MARALINGA

AND THE

DISPOSAL OF NUCLEAR WASTE

Alan Parkinson

Former Government Representative to oversee the Maralinga Rehabilitation Project and Member of MARTAC

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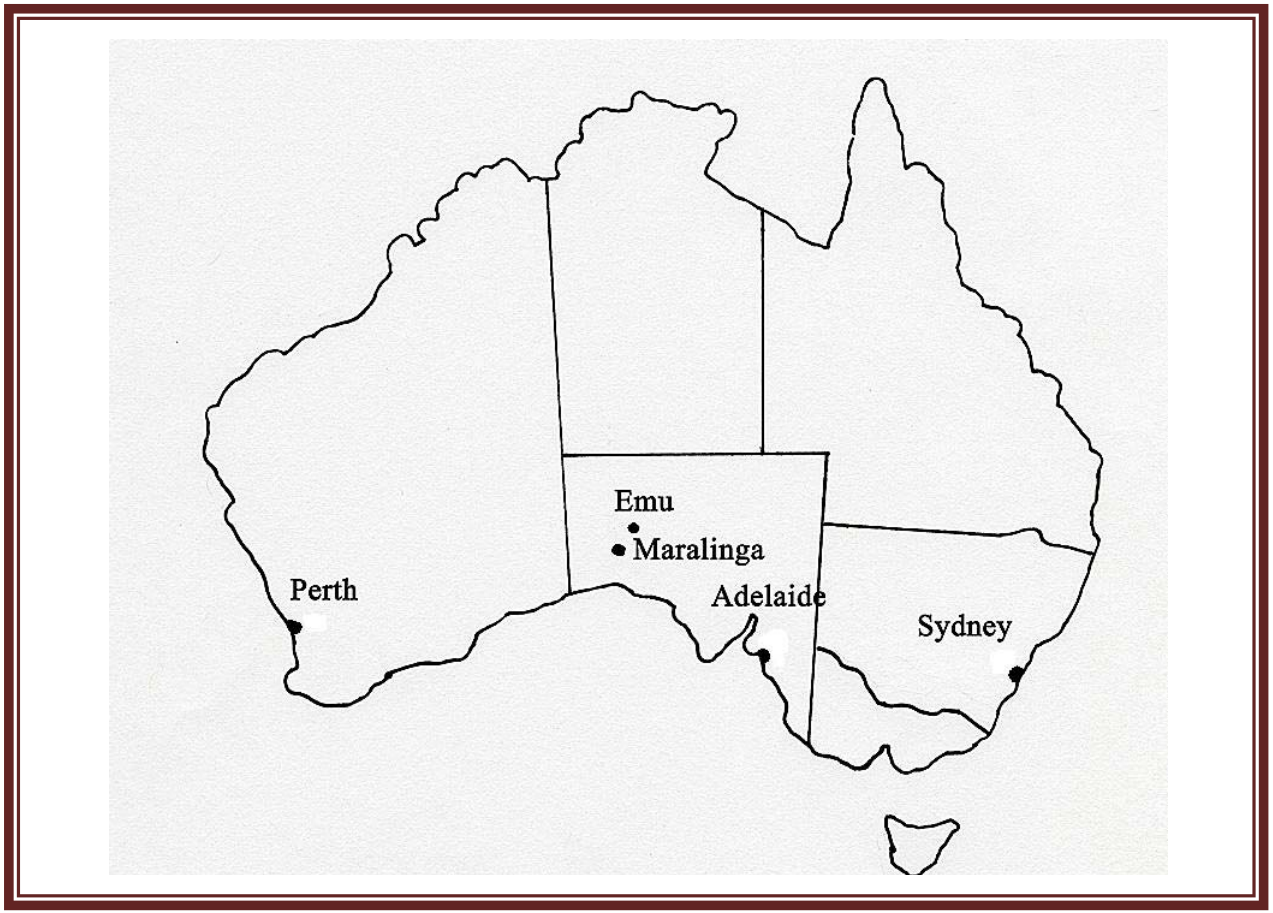
