historical TSR ponds and these values are considered to be reflective of ambient groundwater conditions. No further action.
MB3		Background bore SW of site. Action: Continue to monitor as a reference.
MB4	Fe, Na/Cl, Mn, Pb, V	Background bore on the beach's high water mark. Vandalised in second half of 2018. Repaired bore in 2019 however was vandalised again in 2020. Natural variation. Action: Consider seeking approval to discontinue use of this location as the well has been consistently vandalised over the past few years. There is over 30 years of monitoring data available from this background monitoring location.
YB	Na/Cl, Cl, EC, Mg, V, SO_4	Deep aquifer supplying town water. Natural variation in levels over time. There is no evidence of any impact of TSR leachate on the Yarragadee aquifer. Action: Continue to monitor.

Concentrations were within the ANZECC marine quality water guidelines (95% trigger) with the exception of the following:

- The majority of monitoring locations were at or below the limit of reporting of 0.001 mg/L for hexavalent chromium in 2023. Only five bores (DM2C (up to 0.501 mg/L), DM8C (0.344 mg/L), DM7C (0.033 mg/L), DM9A (up to 0.027 mg/L) and DM2A (up to 0.024 mg/L)) recorded values that exceeded the LOR. DM8A was conservatively assumed to have recorded an exceedance of the guideline value as the LOR for this sample (0.005 mg/L) was higher than the guideline value (0.0044 mg/L);
- DM2C (0.129 mg/L) and DM8C (0.112 mg/L) exceeded the guideline for trivalent chromium (0.0274 mg/L);
- DM9C (0.004 mg/L) and DM4A (up to 0.0015 mg/L) exceeded the guideline for cobalt (0.001 mg/L);
- DM4A (0.0058 mg/L), DM2C (up to 0.0055 mg/L), DM8C (0.0048 mg/L), DM4C (0.0039 mg/L), DM7C (0.0026 mg/L), DM1C (0.0025 mg/L), DM1A (0.0021 mg/L), DM9C (0.002 mg/L), DM2A (0.0016 mg/L) and DM7A (0.0015 mg/L) exceeded the guideline for copper (0.0013 mg/L); and
- DM8A (0.17 mg/L) and DM9C (0.0978 mg/L) exceeded the guideline value for nickel (0.07 mg/L).

Data is provided in Appendices D and E.

The Hydrogeological Assessment (GHD 2015) concluded that reported exceedances of select metals including lead, cobalt, copper and zinc are likely to be due to natural background conditions encountered at the time of sampling. Chromium and vanadium were the only two trace metals that appear to be linked to the TSR as their concentration shows an increase between the up and down-gradient wells.

Points of note from the 2023 SWL dataset for the superficial aquifer are:

- There were no notable short-term trends in SWL's.
- Longer term trends for SWL's indicate an overall decrease in level in response to a decrease in annual average rainfall (Figure 4) and cessation of operations.

