

# **“CONTAMINATION OF THE ENVIRONMENT – PAST PROBLEMS AND CONTEMPORARY RESPONSES”**

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## **Introduction**

Recognition of the impact of industrial society on the environment emerged in the 19<sup>th</sup> century. Pollution of the air by the release of chemicals from refining and other industrial processes accelerated the development of the law of public nuisance.<sup>1</sup> During the 20<sup>th</sup> century the potential for industrial processes to pollute waterways and the land on which they were carried out was increasingly recognised. In the latter part of the 20<sup>th</sup> century the significance of pollution of the environment and the damage to human health that could occur became an issue requiring government intervention. This was in large part due to the increased knowledge of engineers and the medical profession about the nature of pollutants and their effect on human health and the natural environment.

Australia is a country with a relatively small population. That population is concentrated largely amongst a number of cities with the population of rural areas being dispersed. Vast areas of Australia's continent are dry and much of it desert. Because of their isolation and lack of development by white settlers it was believed that two areas of Australia, Monte Bello Islands and Maralinga were

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<sup>II</sup> I gratefully acknowledge the assistance of my researcher Nicholas Simpson in the preparation of this paper.

<sup>1</sup> See: *Halsey v Esso Petroleum Co Ltd* [1961] 2 All ER 145; [1961] 1 WLR 683; *Hargrave v Goldman* (1963) 110 CLR 40; [1964] ALR 377.

suitable for the testing of nuclear weapons which involved the dispersal of dangerous contaminants over significant areas of the land and their introduction into the upper atmosphere. Although potential dangers were recognised, the level of scientific knowledge available at the time meant that risks were taken which would be considered unacceptable today. Furthermore, when the project had been completed the approach to cleaning up the contaminated lands and the standards applied fell well short of those considered appropriate, even 20 years after the event.

The British nuclear tests were conducted at a time when there was no Government body regulating the control of polluting activities on land. Furthermore there was no Government body responsible for defining standards and imposing appropriate criteria for the remediation of contaminated land. Such bodies did not come into existence in Australia until the last quarter of the 20<sup>th</sup> century.

This paper gives a brief description of the British nuclear tests in Australia and the contamination which they created over vast areas within central Australia. It describes the inadequate attempts to remediate those lands. It was not until the Royal Commission into the testing program that the problems in the remediation efforts were identified following which steps were taken to remedy the situation. The ad hoc control of the testing program and the remediation process can be contrasted with the regulatory regime that exists today. I was the counsel assisting that Royal Commission. The second part of this paper describes that regime as it operates in the State of New South Wales, the most populous State in Australia. Sydney is the capital of New South Wales.

### **Past Problems: British Nuclear Testing in Australia**

Between 1956 and 1963 the British Government utilised areas of central Australia for testing and development of nuclear weapons. This was a time of global competitiveness between the United Kingdom, the United States of America and the Soviet Union.<sup>2</sup> After the Second World War nuclear weapons and technology

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<sup>2</sup> Robert Milliken, 'Australia's Nuclear Graveyard' (1987) 43(3) *Bulletin of the Atomic Scientists* 38, 41.

were regarded by many countries to be the “key to international power and prestige.”<sup>3</sup>

Australia’s involvement in the British nuclear development program came because the United States excluded Britain from utilising its facilities.<sup>4</sup> In 1946 the United States enacted the *Atomic Energy Act* which made it illegal for any classified information relating to American nuclear testing to be delivered to any other country. A maximum penalty of life imprisonment or death could result if the Act was breached.<sup>5</sup> The British had initially considered the Nevada desert to be an appropriate testing site for their nuclear weapons but this ceased to be an option.<sup>6</sup> Although they flirted with the possibility of using an island off the Scottish coast Australia was found to be a more suitable location. The Australian Prime Minister Robert Menzies was keen to assist.<sup>7</sup>

Between 1952 and 1963 several hundred nuclear tests were carried out in Australia. There were a total of twelve major nuclear explosions under five separate “operations” – Hurricane, Totem, Mosaic, Buffalo and Antler.<sup>8</sup> Operation Hurricane took place at the Monte Bello Islands, some 130km off the coast of North West Australia.<sup>9</sup> This test involved a plutonium implosion bomb that was detonated in the hull of a 1450-ton frigate, anchored off Trimouille Island, one of the main islands of the Monte Bello group.<sup>10</sup> Operation Totem involved the explosion of two nuclear bombs on mainland Australia.<sup>11</sup> The tests were conducted at Emu Field in central Australia in October 1953.<sup>12</sup> The British revisited the Monte Bello Islands between May and June 1956 and conducted further tests at Trimouille and Alpha Islands under Operation Mosaic.<sup>13</sup> The choice

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<sup>3</sup> Ibid 39.

<sup>4</sup> Adrian Tame and Francis Robotham, *Maralinga British A-Bomb Australian Legacy* (Fontana Books, 1982) 49.

<sup>5</sup> See: *Atomic Energy Act*, 1 § 10 (1946).

<sup>6</sup> Milliken above n 1, 38.

<sup>7</sup> Ibid 40.

<sup>8</sup> Tame and Robotham above n 4, 111 and Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vols 1 and 2 and Conclusions and Recommendations.

<sup>9</sup> Milliken above n 1, 39.

<sup>10</sup> Australian Government, Department of Veteran Affairs, *Australian Participants in British Nuclear Tests in Australia: Morality and Cancer Incidence*, vol 2 (2006), 117.

<sup>11</sup> Ibid

<sup>12</sup> Ibid

<sup>13</sup> Ibid

of Monte Bello Islands was later considered unsuitable as a location for nuclear testing.

The last two Operations (Buffalo and Antler) were conducted at Maralinga (an Aboriginal word meaning “Thunder”) between September 1956 and October 1957.<sup>14</sup> A total of seven major explosions were carried out.<sup>15</sup> Maralinga is located approximately 200 km south of Emu Field and was developed as a township with the intention to carry out tests for some time into the future.<sup>16</sup> The site was used for 11 years for major explosions and 600 minor trials.<sup>17</sup> Although the major explosions were more dramatic the greatest environmental damage resulted from the minor trials.<sup>18</sup> The tests were shrouded with secrecy.