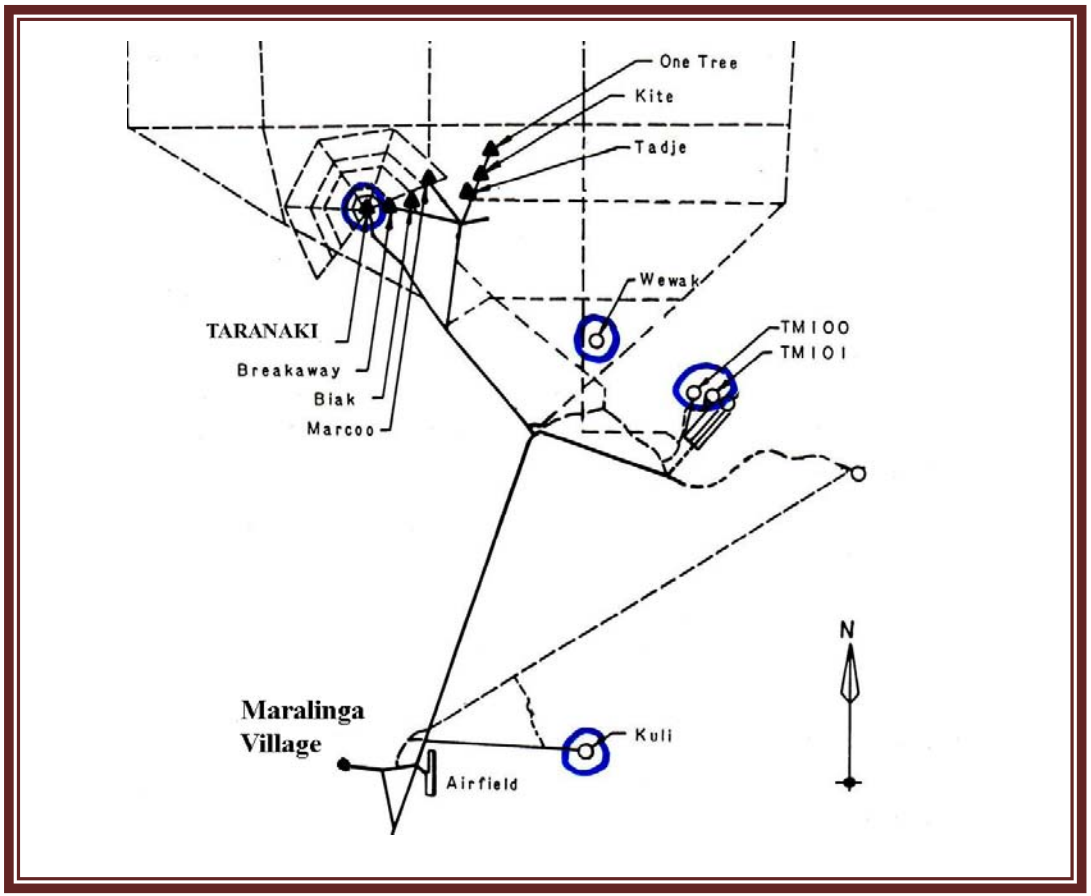
On 3 October 1952, Britain exploded its first atomic bomb. The bomb was placed onboard HMS *Plym* moored near Trimouille Island in the Monte Bello islands off the coast of Western Australia.