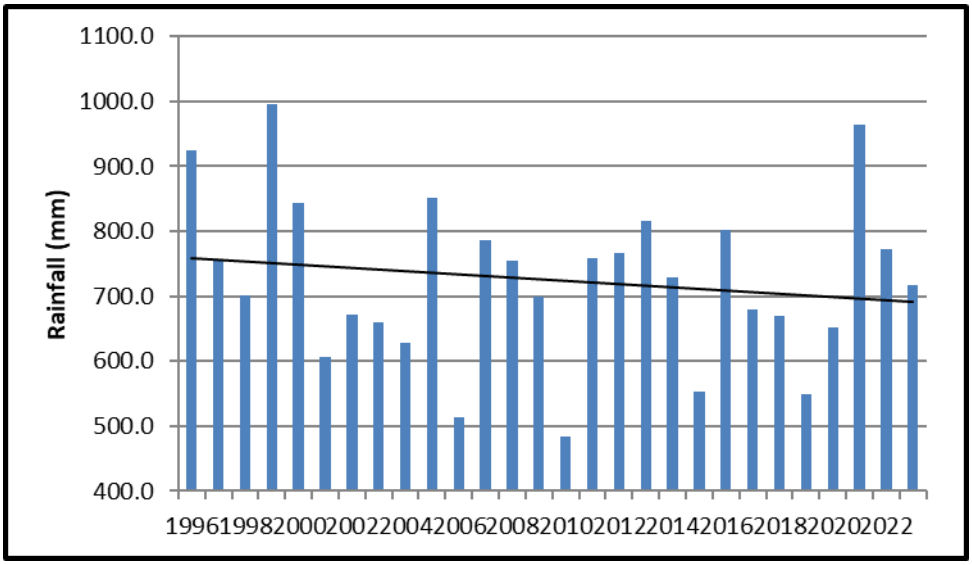

Figure 4 - Total Annual Rainfall at Bunbury (data from BOM (2023))

The monitoring of the molar Na/Cl ratio in groundwater over time assists in determining the position of the TSR salt plume. TSR is rich in soluble chlorides, in particular calcium chloride. As a guide, in nature the molar Na/Cl ratio of waters, be it strongly saline or dilute concentration, approaches 1. Therefore, the TSR salt plume, enriched with chlorides, which moves west to the ocean, will have a low molar Na/Cl ratio (0.2). As the plume is displaced and / or diffused by fresh groundwater flow the molar Na/Cl ratio will approach 1. Refer to graphs in Appendix D. Those monitoring bores up hydraulic gradient of the site, DM1A/C and DM9A/C, show no salt plume, whilst the plume persists in down hydraulic gradient bores of the last filled ponds, DM2A/C, DM4A/C, DM8A/C. DM7A/C, bores down hydraulic of southern ponds, have rising ratios showing the return to background conditions. The southern ponds were decommissioned in 2001 which indicates Na/Cl ratio levels will naturally attenuate after the site ceased operation.

EC and TDS concentrations are also an indicator of the saline leachate plume. These parameters have been declining in all site bores indicating that the generation of saline leachate is reducing since the closure of the facility.

3.3 Yarragadee Bore

The Yarragadee Bore (YB) was sampled quarterly for SWL, pH, electrical conductivity, chloride, sodium, redox potential and radionuclides, and annually for dioxins and furans (see Section 3.4). This data is provided in Appendices D, E and I. Results from 2023 monitoring indicate:

- The Yarragadee aquifer SWL remains between 1.2 to 2.1 m AHD.
- Salinity remains within the ‘marginal’ salinity threshold category of 500 to 1000 mg/L. The long term trend observed regionally is that the aquifer is becoming more saline which corresponds with the lowering rainfall.
- Na/Cl ratio values in the Yarragadee monitoring bore (YB) continue to be aligned with historical values of around 0.7 indicating that connectivity with the shallow contaminated aquifer is minimal and there has been no impact associated with leachate generation from the TSR disposal ponds.

3.4 Dioxins and Furans

A requirement of the Closure Notice is to monitor dioxins and furans annually in bores YB, MB3 and DM8. Refer to Appendix I. Tables (2-4) report the lower, middle and upper boundaries of the data on toxicity

equivalent (TEQ) basis. Variability can be expected at these very low levels and boundaries provide a potential range within each sample.

There were no measureable dioxins or furans (1, 2,3,7,8 PECDD) in the groundwater samples from the monitoring bores (YB, MB3, DM8A or DM8C). In 2023, reported values for all congeners were generally reported as less than the level of detection. OCDD in YB in 2020 was higher than historically recorded with a value of 24 pg/kg. However, OCDD is the least toxic of the congeners and the overall sum of the congeners was still low. There has been no evidence of there being any impact from the TSR leachate on the Yarragadee aquifer and this elevated result may be from contamination during the sampling event. 2021, 2022 and 2023 results support this with a value less than the LOR (3 pg/L) recorded.