Many authors have regarded this time in history as demonstrating the final episode of Australia’s subservience to the British.<sup>19</sup> Australia’s involvement was a decision principally made by Menzies without consultation, at least in the infancy of the tests, with his cabinet or Parliament.<sup>20</sup> Menzies wrote to Prime Minister Churchill in 1953 after the first three major explosions: “The basic fact is that we stand or fall together, and that Great Britain will no more need to worry about Australian cooperation in the future than she has in the past.”<sup>21</sup>

At most times during the late 1940’s and early 1950’s the British lagged behind in the nuclear race with the Soviet Union and the United States. By 1949 the Soviet Union had developed their first atomic weapon, three years before the British and detonated the world’s first thermonuclear bomb in the Pacific Ocean in 1953 before the British.<sup>22</sup> The prestige and power associated with possessing the most contemporary armaments became increasingly important for the British who wished to remain a formidable force in world affairs.

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<sup>14</sup> Tame and Robotham above n 4, 111.

<sup>15</sup> Ibid.

<sup>16</sup> Ibid.

<sup>17</sup> Ibid 112.

<sup>18</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) Conclusions and Recommendations 24.

<sup>19</sup> See: Milliken (1987) above n 1 and Robert Milliken, *No Conceivable Injury* (Penguin Books, 1985) and Alan Parkinson, *Maralinga Australia’s Nuclear Waste Cover-up* (ABC Books, 2007).

<sup>20</sup> Milliken (1985) above n 19, 56.

<sup>21</sup> Ibid 55.

<sup>22</sup> Milliken (1987) above n 1, 41.

## **The Royal Commission into British Nuclear Tests in Australia 1985**

The testing program was completed by 1963 after which efforts were made to “clean up” the land which had been contaminated by the dispersal of plutonium and other toxic material. For a time the testing program slipped from public concern. However by the 1980’s concerns about the effects of the tests on the health of Aboriginal people, the military personnel in the operation and the state of the contaminated land emerged. It resulted in the Australian Government setting up a Royal Commission to inquire into the British Nuclear Tests. The terms of reference of the Commission were broad in nature. They required examination into the adequacy of the measures used to protect persons from exposure to harmful ionising radiation and whether the health of persons in Australia and abroad had been compromised by exposure to the tests.<sup>23</sup> Particular consideration was given to certain groups of people, namely the Australian Defence Force, Royal Australian Navy and Royal Australian Air Force personnel, Aboriginals and other civilians in the general vicinity of the test sites.<sup>24</sup>

The Commission was chaired by the late James ‘Diamond Jim’ McClelland; a former politician and by then the Chief Judge of the New South Wales Land and Environment Court. His Honour’s “publicity consciousness [proved] ... to be crucial to the royal commission’s success in unleashing thousands of documents in Britain and Australia which had been locked up in secret archives for more than 30 years.”<sup>25</sup> Spanning over 118 days the Commission took evidence from 311 witnesses, received in evidence 10,000 documents and generated 10,000 pages of transcript.<sup>26</sup>

### **The Commission’s Findings**

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<sup>23</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 1, 1- 4.

<sup>24</sup> *Ibid.*

<sup>25</sup> Milliken (1985) above n 19, 316.

<sup>26</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 1. 6 – 8.

The two volumes and the conclusions and recommendations of the Commission Report cover many topics. The Commission came to the conclusion that “the Australian Government’s agreement to make the mainland available was given with no independent advice or analysis and little consideration and consultation.”<sup>27</sup> It concluded that for both the offshore and mainland testing there was an absence of scientific information available to scientists to properly advise of the potential hazards associated with the use of atomic and thermonuclear weapons.<sup>28</sup> During the testing program this situation was rectified with the constitution of the Atomic Weapons Tests Safety Committee (AWTSC), which was convened to provide the Australian Government with independent scientific advice on the safety aspects of the tests.<sup>29</sup> The impartiality of the Committee was later questioned after it was revealed that membership was vetted by the British.<sup>30</sup>

### **The Minor Trials**

Many of the minor trials took place at Maralinga between November 1958 and September 1961 by which time a moratorium on nuclear tests had been agreed.<sup>31</sup> The minor trials were codenamed: Kittens, Tims, Rats and Vixen. The purpose of the first three tests was to examine component parts of nuclear weapons.<sup>32</sup> Only the Tims and Vixen tests used plutonium and other radioactive material. In the case of Tims three hundred and twenty one experiments were carried out between 1955 and 1961 and some in 1963.<sup>33</sup> The chemicals used in addition to plutonium included beryllium, uranium and natural uranium.<sup>34</sup> Approximately 1.2kg of plutonium was used.<sup>35</sup> The Vixen series, were broken up into two groups: Vixen A and Vixen B. The former was concerned with a study of the spread of radioactive and toxic materials that may be released from a nuclear accident. Three kinds of experiments were undertaken: combustion in a controlled petrol fire; combustion

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<sup>27</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) Conclusions and Recommendations 8.

<sup>28</sup> *Ibid* 8 – 9.

<sup>29</sup> *Ibid*.

<sup>30</sup> *Ibid*.

<sup>31</sup> Milliken (1985) above n 19, 239.

<sup>32</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 2. 396.

<sup>33</sup> *Ibid*.

<sup>34</sup> *Ibid*.

<sup>35</sup> *Ibid* 397.

in air in an electric furnace; and dispersion by high explosive.<sup>36</sup> Collectively thirty-one experiments were conducted under Vixen A.<sup>37</sup> The materials dispersed included 0.58kg of plutonium, 4.2kg of beryllium, 68kg of natural and depleted uranium, 99 Ci of polonium-210 and 1.96 Ci of actinium-227.<sup>38</sup>

Vixen B tests were regarded as 'safety experiments' examining accidental explosions. There were twelve in total conducted in 1960, 1961 and 1963.