It was followed by two further explosions at Emu in the north of South Australia and two more off the Monte Bello islands.

Development then moved to Maralinga in South Australia.



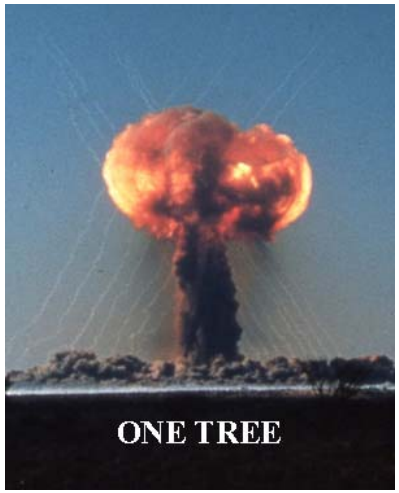
Maralinga is on the edge of the Nullarbor Plain 40km north of the Indian Pacific Railway



Map of the Maralinga site

(based on *K Lokan, Residual Radioactive Contamination at Maralinga and Emu,* 1985 ARL/TR070)

Britain exploded seven atomic bombs at Maralinga



Operation Buffalo

Sept – Oct 1956

- One Tree – 15 kt
- Marcoo – 1.5 kt
- Kite – 1 kt
- Breakaway – 10 kt

Operation Antler

Sept – Oct 1957

- Tadje – 1 kt
- Biak – 6 kt
- Taranaki – 26 kt

In addition to the atomic explosions, Britain carried out hundreds of 'minor' trials with code names Rats, Tims, Kittens and Vixen.

The Rats, Kittens, and Tims trials were conducted at the Wewak, TM and Kuli sites.

There were two types of Vixen trial.

The Vixen A trials were conducted at the Wewak and TM sites.

The Vixen B trials were all conducted at Taranaki.

See: ***A History of British Atomic Tests in Australia, JLSymonds***

Department of Resources & Energy, 1985

In the Vixen B trials, a nuclear bomb was placed on a heavy, steel structure known as a 'featherbed'. The bomb was detonated in a manner which prevented a nuclear explosion, but the heat and power of the chemical explosion hurled molten uranium and plutonium almost a kilometre into the air.

In the years 1960 – 63, fifteen Vixen B trials were conducted at Taranaki, dispersing 22 kg of plutonium and a similar amount of uranium far and wide. Three of the trials were calibration rounds with cores of uranium only.

The featherbeds were so damaged and contaminated with plutonium that they could not be used a second time and were buried in pits generally adjacent to the firing pads.

The land surface close to the firings was also scraped and the soil pushed into the pits along with the remains of the featherbeds.

Before the British left Maralinga, they carried out a ‘final’ clean-up. They ploughed the most contaminated areas to dilute the radioactivity in the soil. They erected fences around areas that were most contaminated, and cast concrete caps over the debris pits.

A ‘monument’ was erected to commemorate the work.

The Kuli site was contaminated with uranium.

A lump of uranium metal on the surface at Kuli compared with a ten cent coin.

The Wewak and TM sites were contaminated with plutonium.

The TM site before work started – ploughed by the British to dilute radioactivity.

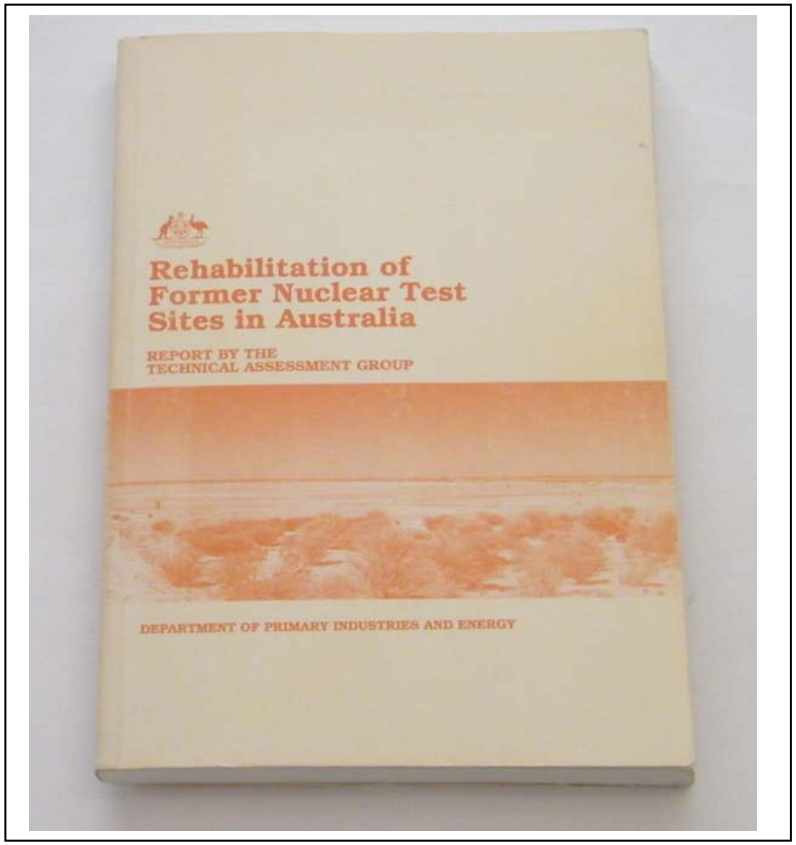
The Taranaki site was contaminated with plutonium and uranium.