Table 2 - Yarragadee Bore

Sampled YB	Lower Bound pg TEQ/L	Middle Bound pg TEQ/L	Upper Bound pg TEQ/L	OCDD pg/L
Aug 2010	0.00	3.08	6.16	< 9.29
Feb 2011	0.00	3.94	7.89	< 9.29
Aug 2011	0.00	3.00	6.00	< 7.20
Feb 2012	0.00	2.72	5.44	< 4.37
Sept 2012	0.00	2.13	4.26	< 7.34
Feb 2013	0.00	1.95	3.90	< 1.69
Apr 2014	0.00	1.50	3.10	< 9
Apr 2015	0.00	2.70	5.30	< 2
Apr 2016	0.01	0.77	1.5	< 1
Apr 2017	0.00	0.39	0.78	< 0.3
Apr 2018	0.00	0.88	1.8	< 0.5
Apr 2019	0.00	1.1	2.1	< 1.0
Apr 2020	0.022	0.78	1.5	24
Aug 2021	0.00	0.34	0.68	< 0.5
Dec 2022	0.00	1.7	3.5	< 3
Nov 2023	0	1.1	2.1	< 2

Table 3 - Superficial Groundwater Background Bore

Sampled MB3	Lower Bound pg TEQ/L	Middle Bound pg TEQ/L	Upper Bound pg TEQ/L	1,2,3,7,8 PeCDD pg/L
Aug 2010	0.00	2.54	5.08	< 1.63
Feb 2011	0.00	2.55	5.09	< 1.40
Aug 2011	0.00	2.95	5.90	< 1.82
Feb 2012	0.00	2.19	4.38	< 3.95
Sept 2012	0.00	1.99	3.98	< 1.90
Feb 2013	0.00	2.59	5.19	< 4.51
Apr 2014	0.00	1.2	1.4	< 0.9
Apr 2015	0.00	1.5	3.1	< 1
Apr 2016	0.00	0.72	1.4	< 0.4
Apr 2017	0.00	0.33	0.67	< 0.2
Apr 2018	0.00	0.52	1.0	< 1
Apr 2019	0.011	1.3	2.7	< 0.8
Apr 2020	0	1.3	2.7	< 1
Jun 2021	0.0053	0.42	0.83	< 0.4
Oct 2022	0	0.71	1.4	< 0.7
Nov 2023	0	0.88	1.8	< 0.9

Table 4 – Down-gradient Superficial Groundwater Bore (Deep) of the Ponds

Sampled DM8A	Lower Bound pg TEQ/L	Middle Bound pg TEQ/L	Upper Bound pg TEQ/L	1,2,3,7,8 PeCDD pg/L
Aug 2010	0.00	1.86	3.71	< 1.28
Feb 2011	0.00	3.15	6.29	< 1.59
Aug 2011	0.00	2.16	4.33	< 1.44
Feb 2012	0.00	2.52	5.03	< 1.88
Sept 2012	1.32	3.00	4.68	1.32
Feb 2013	0.00	2.57	5.13	< 1.46
Apr 2014	0.00	1.6	3.1	< 0.7
Apr 2015	0.00	2.5	5.0	< 1
Apr 2016	0.00	0.79	1.6	< 0.5
Apr 2017	0.00	0.35	0.88	< 0.3
Apr 2018	0.00	0.7	1.4	< 0.5
Apr 2019	0.00	1.1	2.1	< 0.8
Apr 2020	0.00	0.57	1.1	< 0.3
Aug 2021	0.00	0.61	1.2	< 0.5
Oct 2022	0	0.87	1.7	< 0.9
Nov 2023	0	0.83	1.7	< 0.9

3.5 Radiological Monitoring

Independent consultants, Radiation Professionals, conduct an annual survey of the site. An RCWA approved radiation monitoring program has been implemented by Tronox. The annual report (Appendix F) relates to monitoring undertaken during 2023.