According to the Report:

"All of the Vixen B rounds were carried out at Taranaki where they produced the worst of the contaminated areas at Maralinga. The materials used and dispersed in the Vixen B series included plutonium-239 (22.2kg), uranium-235 (22.4kg), uranium-238 (24.9kg) and beryllium (17.6kg)."<sup>39</sup>

Accordingly the materials dispersed in the minor trials were plutonium, uranium and beryllium. Some of the scattered material was collected and buried in pits. However there was no concerted effort to completely clean up the site.<sup>40</sup> Because of the contaminating potential the Commission concluded that the minor trials were much more significant than their name suggested. The Report noted that: "[m]ost of the radioactive and other contamination remaining on the Range [was] due to the Vixen trials."<sup>41</sup> To make matters worse as some writers observe, that:

"Maralinga is probably the only place in the Western world where plutonium is dispersed without precise knowledge of how much is above and below the ground. ... The precise amount of plutonium used in these trials had always remained a mystery because the available records were incomplete and the British authorities had refused to give details."<sup>42</sup>

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<sup>36</sup> Ibid.

<sup>37</sup> Ibid.

<sup>38</sup> Ibid 397.

<sup>39</sup> Ibid 398.

<sup>40</sup> Ibid 415.

<sup>41</sup> Ibid 405.

<sup>42</sup> Milliken (1985) above n 19, 241.

## Problems with Major Trials

The Commission reported on many health and safety concerns with the trials. Some of these problems are referred to in the following discussion.

### Totem

The Commission found that the safety of the surrounding Aboriginal population was not adequately considered. The task however of locating and warning all the nearby Aborigines was fraught with great difficulty. Some communities were scattered over more than 100,000 square kilometres.<sup>43</sup> The Commission found that some radioactive fallout from Totem 1 might have caused many Aboriginal people to fall ill.<sup>44</sup> An account of a 'black mist' or 'cloud' by some Aboriginal people was not regarded as unbelievable by the Commission.<sup>45</sup> The Commission found it to be distinctly possible that the physical signs of illness displayed by the Aborigines were as a result of radiation exposure or a psychogenic reaction to a frightening experience or both.<sup>46</sup> The ground and aircrew were exposed to doses of radiation generally due to an absence of protective clothing, radiation monitoring devices and proper instructions as to the use of such devices.<sup>47</sup> This was particularly so for the aircrew which were required to fly through the Totem 1 cloud. The conclusion by the Commission was that those crewmembers were unlikely to have received an unacceptable dosage, however this was said to be almost "impossible to accurately determine."<sup>48</sup>

### Mosaic

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<sup>43</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) Conclusions and Recommendations 16.

<sup>44</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 1. 175.

<sup>45</sup> *Ibid* 177.

<sup>46</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) Conclusions and Recommendations 17.

<sup>47</sup> *Ibid* 17.

<sup>48</sup> *Ibid* 18.



The choice of the Monte Bello Islands occasioned many problems. The planning of the tests was often based on inaccurate scientific predictions.<sup>49</sup> Predictions as to whether parts of the nuclear cloud would pass over the mainland proved to be wrong.<sup>50</sup> The community of Portland was exposed to higher than acceptable levels of radiation for the general public, however it was lower than the level allowed for “occupationally exposed workers.”<sup>51</sup> There were difficulties in meeting the safe firing criteria, unexpected winds brought parts of the cloud to the mainland and there were higher than anticipated levels of fallout.<sup>52</sup> Further, the safety and vulnerability of the local Aborigines at Monte Bello was overlooked.<sup>53</sup> The Commission did however conclude that the health and safety precautions for the servicemen at Mosaic were sound.<sup>54</sup>

## Buffalo

The Buffalo Operation involved four separate explosions and, to a varying degree, adhered to the firing criteria save for test two, codenamed Marcoo. One criterion for safe firing was that there should not to be any rain within close range of the testing zone – rain did in fact fall within 160 kilometres of the testing zone.<sup>55</sup> Tests one, three and four led to increased fallout and contamination of the Maralinga Village. The Commission delivered a stinging rebuke in relation to the attempts to ensure the safety of the Aboriginal inhabitants of Maralinga Village. The point was put rather bluntly:

“the Buffalo series demonstrate ignorance, incompetence and cynicism on the part of those responsible for that safety. The inescapable conclusion is that if Aborigines were not injured or killed as a result of the explosions, this was a matter of luck

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<sup>49</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 1, 258.

<sup>50</sup> *Ibid.*

<sup>51</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) Conclusions and Recommendations 19.

<sup>52</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 1, 258.

<sup>53</sup> *Ibid.*

<sup>54</sup> *Ibid.*

<sup>55</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) Conclusions and Recommendations 19.

rather than adequate organisation, management and resources allocated to ensuring safety.”<sup>56</sup>

This conclusion reflected the assumption, which turned out to be false, that there would be no Aboriginal inhabitants at the test site. Coupled with this assumption was the demonstrably flawed security system of the site.<sup>57</sup> One of the most significant events concerned a tribal family called the Milpuddies. About halfway between the tests at Buffalo and the beginning of the Antler series, the Milpuddies had gone for a walkabout to Ooldea.<sup>58</sup> They were unaware that because of the tests that Ooldea had been closed down for several years. The family subsequently camped the night at the Marcoo crater (a site near Maralinga), dining on a kangaroo that had been caught in the general vicinity.<sup>59</sup> The Commission could not rule out that the Milpuddie family entered the contaminated area resulting in injury to them.<sup>60</sup>

### **The Commission’s Recommendations**

The Commission’s recommendations were broad ranging. They included compensation to affected persons, clean-up, future management of the range and re-establishing a relationship between the Aboriginals and their land. There were seven recommendations in total:

#### “Recommendation 1

The benefits of the Compensation (Commonwealth Government Employees) Act 1971, including the shifting of the onus of proof from the claimant to the Commonwealth should be extended so as to include not only members of the armed forces who are at present covered by the Act, but also civilians who were at the test sites at the relevant times, and Aborigines and other civilians who may have been exposed to the Black Mist.

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<sup>56</sup> Ibid 20.

<sup>57</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 1, 319 – 323.

<sup>58</sup> Ibid.

<sup>59</sup> Milliken (1985) above n 19, 112.

<sup>60</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) Conclusions and Recommendations 21.