The Taranaki site viewed from the north before work started.

In 1984, the Hawke government established the McLelland Royal Commission to enquire into the state of the site and its suitability for return to the traditional owners – the Maralinga Tjarutja.

McLelland recommended the site should be cleaned up to allow the Aborigines to have unrestricted access on return to their lands.

The government then set up a Technical Assessment Group (TAG) to oversee some scientific and preliminary engineering studies as a basis for consideration of options to rehabilitate the site.



The TAG reported its findings to the government in 1990.

Some thirty options for the rehabilitation were included.

One option was selected and agreed to by the federal government, the South Australian government, and the traditional owners. That option was known as Option 6 (c).

See: *Rehabilitation of Former Nuclear Test Sites in Australia*, Report by the Technical Assessment Group, Department of Primary Industries & Energy, 1990

Under Option 6 (c), soil contaminated above a certain level would be removed from the TM and Wewak sites and buried in trenches excavated at those sites.

The most contaminated soil at Taranaki would also be scraped up and buried in a large trench at that site.

Twenty-one debris pits at Taranaki would be treated by a process of *in situ vitrification*. Pits at the other two sites would be exhumed and their contents transferred to the burial trenches.

Lumps of uranium metal would be removed from the Kuli site and buried.

Some pits in the Airfield Cemetery would be exhumed and their contents transferred to another trench at Taranaki for burial.

Some 70 other pits would be checked and 'landscaped.'

One of the ‘pits’ to be tidied was the old swimming pool in the village.

The pool during its heyday of the test era, and when the rehabilitation started.

In 1994, a contract to manage the first part of the project was awarded to Australian Construction Services (ACS) which was part of the Department of Administrative Services.

Their scope of work was to:

- **Award contracts for**
  - **Erection of a construction camp for the workforce**
  - **Installation of infrastructure – telephones, electricity, water supply and sewerage**
  - **Installation of Forward Area Facilities**
  - **Excavation of burial trenches at three worksites**
  - **Collection and burial of contaminated soil**
  - **Provision of Health Physics services**
- **Manage the subcontracts**

A construction camp was erected in the village, providing sleeping, washing and laundry facilities together with meal rooms, bar and some recreational facilities.

The largest burial trench was excavated at Taranaki.

It measured 205m long by 140m wide by 15m deep.

There was an entrance ramp at one end and an exit ramp at the other to allow one-way traffic through the trench.

Three scrapers, assisted by a bulldozer, scraped up contaminated soil from an area designated by the Australian Radiation Laboratory (ARL).

Over a period of about 8 months they removed 330,000 cubic metres of soil and deposited it in the burial trench.

An attempt was made to estimate the amount of plutonium contained in the soil collected and transferred to the burial trench. The amount quoted by the government was about 3.3 kg.

This block of wood is about the same size as 3.3 kg of plutonium.