The approved radiation monitoring program includes periodic radiation surveys to ensure that the site is returned to natural background radiation levels for the area.

Based on the 2023 survey of gamma dose rate-in-air, the results clearly show that the gamma radiation levels are consistent with the natural background gamma radiation levels expected in the area and pose no radiological health issues to the public or the environment.

The average gamma dose rate for the rehabilitated area was 0.12 µGy/h. The results are comparable to last years' results and are typical for the background gamma dose rate levels for the Perth Coastal Plain.

During 2023, most radon results are less than Minimum Detectable Level (MDL), i.e. <15 to <30 Bq/m^3. The measurements of activity concentrations that were greater than the MDL have large measurement errors and the measured activity concentrations are only slightly above MDL. The thoron results are also less than the MDL, with three exceptions:

- for the March 2023 to June 2023 period at location 16 (RM2) of 101 ± 20 Bq/m^3, at location 3 (RM7) of 24 ± 14 Bq/m^3 and at location 1 (RM8) of 37 ± 14 Bq/m3.

The three measurements of activity concentrations that were greater than MDL have large measurement errors, and the measured activity concentrations are only slightly above the MDL.

The data do not provide an indication of long-term elevation in the radon and thoron levels for the Dalyellup Rehabilitation area. The results for 2023 monitoring indicate that radon and thoron activity concentration levels are low and would pose no radiological health issues to the public.

The groundwater sampling results for 2023 are comparable to previous years and they continue to remain below the National Drinking Water Guidelines recommended screening concentration for gross alpha activity or gross beta activity of 0.5 Bq/L (500 mBq/L).

The highest recorded activity concentration for Ra-226 in 2023 was 0.09 Bq/L for bore DM9C. The highest recorded activity concentration for Ra-228 in 2023 was 0.08 Bq/L for bore DM8A and all other measurements were less than the MDL of 0.08 Bq/L.

Data gathered during the groundwater monitoring program for 2023 suggests that there is no leaching of radionuclides into the surrounding areas.

The RCWA have reiterated that the radiological risk to the community is low and does not support a buffer zone to the east of the site.

4.0 LICENCE COMPLIANCE & INCIDENTS

4.1 Operating Licence

The site operated under Closure Notice for Licence 6130/1989/12. The degree of compliance is summarised in Table 5. All groundwater monitoring results for monitoring required by the Closure Notice were recorded in Tronox's environmental database ESDAT, and provided in Appendix D.

Background monitoring bore, MB4, was vandalised during late 2018. This bore had been refurbished and sampling recommenced in 2019. The bore was vandalised again during 2020 and samples were not able to be collected after the January 2020 monitoring event. The bore is located outside of the TSR disposal facility in a publically accessible area. This limits Tronox's ability to continuously maintain the security/integrity of this bore. The bore is on the beach's high water mark and subject to interference. There have been five instances of the bore being vandalised since 1989.

4.2 Incidents

There were no environmental incidents or community complaints recorded for the Dalyellup site during the 2023 reporting period.

