CONSOLIDATED EIS RESPONSE FOR THE NRWR

EXECUTIVE SUMMARY

This is not a public submission or a submission made pursuant to the *Environment Protection and Biodiversity Conservation Act* but is rather an information paper to draw all Defence considerations to the attention of the proposing department, the Department of Education, Science and Training.

Of the three sites assessed during the EIS process for the proposed National Radioactive Waste Repository, 52a is the only location contained within the Woomera Prohibited Area (WPA). This site is adjacent to the Range E Target Area (RETA) in the Woomera Instrumented Range (WIR) and within the safety template of weapons tested at the WIR. The location of the NRWR at Site 52a will significantly impede Defence's ability to test and evaluate weapons and training capabilities. The preferred site will also have high cost implications to Defence and will greatly impede economic development of the Woomera region.

This document clearly assesses that Site 52a is an unacceptable location for the NRWR.

The Woomera Prohibited Area

The WPA is an area of land of approximately 127,000 square kilometres (12.7 million hectares). The south-eastern corner of the area is located approximately 450 kilometres north of Adelaide. The WPA has been set aside for the testing of war materiel under Defence Force Regulation 35. The majority of the WPA is State-owned land, about half of which is leased to pastoralist or mining companies. Portions of the WPA are also designated lands of the Maralinga Tjarutja Aboriginals.

Key components of the WPA infrastructure are contained within the WIR. These include the main instrumentation building, associated structures and workshops, two radar sites, prepared and surveyed kinetheodolite sites, rocket launch emplacements, microwave repeater masts and explosive preparation and test workshops.

Instrumentation has been positioned at the WIR to take advantage of the unique features of the WPA for the purpose of testing complex weapon systems. The radars have been specifically located to provide a highly accurate coverage of a wide expanse of airspace. A number of fixed optical tracking sites on the WIR provide extremely accurate tracking and recording of weapon systems during flight.

Given the unique characteristics of the WPA and at an estimated replacement cost for infrastructure of approximately $180 million, the WPA comprises a high value asset servicing Australia's defence requirements and commercial aerospace needs that is not replicated anywhere else in the world.

EIS Findings

The Draft EIS reports that Site 52a, within the WPA, remains the preferred site for the location of the NRWR. However, it also states that the alternative sites, 40a and 45a, are acceptable locations. Reasons put forward for Site 52a remaining the preferred location include good existing access, superior security, the presence of shale to provide the availability of lower permeability material for the trench base of the repository and favourable surface drainage features. The main disadvantage is the activity within the WPA, despite the Draft EIS stating that such impacts can be managed, which is contrary to advice provided by Defence.

Defence EIS Review Findings

The Defence review of the Draft EIS has identified that the recommendation to locate the NRWR at Site 52a is based on incorrect information. When an objective and accurate assessment of the three sites is undertaken, Site 52a can no longer be considered as an acceptable location for the NRWR for the following reasons:

- The EIS calculation for the frequency of missile impact on the NRWR if located at Site 52a is incorrect. The total risk of repository breach from a missile impact per annum is 8.7×10^{-2}, compared with 3×10^{-5} disruptions per annum calculated in the EIS.

- Using the EIS methodology to assess the risk of contracting fatal cancer as a result of radioactive material being expelled from the NRWR, a risk of 2.1×10^{-5} exists for the 'no–dilution' case. The NHMRC Code of Practice for the Near Surface Disposal of Radioactive Waste in Australia, 1992, requires the individual risk of fatality of a near-surface radioactive waste repository to be less than 1×10^{-6}. The risk associated with Site 52a exceeds this criterion by more than an order of magnitude; consequently, on this basis alone, Site 52a is an unacceptable site for the location of the NRWR. The risk is not applicable to the other two sites.