## Recommendation 2

To assist the Commissioner for Employees. Compensation in the performance of the additional duties recommended in Recommendation 1, a national register of nuclear veterans, Aborigines and other persons who may have been exposed to the Black Mist or exposed to radiation at the tests should be compiled.

## Recommendation 3

Action should be commenced immediately to effect a clean-up of Maralinga and Emu to the satisfaction of the Australian Government so that they are fit for unrestricted habitation by the traditional Aboriginal owners as soon as practicable.

## Recommendation 4

A Maralinga Commission, comprising representatives of the traditional owners, the UK, Australian and South Australian Governments should be established to determine the clean-up criteria, oversee the clean-up and co-ordinate all future Range management.

## Recommendation 5

Action should be taken immediately to ensure that all areas of the Monte Bello Islands where the radiation levels are above the limits recommended for continuous exposure of members of the public are suitably signposted until safe for permanent occupation. Small pieces of debris should be collected to avoid them being removed as souvenirs. The large structures remaining on Trimouille Island that are relics of the test programs could remain for historic interest.

## Recommendation 6

All costs of any future clean-ups at Maralinga, Emu and the Monte Bello Islands should be borne by the United Kingdom Government.

## Recommendation 7

The Australian Government should make compensation to those persons and descendants of those persons who have a traditional interest in sites at the former Maralinga Prohibited Area for loss of use and enjoyment of their lands since the beginning, and as a result of the atomic tests program. This should take the form of technology and services which Aboriginal people regard as necessary for them to re-establish their relationships with their land as rapidly as possible and with minimal hardship.”<sup>61</sup>

### **The Minor Trials and Rehabilitation Programs**

Between 1963 and 1967 several attempts were made to cleanup the Maralinga “area”. The first undertaking in 1963 was codenamed Operation Cleanup.<sup>62</sup> Part of this cleanup involved the removal of 175 tons of contaminated material.<sup>63</sup>

In August 1964 another operation was initiated to clean up the Range. Codenamed Operation Hercules V, the tasks to be carried out variously included the cleaning of contaminated buildings, cleaning or burying of contaminated vehicles, sealing of contamination in concrete structures and removal and burial of all mounds of contaminated debris.<sup>64</sup> Two reports were produced following Hercules V. The first described the state of the Range and the second discussed the residual toxic and radioactive material left on the site.<sup>65</sup>

By February 1966 both Australia and the United Kingdom Government were discussing the imminent end of the Memorandum of Agreement between both nations establishing the Atomic Weapons Proving Ground at Maralinga. The agreement was to expire by 7 March 1966. By mid February 1966 the British Government informed the Australian Government that it no longer required the Maralinga site for atomic and nuclear testing and that in departing from Maralinga it sought to discharge its “security and safety obligations” under the existing

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<sup>61</sup> Ibid 31 – 32.

<sup>62</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 2. 528.

<sup>63</sup> Ibid.

<sup>64</sup> Ibid 529.

<sup>65</sup> Ibid.

agreement.<sup>66</sup> As the Report recounts: “the UK was liable for ‘such corrective measures as may be practicable in the event of radioactive contamination resulting from the tests on the site’”.<sup>67</sup> These corrective measures were later agreed to in principle by the Australian Government and included the disc-harrowing of certain open areas containing radioactive material with a view to achieving a safe hazard level for continued human habitation, the sealing of certain pits with concrete plugs, the burial of contaminated air trunking in buildings at Maralinga Village, and the movement of non-radioactive hazards.<sup>68</sup> The British sought an agreement with Australia that they would be discharged from any future liability if those measures were undertaken.<sup>69</sup> The Safety Committee discussed these proposals. They did not take any desire by the British to turn Maralinga into a “safe [environment] for permanent habitation” seriously.<sup>70</sup> The assumption was that it would be unlikely that any re-population of the area would happen in the foreseeable future.<sup>71</sup> The Australian Government did not identify the likely future for Maralinga.<sup>72</sup>

The ‘final’ cleanup was codenamed Operation Brumby and was led by the British. Operation Brumby consisted of mixing contaminated soil with clean soil with the aim of diluting the level of radioactivity.<sup>73</sup> The areas worked became known as the ‘ploughed area’. Overall the degree of dilution achieved was regarded as acceptable although the required ‘dilution factor’ was not achieved over the whole of the ploughed area.<sup>74</sup> The Commission concluded that the British cleanup was inadequate.

The British terminated their original agreement with Australia on 23 September 1968 absolving them of further liability for the cleanup of Maralinga.<sup>75</sup> The Commission said of the Memorandum of Agreement signed at the time:

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<sup>66</sup> Ibid 531.

<sup>67</sup> Ibid.

<sup>68</sup> Ibid.

<sup>69</sup> Ibid.

<sup>70</sup> Ibid 532.

<sup>71</sup> Ibid.

<sup>72</sup> Ibid 534.

<sup>73</sup> Parkinson above n 19, 8.

<sup>74</sup> Ibid.

<sup>75</sup> Commonwealth, Royal Commission into British Nuclear Tests in Australia, *The Report of the Royal Commission into British Nuclear Tests in Australia* (1985) vol 2. 540.

“[t]he 1968 Memorandum of Agreement was based on information and a hazard assessment that have been shown to be invalid. It is clear now that Operation Brumby did not satisfactorily decontaminate the Range. The condition of the plutonium-contaminated areas would have not met the standards of the time, and certainly does not meet the standards of today.”<sup>76</sup>

The Commission recommended that there be a second Maralinga Commission to handle further cleanup.<sup>77</sup> In 1986 a consultative group known as the Technical Assessment Group (TAG) was formed which was instructed to investigate the site and design various means of cleaning up.<sup>78</sup> The group was composed of representatives from the Australian Governments and States affected by the explosions, the United Kingdom, members of the Maralinga Tjaratja Aborigine people and their legal representatives.<sup>79</sup>

It was not until 1993 that the Maralinga Rehabilitation Technical Advisory Committee (MARTAC) was established to oversee the clean up of Maralinga and provide advice to the project managers of the site, the Department of Primary Industries and Energy. The MARTAC’s terms of reference required a scope of works designed to remediate areas of Maralinga to achieve outcomes that led to a degree of risk that fell safely within the risk limit for the stated lifestyle of inhabitants and assumed future administrative control of the area.<sup>80</sup> These works included: areas ploughed during Operation Brumby would be removed and buried in an engineered trench; formal debris pits for radioactive waste would be controlled by ISV (In Situ Vitrification) which is a process that uses electricity to melt, remove and/or destroy plutonium-contaminated debris;<sup>81</sup> informal rubbish pits would be sorted to find further radioactive material which would be later reburied; and Vixen B plumes be delineated so as to enclose the 5 mSv/yr dosimetric contour, with a single wire boundary fence.<sup>82</sup> In general terms, the aim of the project was to reduce the risk of radiation exposure to those likely to enter the area to a level that was

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<sup>76</sup> Ibid.