One disappointing aspect of soil removal at Taranaki was the poor suppression of dust.

On 15 occasions, work had to stop because it was not safe to move heavy equipment in such poor visibility. On at least one occasion the Health Physics team evacuated the forward area facilities because of the dust. To be fair to the Contractor, with a change of procedure, the dust suppression at the other two sites was excellent.

The collected soil was transferred to the burial trench.

The trench was filled to about 3m from the lip. It was then covered with about 6m of clean soil.

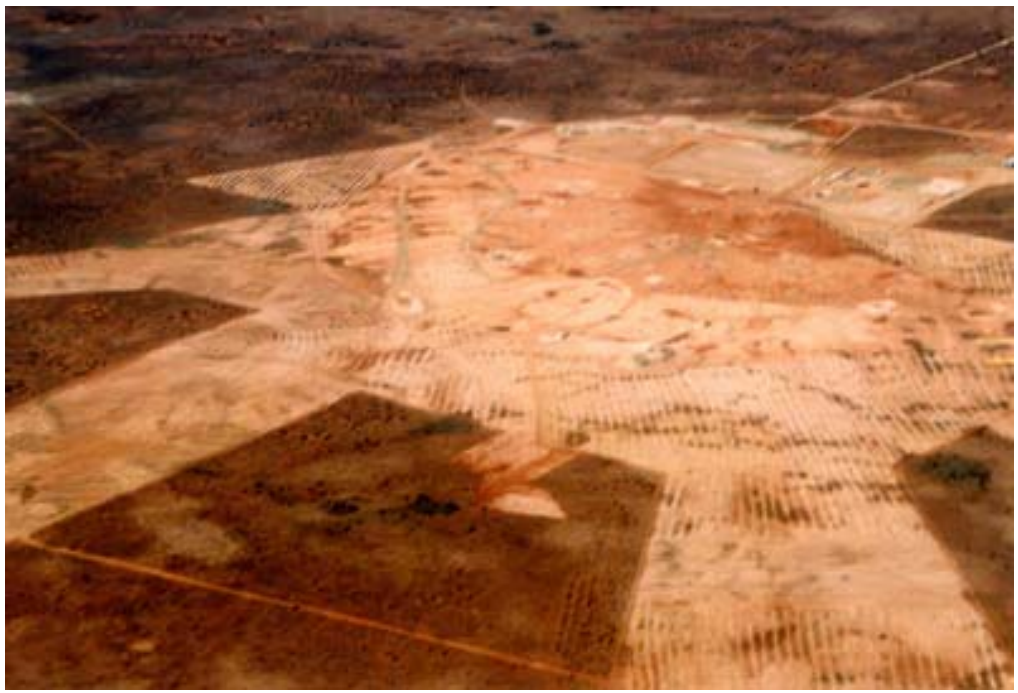
As soil was removed from Central Taranaki, the team uncovered thousands of tonnes of debris contaminated with plutonium beyond what had been reported as the pit boundaries. None of the concrete caps covered the entire pit. Two caps were several metres from the pit.

Since it would not be possible to remove every speck of plutonium, a target was set that had to be achieved. At Taranaki, the target was 3kBq of Am-241 per square metre.

After soil was removed, the surface was monitored to confirm the criterion had been satisfied. The Contractor achieved a remarkable three thousand-fold decrease in the level of contamination.

The two methods of monitoring the soil adopted by ARL

Mounds of clean soil were then placed over the scraped area and seed of native shrubs cast over the mounds to assist in revegetation.



Mounds of clean soil at Taranaki

Towards the end of the soil removal phase, the Howard government implemented a privatisation scheme under which ACS was sold to the private consultancy Gutteridge Haskins and Davey (GHD). A company that was not in the final six considered to manage the first part of the project became Project Manager.

Before the vitrification could start at site, the contract with GHD was extended to include management of the ISV phase. As well as being appointed Project Manager, they were also appointed Project Authority.