Table 5 - Compliance with Closure Notice

	Licence Requirement	Comment	Compliance
1.1.1	The Person to Whom this Notice is Given shall undertake the monitoring in Table 1.1.1 according to the specifications of that Table.	Monitoring of the required parameters was undertaken at the intervals outlined in Table 1.1.1.	✓
1.1.2	The Person to Whom this Notice is Given shall ensure that: (a) All samples required by Table 1 are collected and preserved in accordance with AS/NZS 5667.1; (b) All sampling required by Table 1 is conducted in accordance with AS/NZS 5667.11; (c) All samples are submitted to a laboratory with current NATA accreditation for the parameters to be analysed; (d) The limit of detection of analysis for all samples is: (i) One order of magnitude below the relevant ANZECC guideline; or (ii) Where the laboratory cannot routinely achieve a limit of detection one order of magnitude below the relevant ANZECC guideline, the lowest limit of detection; (e) Quarterly monitoring is undertaken at least 45 days apart, with the first round of sampling to commence in Q3 2013 (i.e. 1 July to 30 September 2013); (f) Six monthly monitoring is undertaken at least 5 months apart, with the first round of sampling to commence between 1 July and 31 December 2013; and (g) Annual monitoring is undertaken at least 9 months apart, with the first round of sampling to commence prior to 1 July 2014.	As above. See Appendix G Site Management Plan detailing the groundwater sampling requirements the consultant implements. All samples sent to ALS, ChemCentre (WA) and Western Radiation Services. Analysis is to the lowest detection limits possible. See Appendix D. Quarterly sampling taken on 9 February, 18-24 April, 26 July, 31 October - 10 November 2023. Bi-annual sampling taken on 18-24 April and 31 October - 10 November 2023. Dioxins and Furans sampling completed April 2018, 2019 and 2020, August 2021, October and December 2022 and November 2023.	✓
1.2.1	The Person to Whom this Notice is Given shall prepare a biennial hydrogeological report on groundwater beneath the Premises, covering the period 4 March 2013 to 4 March 2015.	Refer to AER 2015, 2016 and 2017 Appendix G.	✓
1.2.2	The Person to Whom this Notice is Given shall ensure the hydrogeological report referred to in paragraph 1.2.1 of this Notice includes: (a) Assessment of groundwater quality below and down, gradient from the Premises and compared to background groundwater quality;	Refer to AER 2015, 2016 and 2017 Appendix G.	✓

	Licence Requirement	Comment	Compliance
	(b) Assessment of any contaminant plume size, movement and distribution of contaminant concentrations from below the disposal ponds to the near shore groundwater discharge zone; and (c) A characterisation of the interaction between the treated solid residue and the groundwater, more specifically being: (I) The geochemical interactions between leachate, underlying soils and groundwater; (ii) Contaminant transport rates; and (iii) Contaminant migration pathways.		
1.2.3	The Person to Whom this Notice is Given shall submit the hydrogeological report referred to in paragraph 1.2.1 of this Notice to DWER at the Contact Address by 5pm on 1 July 2015.	Accompanied the Annual Report that was delivered to the DWER offices in Bunbury before the due date.	✓
2.1.1	The Person to Whom this Notice is Given shall undertake the monitoring in Table 2.1.1 according to the specifications of that Table whilst the ponds remain uncovered.	Dust monitoring not required during 2023 as the ponds were covered in September 2013.	✓
2.1.2	The Person to Whom this Notice is Given shall ensure dust sampling equipment is co-located and sited in compliance with AS/NZS 3580.1.1 :2007.	Dust monitoring not required during 2023 as the ponds were covered in September 2013.	✓
3.1.1	The Person to Whom this Notice is Given shall submit to DWER at the Contact Address an annual report on the implementation of the requirements of this Notice by 30 June 2014, and by 30 June in each subsequent year.	Compliant with this condition. Annual report submitted before 30 June.	✓
3.1.2	The report referred to in paragraph 3.1.1 of this Notice shall include: (a) Annual monitoring data and other collected data required by any clause in this Notice; and (b) Interpretation and appraisal of the annual monitoring results against: (i) background water quality below and down-gradient from the Premises and compared against background groundwater quality found up gradient of the Premises and against relevant ANZECC guidelines for water quality, historical data, the surrounding environment and other beneficial users; and (ii) NEPM standard of 50 µg/m^3 for PM_{10} (24-hour average) and WHO	Contained in Appendices D, E and I. See AER 2017 Appendix G. Not required. See condition 2.1.1.	✓

	Licence Requirement	Comment	Compliance
	Guideline of 120 µg/m^3 for TSP (24-hour average).The Licensee shall take representative samples of the TSR solid and TSR filtrate prior to the waste being brought to the Premises for disposal at quarterly intervals.		