- Defence risk management processes detailed in this submission show that the risk of impact of a weapon on the NRWR is 1 in 11 years. Using this result, the following risks were calculated:

    - Based on fatality risk alone, a 'Medium' level risk exists, meaning that Aircraft Research and Development Unit (ARDU) could not, under existing risk management policies, operate the WIR with the NRWR located at Site 52a.
    - Based on financial risk criteria, using Mil-Std-882d, the risk is assessed as 'High', which is the highest risk category. The location of the NRWR at Site 52a and the simultaneous operation of the WIR are therefore incompatible.
    - Based on Public/Image/Morale criteria using the RAAF-AVRM risk matrix, the risk is assessed as 'Extreme', which is the highest risk rating. Under Chief of Air Force Directive 1103/2001, it would be necessary for Defence to reconsider their use of the WIR, should the NRWR be located at Site 52a.

- The location of the repository at Site 52a within the WIR, adjacent to the Range E Target Area and within known safety templates for more commonly tested weapons, means that the risk of a weapon hitting the repository and discharging radioactive material from the repository to the surrounding environment exceeds the risk for Sites 40A and 45A. Site 52a is therefore unacceptable based on the ALARA (As Low As Reasonably Achievable) principle specified in both national and international guidelines.

- Access to Site 52a will require at least 10.5 km of road upgrading; not 1.5 km, unless it is being proposed to extend any disposal and construction phase due to wet weather, thereby potentially closing down the WPA for extended periods of time. This requirement is similar to Site 45a; therefore no significant advantage exists based on site access.

- Site 52a will not have superior security to Sites 40a and 45a because the WPA is only monitored during operations. Thus 52a is effectively no more secure than the others are. Consequently, all three sites will require increased security measures.

- The low permeability material (Bulldog Shale) at Site 52a, supposedly offering a greater protection from radioactive leakage when compared to Sites 40a and 45a, may be very thin or non-existent beneath excavated repository trenches. The sediments underlying the Bulldog Shale at Site 52a are likely to be more permeable than at the other two sites. In addition, the water table is shallower at Site 52a. This indicates that Site 52a is likely to be the least preferred site on a hydrogeological basis.

- No advantage exists between the three sites regarding favourable surface drainage characteristics because surface drains will be constructed no matter which site is selected.

- The Woomera Prohibited Area is not owned by the Commonwealth. It is declared a Prohibited Area under Defence Force Regulation 35 for the purposes of testing war materiel, and while Defence owns small pockets of land, the majority is State Crown land covered by mining and pastoral leases. Site 52a is not on Commonwealth owned land, but rather is on land which is held as a pastoral lease by the owners of Wirraminna Station. Should Site 52a be chosen as the final site for the establishment of the NRWR, the Commonwealth would be required to compulsorily acquire this land. Thus no advantage exists between the three sites regarding the acquisition of the land.

- If the NRWR is located at Site 52a, costs of approximately $180 million will be incurred to relocate the WIR, providing a suitable location can be found. Other potential cost implications include the loss of economic development for the Woomera area and South Australia if the commercial operations at the site are lost. Costs associated with Unexploded Ordnance (UXO) clearance for Site 52a, the EIS process for the location of a new facility, down-time and loss of Defence's weapons test and evaluation and training capabilities whilst any relocation activity takes place would also have to be added.

- Risk mitigation measures presented in the EIS are supposed to reduce the likelihood of a weapons impact on Site 52a. These measures are impractical and demonstrate a lack of experience and understanding of how the WIR operates, the use of safety templates and the impact of weapons on structures such as the NRWR. Advice provided by Defence, the experts in this field, appears to have been ignored.

Based on the risk of fatal cancer and the principles specified in national and international guidelines, Site 52a is clearly an unacceptable site for the NRWR. Defence will not be able to continue its current activities at the WIR if Site 52a is selected and used for the NRWR. If the NRWR is positioned at this location, it will be necessary for Defence to move the WIR at a cost of about $180M, provided a suitable site can be identified.

Based on these objections and given that two acceptable sites, which do not affect the operation of the WIR, remain for the location of the NRWR, Site 52a should not be selected as the preferred site.