Several times, the Department was informed in writing that GHD had not been involved in the three year development program to match the ISV technology to the Taranaki geology, had no knowledge of the technology, and had not even seen the equipment to be used.

The Department ignored the advice.

Almost as soon as they were appointed, GHD submitted a case to the Department to abandon the ISV project and instead simply exhume the debris pits and bury the debris in a shallow trench.

A submission by GHD states "*The recent consideration of alternative treatments for ISV for these outer pits has arisen as a result of the revised estimate for ISV being considerably above the project budget.*"

See: ***GHD Cost Comparison for Treatment of Outer Pits*****, 21 August 1998**

The Department then broke its agreement with the South Australian government and the Aborigines and introduced a hybrid scheme to continue the vitrification of some pits but exhume and bury the debris from other pits.

When the Taranaki site had been scraped and accepted as meeting the acceptance criteria, it was handed over to Geosafe to treat the pits by *in situ vitrification.*

A steel hood was placed over the pit and electricity fed to the four electrodes shown protruding from the hood.

Photo courtesy of Leo Thompson

The electricity melted the silica sand that had been placed over the pit. The upper layer melted the next layers down into the pit and continued 24 hours a day for about a week until the whole pit was consumed.

Photo courtesy of Leo Thompson

The pit contents were thus turned into a hard glass-like rock with properties similar to obsidian glass. This would immobilise the plutonium for thousands of years.

Samples of vitrified radioactive waste at Taranaki.

Vitrification of pits continued at the same time as other pits were exhumed.

Twelve melts were successfully completed but as the thirteenth melt was nearing completion, something in the pit exploded. The hood over the pit was severely damaged and molten glass was spewed some fifty metres from the pit. The Department then cancelled the vitrification of pits and exhumed them all, including those that had been vitrified, and buried everything in a shallow trench. The top of the debris is only two metres below ground.

The Chief of the nuclear regulator ARPANSA said *"Claims that the clean-up of Maralinga is not to world best practice are not well founded."*

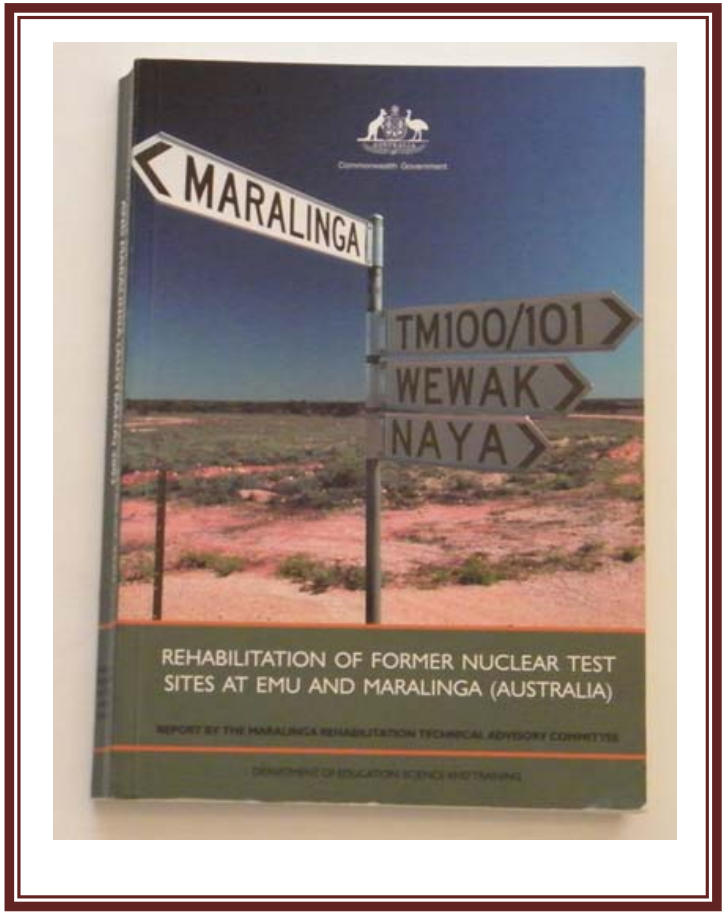
See: J Loy, Media Release, '*Maralinga Cleaned Up to Acceptable Standards*' 17 April 2000

Can this be taken to mean that in his opinion shallow burial of plutonium-contaminated debris in dolomite and limestone geology with many cracks and fissures is world best practice?