<sup>77</sup> Parkinson above n 19, 9.

<sup>78</sup> Ibid.

<sup>79</sup> Ibid.

<sup>80</sup> Maralinga Rehabilitation Technical Advisory Committee, Commonwealth Government, *Rehabilitation of Former Nuclear Test Sites at Emu and Maralinga (Australia)*, 2003 vii.

<sup>81</sup> Ibid xlv.

<sup>82</sup> Parkinson above n 19, 13.

acceptable to the Aboriginal communities and the Australian Government. This level was determined to be an annual dose of 5 mSv, which assumed full time occupancy by Aborigines living an outstation lifestyle and in addition reflected standards considered permissible under the International Commission on Radiological Protection.<sup>83</sup>

What was initially required before the rehabilitation project could proceed was a demarcation of the boundaries of the cleaning area and a clear indication of the cleaning targets. There were three sites in total that the project sought to clean up: surface soils at Taranki, the TM site (TM100 and TM101) and Wewak; and formal waste disposal pits at Taranki, TM101 and the airfield cemetery.<sup>84</sup> In many cases the contamination of concern was plutonium which was, and still is, well documented as extremely toxic if taken in the body, especially if inhaled.<sup>85</sup> As noted earlier, much of the plutonium originated from the minor trials. On the issue of criteria or targets, the MARTAC created three sets of criteria guiding the permitted level of contamination. They included the Soil-Removal, Clearance and Unrestricted Land-Use criteria. In order to achieve these levels the methodologies for cleaning needed to be quite specific.

For the soil-removal criteria, if contamination levels of dispersed Americium rose above 40 kBq/m<sup>2</sup> averaged over 1 hectare then the soil at Taranaki was to be removed.<sup>86</sup> Once the soil was removed, the clearance criteria stipulated that the residual levels were not to exceed 3 kBq/m<sup>2</sup> averaged across one hectare.<sup>87</sup> Lastly, for the unrestricted land-use dispersed contamination levels were not to exceed 3 kBq/m<sup>2</sup> averaged across 3km<sup>2</sup>.<sup>88</sup> The clearance levels at each site were calculated to include 3 kBq AM-241/m<sup>2</sup> for Taranki, 1.8 kBq AM-241/m<sup>2</sup> for TM100, 4 kBq AM-241/m<sup>2</sup> for TM101 and 1.8 kBq AM-241/m<sup>2</sup> for Wewak.<sup>89</sup> Although the criteria may appear different for each site when considered by reference to plutonium they are

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<sup>83</sup> Australian Radiation Protection and Nuclear Safety Agency, *Maralinga* (13 May 2004), Australian Government: Australian Radiation Protection and Nuclear Safety Agency <<http://www.arpsa.gov.au/pubs/basics/maralinga.pdf>> 5.

<sup>84</sup> Parkinson above n 19, 53.

<sup>85</sup> *Maralinga Rehabilitation Technical Advisory Committee* above n 80, xli

<sup>86</sup> Australian Radiation Protection and Nuclear Safety Agency above n 83.

<sup>87</sup> *Ibid.*, 5 – 6.

<sup>88</sup> *Ibid.*

<sup>89</sup> *Ibid.* 6.

the same: “all particles greater than 100 kBq Am-241 should be removed, and there should not be more than one particle of 20 kBq Am-241 or higher per 10m<sup>2</sup> of soil.”<sup>90</sup>

The TAG envisaged that the soil in the areas contaminated by Operation Brumby would be removed and disposed of in a purpose designed burial trench under 5 m of uncontaminated rock and soil cover.<sup>91</sup> After cleaning, the cleared lands at Taranki were to remain surrounded by land restricted to hunting and transit for future use, while the TMs and Wewak were intended to be unrestricted.<sup>92</sup>

Another legacy of the British at Maralinga was the plutonium and other wastes which had been buried in shallow pits at Taranki, TM101 and in the airfield cemetery. Despite the pits being formally documented, the estimates for their contamination levels proved to be grossly underestimated.<sup>93</sup> The TAG options recommended that the disposal pits be treated using ISV.<sup>94</sup> ISV was used to treat 11 of the 21 pits at Taranki and was combined with excavation and reburial techniques.<sup>95</sup> Of the remaining formal pits and disposal trenches at Taranki, TM100 and TM101 and airfield cemetery, a mixture of excavation techniques, reburial and ISV were used. For those sites aided by ISV, a further burial trench was required to dispose of contaminated material generated from this procedure.<sup>96</sup>

It was not until 2000 that the work at Maralinga was considered complete. Some 3,200 square kilometres of once contaminated land is now accepted to be safe for unrestricted access.<sup>97</sup> However parts of the site are still restricted for particular land use. Approximately “120 square kilometres, enclosed within an area of 412 square kilometres delineated by marker posts, is considered safe for access but not for permanent occupancy.”<sup>98</sup> After the project was declared complete, the MARTAC

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<sup>90</sup> Parkinson above n 17, 54.

<sup>91</sup> Maralinga Rehabilitation Technical Advisory Committee above n 80, 106.

<sup>92</sup> Ibid.

<sup>93</sup> Maralinga Rehabilitation Technical Advisory Committee above n 80, xliv.

<sup>94</sup> Ibid 129.