5.0 MINISTERIAL CONDITIONS & COMPANY COMMITMENTS

TRONOX operates its Dalyellup solid waste disposal facility in accordance with Company Commitments and Ministerial Statements 213 and 332. Compliance with these conditions and commitments is discussed below (Table 6 and Table 7).

Table 6 - Compliance with Ministerial Conditions

Commitment		Action Taken	Outcome
332:M1 Commitments	Fulfil the commitments (which are not inconsistent with the conditions or procedures contained in the Minister's statement)	Tronox has undertaken the requirements that currently apply.	Full compliance.
332:M2:1 Implementation	Adhere to the proposal as amended (via Statement 332) in accordance with any designs, specifications, plans or other technical material submitted by the proponent to the DWER.	Tronox has implemented the proposal as submitted.	Site operated effectively.
332:M2:2 Minor amendments	Seek approval for modifications to the proposal by detailing changes to design, specifications, plans or technical material.	Tronox to notify DWER of any changes. Closure plans sent to OEPA and other key stakeholders. OEPA satisfied with Closure Plan in February 2015. Closure Plan was updated in July 2018 and sent to OEPA once the sport fields' option was not part of the Shire of Capel's short term plans.	Remaining ponds covered with clean fill. Final end use confirmed. Revised Closure Plan waiting for Radiological Council to respond to OEPA's request for comment.
213:M3 Compliance Audit Report	Prepare "Annual Compliance Report"	Contained in this report	Fully compliant. Refer to Table 5.
332:M4:1 Rehabilitation	Prepare a final rehabilitation programme.	Tronox submitted a staged rehabilitation management program in October 2001. The DWER, Radiological Council and Shire of Capel approved the plan. Preliminary plan was submitted in September 2012. A Final Closure Rehabilitation Plan was sent June 2013 and updated in July 2018.	Final Closure Rehabilitation Plan requires the completion of the Contaminated Sites risk assessment which was progressed further in 2015. OEPA approved Final Closure Rehabilitation Plan in February 2015.

Commitment		Action Taken	Outcome
332:M4:2 Rehabilitation	Implement the rehabilitation programme	Tronox has implemented the first stage of the program as specified in the Staged Rehabilitation Management Program. Final Closure Rehabilitation Plan is being implemented.	Vegetation surveys and dune subsidence surveys conducted in 2003 and 2004. 2009 visual inspections revealed continued success in rates of plant growth. The remaining ponds were covered with clean fill in September 2013. Native rehabilitation has been selected as a post-closure land use in consultation with Capel Shire and DWER. Revegetation of the remaining ponds commenced in 2018 with seeding occurring in 2018. Further infill planting and seeding has since been undertaken. Weed and pest control and planting of *Agonis flexuosa* seedlings was undertaken during 2023. Monitoring of the rehabilitation area continued throughout the year. Data and observations from the Spring monitoring event are consistent with monitoring undertaken since 2019. Plant health generally improves after winter then declines through the summer months. After a sustained period of soil moisture and cooler temperatures, plant health improves, and growth rates increase. When consistent hot wind and lack of rainfall dries the site during summer, plant health declines.
213:M5 Proponent	Seek approval for transfer of proponent	Although Tronox has acquired Cristal Pigment Australia Ltd the ABN remains unchanged.	Tronox will comply, when or if appropriate.

Commitment		Action Taken	Outcome
332:M6:1 Site management	Operate and maintain the waste disposal site to protect the environment from unacceptable environmental impacts	Tronox complies with this condition through regular groundwater and radiation monitoring, dust, geochemical and geotechnical research and by following operational control procedures documented in the SMP and Radiation Management Plan, DWER licence and Closure Notice	Refer to 2023 Annual Environmental Report and future AERs for ongoing monitoring and assessment.
332:M6:2 Site management	Extent of disposal. Ensure that disposal occurs within the existing lease boundary and does not encroach on the primary dunes and is limited to a fill height of no more than RL24.	Design for disposal ponds show only areas to the east of the primary dunes will be utilised. Tronox will comply with fill height of RL24.	Validation report on the rehabilitated site in January 2014 has confirmed, from core logs, that the fill coverage on top of the mud is 3-4 m and mud level is below the RL24 mark across the site.
332:M6:3 Site management	Only dispose of waste from own operations	Only TSR produced at Tronox was disposed at the site.	Full compliance.