A similar project, but on a much smaller scale, was in progress in the USA. The Americans collected all the contaminated debris and bagged it. Then they collected the contaminated soil and bagged that. The whole lot was transported over 300 km by road to the Nevada Test Site for storage at a properly designed facility on a guarded site.

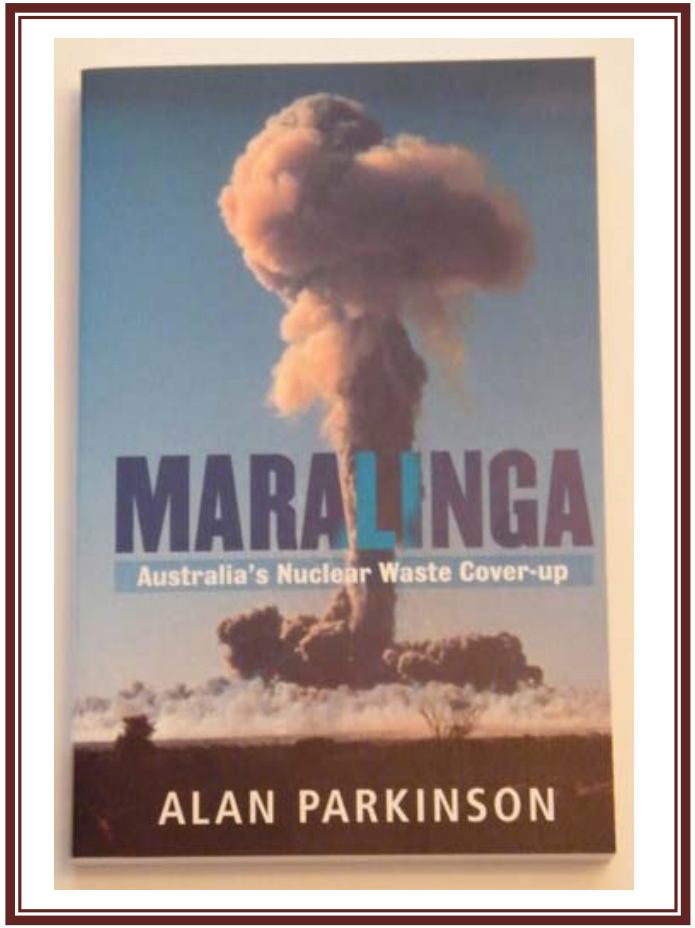
In Britain, plutonium contaminated material is placed in stainless steel drums which are placed on a concrete base in an air-conditioned building on a guarded site.

In 2003, the government published its report of the Maralinga project. When tabling the report in Parliament, the Minister Mr Peter McGauran said: *"The project achieved its goals and a world's best practice result."*



See: *Rehabilitation of Former Nuclear Test Sites at Emu and Maralinga (Australia)*, Department of Education, Science and Training, 2003

The MARTAC Report contained so many mistakes in its descriptions of the project that a book was published to give a better explanation.