<sup>95</sup> Ibid xlv.

<sup>96</sup> Ibid.

<sup>97</sup> Australian Government, Department of Resources, Energy and Tourism, *Maralinga Rehabilitation Project* (31 January 2011)

<[http://www.ret.gov.au/resources/radioactive\\_waste/maralinga/pages/maralingarehabilitationproject.aspx](http://www.ret.gov.au/resources/radioactive_waste/maralinga/pages/maralingarehabilitationproject.aspx)>.

<sup>98</sup> Maralinga Rehabilitation Technical Advisory Committee above n 80, xliv.



discussed recommendations for the future of Maralinga. They primarily included the creation of a Maralinga Land and Environment Management Plan for the site. Within this plan several objectives were articulated. Those of particular interest included:

- “to ensure that no changes occur in the containment of the radioactive materials that would increase the level of risk to current and future generations above that existing at the time of completion of the rehabilitation;
- to ensure that any exposures or discoveries of potentially contaminated materials are reported to an appropriate authority for investigation and action;
- to ensure that the area is managed in a manner which is consistent with not disturbing the contained contaminants and that land use restrictions are adhered to;
- to ensure that the records on the final disposal of all contaminated materials are stored for long-term preservation and are readily retrievable

...”<sup>99</sup>

Since being tabled in the Upper House in 2003 the MARTAC Report has become the “benchmark for subsequent rehabilitation programs.”<sup>100</sup> It led to the British Government contributing £20 million to settle Australia’s claims and contribute to the rehabilitation of the Maralinga site.<sup>101</sup> Costing approximately \$108 million, the largest and most expensive cleanup in Australia’s history, it has made a lasting impression on Australian land management and future practices.<sup>102</sup>

### **Contemporary Responses: Land Management in New South Wales**

The control of seriously contaminated lands in New South Wales is regulated by the *Contaminated Land Management Act 1997* (CLMA), the *Protection of the Environment Operations Act 1997* (PEOA) and the *SEPP 55 – Remediation of Land*.

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<sup>99</sup> Maralinga Rehabilitation Technical Advisory Committee above n 80, 392.

<sup>100</sup> Commonwealth, *Parliamentary Debates*, Senate, 25 March 2003, 10089 (Kim Carr).

<sup>101</sup> *Ibid.*

<sup>102</sup> The Hon Peter McGauran MP, ‘Maralinga Report Definitive Work on Clean-up’ (Media release March 7 2003).

## **The *Contaminated Land Management Act 1997***

Under the CLMA the principle of “polluter-pays” is adopted. Those individuals or corporations which created the pollution are liable for its treatment or removal rather than the community.<sup>103</sup> Contaminated land is defined under the CLMA as land where substance in a concentrated form is at a higher level of concentration than normally found in the same locality, where such a substance presents a risk of harm to human health or any other aspect of the environment.<sup>104</sup>

Similarly, remediation is defined as the “preparing of a long-term management plan for the land and removing, dispersing, destroying, reducing, mitigating or containing the contamination of the land, and eliminating or reducing any hazard arising from the contamination of the land (including by preventing the entry of persons or animals on the land).”<sup>105</sup>

The CLMA holds persons responsible for contamination of land if:

- (a) the person caused the contamination of the land;
- (b) the person whose activity resulted in the conversion of a substance that cause the contamination;
- (c) the person is the owner or occupier of the land and the person knew or ought reasonably to have known that contamination of the land would occur and the person failed to take reasonable steps to prevent the contamination,
- (d) the person carried on activities on the land that generate or consume: the same substances as those that caused the contamination, or; substances that may be converted, by reacting with each other or by the action of natural processes on the land, into substances that are the same as those that caused the contamination.<sup>106</sup>

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<sup>103</sup> Justice Brian Preston, ‘Sustainable Development Law in the Courts: The Polluter Pays Principle’, (Speech delivered to the 16<sup>th</sup> Commonwealth Law Conference, Hong Kong, 7 April 2009).

<sup>104</sup> *Contaminated Land Management Act 1997* (NSW): section 5.

<sup>105</sup> *Contaminated Land Management Act 1997* (NSW): section 4.

<sup>106</sup> *Contaminated Land Management Act 1997* (NSW): section 6(1).

Where the land owner cannot be held responsible, liability may fall on the notional owner of the land. The CLMA defines this type of owner as someone generally who is to benefit from the sale of the land, particularly, but not limited to, a mortgagee in possession of land.<sup>107</sup>

The administration of the CLMA is undertaken by the Environmental Protection Authority (EPA) which is an independent statutory authority with duties to investigate and respond to any possible or actual contamination of land.<sup>108</sup> The EPA follows the principles of Ecological Sustainable Development (ESD) which requires the “integration of economic and environmental considerations in the decision-making processes” achieved through the implementation of the precautionary principle, intergenerational equity, conservation of biological diversity and ecological integrity and improved valuation, pricing and incentive mechanisms such as the polluter-pays principle.<sup>109</sup>

Before a person may be liable to remediate land the EPA is required to be satisfied that the land is contaminated to a degree warranting a declaration of its contaminated status. The litmus test for the EPA is whether the land is “significantly contaminated”.<sup>110</sup> All responses by the EPA must be reasonable. This includes taking reasonable steps to investigate or manage contaminated land.<sup>111</sup> Whether the CLMA decides to regulate contaminated land is assessed against statutory criteria. These criteria are:

- “(a) whether the substances have already caused harm (for example in the form of toxic effects on plant or animal life),
- (b) whether the substances are toxic, persistent or bioaccumulative or are present in large quantities or high concentrations or occur in combinations,
- (c) whether there are exposure pathways available to the substances (that is, the routes whereby the substances may proceed from the source of the contamination to human beings or other aspects of the environment),

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<sup>107</sup> *Contaminated Land Management Act 1997* (NSW): section 7(1).

<sup>108</sup> *Contaminated Land Management Act 1997* (NSW): section 4(1).

<sup>109</sup> *Contaminated Land Management Act 1997* (NSW): section 9.

<sup>110</sup> *Contaminated Land Management Act 1997* (NSW): section 11.