Table 7 - Compliance with Company Commitments

Commitment		Action Taken	Outcome
P1	The groundwater monitoring and reporting program will continue. This will be combined with ongoing investigations, including solute transport modelling to improve the understanding of the disposal technique.	Groundwater monitoring, radiation monitoring was conducted to schedule in 2023. Reporting as required. Biennial Hydrogeological Report submitted to DWER in June 2015.	Whilst the plume persists in down hydraulic gradient bores of the last filled ponds, DM2A/C, DM4A/C, DM8A/C. DM7A/C, bores down hydraulic of southern ponds, have rising Na/Cl ratios showing the return to background conditions. The southern ponds were decommissioned in 2001 which indicates Na/Cl ratio levels are naturally attenuating. EC and TDS concentrations are declining in all bores down hydraulic gradient of the ponds.
P2	Existing topsoil removal practices will be continued to ensure that windblown dust remains under control.	Stockpiled topsoil is appropriately located and germinating seed in the soil alleviates dust problems. "Hydromulch" paper mulch and grass seed was sprayed onto the stockpile at various times (last time in November 2013).	Full compliance. No dust issue at the site. No community complaints relating to dust since project inception.
P3	Radiation monitoring and reporting program will continue.	Radiation monitoring program carried out by Radiation Professionals.	Full compliance. Refer Annual Radiation Monitoring Report (Appendix F).

Commitment		Action Taken	Outcome
P4	At the end of the disposal period the proponent will cause the disposal site to be rehabilitated to the satisfaction of the Shire of Capel and the DWER.	Tronox submitted a staged rehabilitation management program in October 2001. The DWER, Radiological Council and Shire of Capel approved the plan. Preliminary plan was submitted in September 2012. A Closure Rehabilitation Plan was sent June 2013 and approved by Shire, RCWA, DWER, and OEPA. Shire of Capel in May 2017 formally endorsed the rehabilitation back to natural vegetation on the remaining part of the site. An updated Closure Rehabilitation Plan was then sent to OEPA in July 2018.	First stage of the programme completed in 2002 with the successful rehabilitation of the southern ponds. The remaining ponds were covered with clean fill in September 2013. Native rehabilitation has been selected as a post-closure land use in consultation with Capel Shire and DWER. Revegetation of the remaining ponds commenced in 2018 with seeding occurring in 2018. Further infill planting and seeding has since been undertaken.
P5	The proponent will continue Research and Development Studies into methods of waste minimisation and modification including further salinity reductions. This will include further studies of the materials properties and possible uses.	A waste minimisation plant was commissioned in December 1992. This has substantially reduced the quantity of residue solids. A system for washing the solids prior to disposal was also developed. Tronox has investigated the solid waste as a soil condition capping and road base material and bricks. Also HCl (nominally 15,000 tonnes/year) which is a by-product in the manufacturing process has been sold commercially rather than neutralised with lime. New Facility at Cleanaway's Banksia Road site at Dardanup has a leachate recovery circuit with leachate now returned to Tronox's Kemerton plant for further waste treatment.	Tronox has actively pursued co-product developments with external parties, however no economically viable options were found. Ceased operations at the site in 2013. Continue to run the waste minimisation plant at Kemerton. Feasibility study to extract minerals of value by third parties to be pursued.
P6	The proponent will continue actively pursuing alternative methods of waste disposal.	Tronox has found an alternative residue disposal site. The site is fully lined and has a leachate recovery circuit.	Full compliance.