See: *Maralinga, Australia's Nuclear Waste Cover-up,* Alan Parkinson, pub ABC Books, 2007

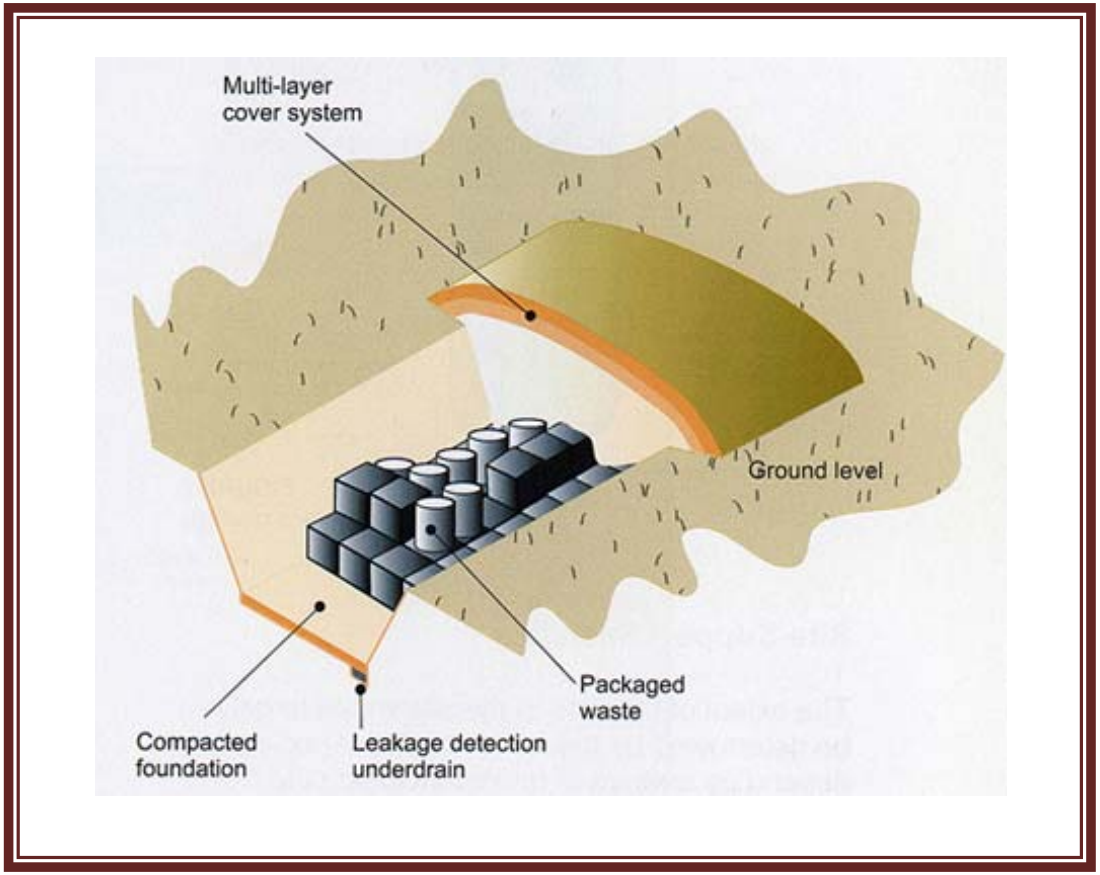
For some twenty years, governments of both persuasions have faced the problem of disposing of some low-level radioactive waste.

The bulk of this waste is 20,000 forty-four gallon drums of soil excavated from a site in Victoria and the remainder is laboratory and hospital waste.

In addition is some intermediate-level waste from a site in NSW which is to be stored. This includes some uranium and americium.

At Maralinga, uranium and americium (and plutonium) is claimed to be low-level waste, but at the store, uranium and americium is acknowledged to be intermediate-level waste.

The plan is to dispose of the waste in a special facility at a remote site in the Northern Territory.



Source: ***National Radioactive Waste Repository, Draft EIS,*** **Department of Education, Science and Training, Jan 2003**

It is interesting to compare the planned disposal of nuclear waste in the National Nuclear Waste Repository in a properly engineered facility, built in carefully selected geology, with the approach at Maralinga of shallow burial of plutonium-contaminated debris with no packaging or conditioning in totally unsuitable geology.

One might ask *"If the Maralinga approach really is world best practice, why not adopt that approach at the National Nuclear Waste Facility?"*