<sup>111</sup> *Contaminated Land Management Act 1997* (NSW): section 8(3).

- (d) whether the uses to which the land and land adjoining it are currently being put are such as to increase the risk of harm from the substances (for example, use for child care, dwellings or domestic food production),
- (e) whether the approved uses of the land and land adjoining it are such as to increase the risk of harm from the substances,
- (f) whether the substances have migrated or are likely to migrate from the land (whether because of the nature of the substances or because of the nature of the land).<sup>112</sup>

Under the CLMA the EPA has wide ranging powers. They include the power to require preliminary investigations of the condition of land, and/or issue management orders.<sup>113</sup> The CLMA lists appropriate persons to whom liability may be ascribed for preliminary investigation orders. Some of those persons include owners, notional owners and any such person the EPA reasonably suspects of contaminating the land.<sup>114</sup> For management orders the EPA can issue an order to an appropriate person, similar to those listed above, directing them to undertake certain conduct in relation to contaminated land and to submit a plan for approval.<sup>115</sup> If the EPA decides to issue a management order, the order must specify the responsible person generally determined by the polluter pays principle.<sup>116</sup> The order must specify the nature of the contamination and the action that is sought.<sup>117</sup> The actions available under the CLMA are extensive and include the following:

- “(a) to investigate the existence, nature and extent of any significant contamination of the significantly contaminated land to which the order relates,
- (b) to investigate the nature and extent of any harm that has been or may be caused by the significant contamination of the land,
- (c) to investigate the most appropriate means for undertaking remediation of the land,

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<sup>112</sup> *Contaminated Land Management Act 1997* (NSW): section 12(1). See: *Edwards v Sutherland Shire Council* [2006] NSWLEC 128 (please note that this decision was made prior to the 2008 amendments of the *Contaminated Land Management Act 1997* (NSW)).

<sup>113</sup> *Contaminated Land Management Act 1997* (NSW): section 8.

<sup>114</sup> *Contaminated Land Management Act 1997* (NSW): section 10(3).

<sup>115</sup> *Contaminated Land Management Act 1997* (NSW): section 14(1).

<sup>116</sup> *Contaminated Land Management Act 1997* (NSW): section 13(2).

<sup>117</sup> *Contaminated Land Management Act 1997* (NSW): section 15(1A).

- (d) to carry out remediation of the land,
- (e) to monitor the effectiveness of any remediation or the risk of harm presented by the significant contamination of the land,
- (f) to erect a fence, wall, bund or other barrier in a specified place on the land,
- (g) to treat, store or contain on the land, or remove from the land and treat or dispose of, any solid or liquid materials including any soil, sand, rock or water,
- (h) to vacate, or cease to carry on any activity on, the land or any part of it,
- (i) to display on the land any specified sign or notice,
- (j) to refrain from disturbing or further disturbing the land in a specified manner or below a specified depth,
- (k) to enter any specified land (which may, but need not, be the significantly contaminated land) in order to carry out the management order,
- (l) to serve notice of the management order on those persons who occupy land, access to which is necessary for the person to carry out the management order,
- (m) to have specified actions audited by a site auditor under Part 4,
- (n) to make progress reports to the EPA,
- (o) if the person finds that groundwater is contaminated, to report that fact to the Minister administering the Water Management Act 2000 ,
- (p) to make available for inspection by any person, free of charge, a report on the action taken under the management order, or the plan of management, and provide a copy of such a report or plan to any person for a reasonable fee,
- (q) to advertise and conduct meetings for the public to receive progress reports, and to make comments, on the action taken under the management order or on the plan of management,
- (r) to inform the EPA of any change in the ownership or occupancy of the land, to the extent that the person is aware of the change.”<sup>118</sup>

In addition to the Management Orders, a proposal may be submitted to the EPA by any person for the management of a contaminated land. The EPA may allow this either conditionally or unconditionally.<sup>119</sup> The EPA must be satisfied that all avenues have been exhausted to locate those who contributed to the

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<sup>118</sup> See: *Jeffman Pty Ltd and Lawrence Dry Cleaners Pty Ltd v Environment Protection Authority of NSW, Sydney Water Corporation and Douglas and Hilary Hutchinson* [2011] NSWLEC 89 (please note that the initial management order in this decision was made prior to the 2008 amendments of the *Contaminated Land Management Act 1997* (NSW); *Contaminated Land Management Act 1997* (NSW): section 16.

<sup>119</sup> *Contaminated Land Management Act 1997* (NSW): section 17.

contamination. More importantly the fact that a voluntary management proposal has been accepted does not preclude the possibility of a management order by the EPA.<sup>120</sup> In addition to a management order, the EPA is able to require ongoing maintenance of land that is subject to an order or proposal whether or not the land is significantly contaminated.<sup>121</sup> The owner or notional owner may be required:

- “(a) to carry out any ongoing management of the land that is specified in the order,
- (b) to provide reports to the EPA or any other specified person at specified periods or on the occurrence of any specified event,
- (c) to inform the EPA of any change in the ownership or occupancy of the land, to the extent that the person is aware of the change,
- (d) to not carry out specified activities on the land and to not permit other persons to carry out any such activities on the land,
- (e) to not use the land for specified purposes and to not permit other persons to use the land for those purposes,
- (f) to carry out any other requirement in relation to the ongoing monitoring and maintenance of the land that is prescribed by the regulations.”

Due to the inevitably slow process of remediation the CLMA provides off-set arrangements that can place further liabilities on those deemed responsible for the contamination. The philosophy behind these arrangements is to limit the loss incurred by the community.<sup>122</sup> Assistance may include “the provision of community facilities or services or the establishment and operation of environmental or resource projects.”<sup>123</sup> This assistance does not include direct financial compensation.<sup>124</sup> Similar to any loss suffered by the community, the CLMA requires the responsible person to compensate the occupier of the land: for loss of business activities<sup>125</sup> and damage to land.<sup>126</sup> Further, in addition to a duty to take reasonable steps to minimise loss or damage, the responsible person needs to

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<sup>120</sup> *Contaminated Land Management Act 1997* (NSW): section 17(6).