While Defence has strong objections to the selection of Site 52A as the preferred location for the NRWR, Defence is willing to work with DEST to identify an alternative solution should Sites 40A, 45A and 52A be deemed unsuitable options for the Commonwealth. Selection of a site within the WPA would be subject to compatibility with Defence use of the WPA.

1.0 INTRODUCTION

The Department of Defence (Defence) has prepared this response to the National Radioactive Waste Repository (NRWR) Draft EIS in order to assist in the selection process for an appropriately located NRWR. A major concern to Defence on review of the Draft EIS is the lack of objectivity in the selection process between Sites 40a, 45a and 52a and the complete disregard given to the many submissions Defence has made regarding their objections to the location of the NRWR at Site 52a. Defence's detailed submission to the Department of Education, Science and Training (DEST) regarding the location of the NRWR **"Impact on Australian Defence Organisation Operations of Locating the National Radioactive Waste Repository at Site 52a within the Woomera Prohibited Area at Woomera, South Australia", (HLA-Envirosciences DO166 dated 11 February, 2002)** has not been raised in the Draft EIS, nor have the significant objections contained in this submission to the location of the repository at Site 52a.

The following question Defence previously asked DEST during the EIS process still remains:

Would DEST consider it reasonable for Defence to recommend the location of a new weapons range with bombing/weapons targets located 3 km from an existing NRWR under their control?

It is Defence's opinion that this possibility would not even be considered and rightly so. Defence is concerned that the intention of the EIS process is to select Site 52a rather than objectively assess the options that are available.

Defence's response to the EIS is detailed in Sections 2 to 11 of this submission. These sections include:

- Section 2 : Background
- Section 3 : Physical and Biological Environment
- Section 4 : Regulatory Framework/Guidance
- Section 5 : Risk Assessment
- Section 6 : Mishap Risk Mitigation
- Section 7 : Land Use (Current and Future) and Temporary Storage Sites
- Section 8 : Security
- Section 9 : Cost Implications
- Section 10 : Other Issues
- Section 11 : Conclusions

It should be noted that Defence acknowledges the requirement for a NRWR but has significant objections to the placement of a NRWR at Site 52a. Defence has no objections to 40a and 45a.

2.0 BACKGROUND

The Woomera Prohibited Area (WPA) is an area of land of approximately 127,000 square kilometres (12.7 million hectares). The south-eastern corner of the area is located approximately 450 kilometres north of Adelaide and immediately adjacent to the townships of Woomera and Roxby Downs. Woomera Township provides domestic and commercial support for the activities at the range. The township is used for the domestic accommodation of range personnel and as a convenient nearby airfield for test aircraft to operate from. Woomera is also currently used as a location for an Immigration Reception and Processing Centre.

The WPA has been set aside for the testing of war materiel under Defence Force Regulation 35. The majority of the WPA is state owned land, about half of which is leased to pastoralist or mining companies. Portions of the WPA are also designated lands of the Maralinga Tjarutja Aboriginals.

The WPA and its associated weapons test ranges were initially developed in the late 1940's for the testing of guided weapons and other rocket powered vehicles. The vehicles were launched in a westerly direction from sites near the range head which is located adjacent to the Evetts Field aerodrome approximately 40 kilometres north-west of the town of Woomera.

Within the WPA, Defence has nominated several areas as Defence Practice Areas where weapons practices and test activities may be conducted. These areas provide an environment in which the flight dynamics and other physical properties of aircraft and weapons systems can be assessed. Large numbers of air to ground and air to air weapons have been tested at these facilities. The primary practice areas located within the WPA are at Lake Hart, the Woomera Instrumented Range (WIR) and within the WIR the Range E Target Area (RETA).

The WIR is an area approximately 55 kilometres long and 25 kilometres wide orientated in a north-west direction from the Range head at Lake Koolymilka, some 40 kilometres from the Woomera Township. Within the WIR there are four main target areas; RETA, the Parakylia Standoff Target Area (PASTA) and Targets A and B. Figure 1 shows the relative locations of Targets A and B and the RETA within the WIR and Site 52a.