<sup>121</sup> *Contaminated Land Management Act 1997* (NSW): section 28(1).

<sup>122</sup> *Contaminated Land Management Act 1997* (NSW): section 111A.

<sup>123</sup> Rosemary Lyster, Zada Lipman, Nicola Franklin, Graeme Wiffen, and Linda Pearson, *Environmental and Planning Law in New South Wales* (The Federation Press, 2<sup>nd</sup> ed, 2009) 580.

<sup>124</sup> *Ibid.*

<sup>125</sup> *Contaminated Land Management Act 1997* (NSW): section 33(1).

<sup>126</sup> *Contaminated Land Management Act 1997* (NSW): section 33(2).

meet all costs and expenses of the owner or occupier in providing access to the land.<sup>127</sup>

The CLMA imposes obligations to notify the EPA of contaminated land as soon as practicable.<sup>128</sup> It extends to both land owners irrespective of whether the contamination occurred at the time or before their occupancy, and to those who have conducted activities causing the contamination.<sup>129</sup> Penalties apply for failing to notify the EPA. Daily penalties may also apply for continued breaches.<sup>130</sup>

Corporations and their directors are not immune from the obligations under the CLMA. If a corporation has been intentionally wound up to avoid a management order, the Land and Environment Court has the ability to compel a director or person affiliated with the management of the corporation to pay personally.<sup>131</sup> The Court needs to be satisfied that the reason for the winding up was for the purpose of escaping a management order and that the person was a manager or director at the time.<sup>132</sup>

### **The *Protection of the Environment Operations Act 1997***

The *Protection of the Environment Operations Act 1997* (PEOA) provides that the EPA can issue licences to industries that have the potential to pollute. The licence will often have attached to it conditions requiring remediation in the case of contamination.<sup>133</sup>

### **Land Development, SEPP 55 Remediation of Land and Guidelines on Remediation**

Remediation “is generally considered beneficial as it improves the quality of the environment, reduces health risks and restores land to productive use. Care must

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<sup>127</sup> *Contaminated Land Management Act 1997* (NSW): section 33(3).

<sup>128</sup> *Contaminated Land Management Act 1997* (NSW): section 60(4). See: *Jeffman Pty Ltd and Lawrence Dry Cleaners Pty Ltd v Environment Protection Authority of NSW, Sydney Water Corporation and Douglas and Hilary Hutchinson* [2011] NSWLEC 89 [6] (Preston CJ).

<sup>129</sup> *Contaminated Land Management Act 1997* (NSW): section 60.

<sup>130</sup> *Contaminated Land Management Act 1997* (NSW): section 60(4)

<sup>131</sup> *Contaminated Land Management Act 1997* (NSW): section 63(1)

<sup>132</sup> *Contaminated Land Management Act 1997* (NSW): section 63(3)

<sup>133</sup> *Protection of the Environment Operations Act 1997*: section 71.

therefore be taken not to create disincentives to remediation through complicated and costly planning procedures.”<sup>134</sup> When remediation is regarded as necessary, either because of some new use that is proposed for the land or when the land has been declared contaminated by the EPA, remediation must achieve identified standards. These standards are reflected in a general fashion under State Environmental Planning Policy No 55 – Remediation of Land under the *Environmental Planning and Assessment Act 1979* and the Planning Guidelines SEPP 55 – Remediation of Land (Guidelines). The Office of Environment and Heritage (OEH), a State Government approved body, has drafted several publicly available guidelines for specific types of remediation. The targets vary but range from service stations to banana plantation sites.<sup>135</sup>

SEPP 55 provides consistent state wide planning and development controls for the remediation of contaminated land. The SEPP 55 ensures, amongst other things, that land use is not undertaken until planning authorities have considered whether the land is contaminated and whether remediation is needed.<sup>136</sup> Whether or not development consent is needed for remediation itself is determined by the significance of the environmental impact that may be involved. There are two categories when consent is required for remediation. Category 1 work requires consent for those matters that include designated development, where the work is to be undertaken on critical habitat, if it is likely to significantly harm the environment or where the work will be carried out in an environmentally sensitive zone.<sup>137</sup>

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<sup>134</sup> New South Wales Government: Department of Urban Affairs and Planning, ‘Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land’ (1998) 28.

<sup>135</sup> New South Wales Government, Office of Environment and Heritage, *Guidelines under the CLM Act* (28 April 2011), Office of Environment and Heritage, <<http://www.environment.nsw.gov.au/clm/guidelines.htm>>.

The guidelines are listed below:

Guidelines for Assessing Service Station Sites (December 1994)

Guidelines for the Vertical Mixing of Soil on Former Broad-acre Agricultural Land (January 1995)

Sampling Design Guidelines (September 1995)

Guidelines for Assessing Banana Plantation Sites (October 1997)

Guidelines for Consultants Reporting on Contaminated Sites (September 2000)

Guidelines for Assessing Former Orchards and Market Gardens (June 2005)

Guidelines for the NSW Site Auditor Scheme, 2nd edition (April 2006)

Guidelines for the Assessment and Management of Groundwater Contamination (March 2007)

Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (June 2009).

<sup>136</sup> Department of Urban Affairs and Planning, ‘Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land’ (1998) 28.

<sup>137</sup> *Ibid* 28 – 29.



Category 2, by contrast, allows all other remediation work to proceed without consent subject to exceptions under the SEPP.<sup>138</sup>

## **Conclusion**

It is apparent from my discussion of the problems which emerged in cleaning up the land contaminated by the nuclear testing program that care needs to be taken in defining an acceptable level of remediation. Although at the time of the original cleanup the objective was considered to be appropriate it later became apparent that it fell far short of that required to enable the land to be safely occupied. Any remediation program for land contaminated by permanent deposits of harmful substances must recognise that as the level of scientific knowledge increases standards may change requiring further remediation activities.

On many occasions lands will be contaminated by deliberate activity and on other occasions by accidents which release harmful substances. The NSW legislative regime contemplates both circumstances and provides statutory powers which may require land owners to respond where their land is found to be contaminated.

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<sup>138</sup> SEPP 55 - Remediation of Land: clause 14.