The WPA, and in particular the WIR, have an extensive suite of facilities and equipment for the conduct, control and reporting of weapons testing and rocket launch activities. The facilities currently in service include communications, telemetry and tracking infrastructure incorporating surveyed instrumentation and tracking equipment emplacements, launch sites and rocket preparation and recovery facilities. The range has the capability to track, via radar and optical means, a wide variety of aircraft and aerospace systems including weapons in free flight and rockets. The instrumentation is also used to assess weapon performance including impact scoring and miss distance measurement.

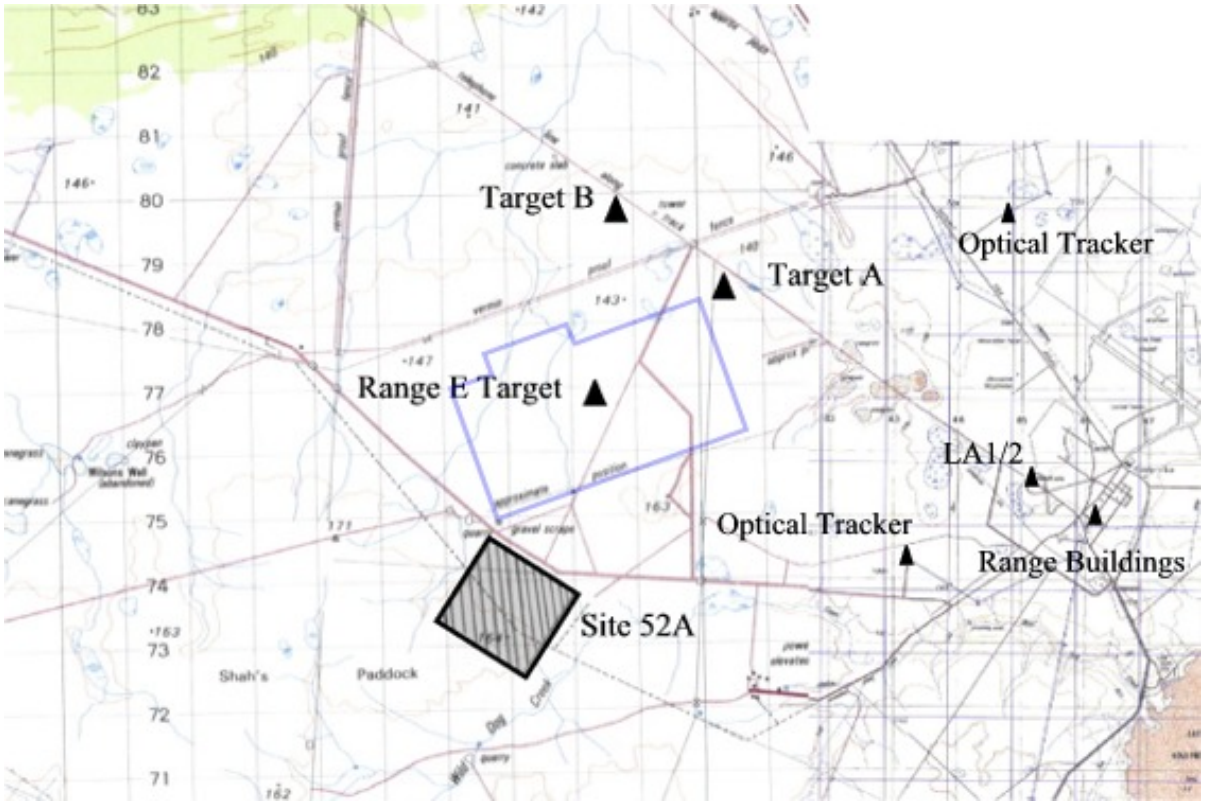

Figure 1 – WIR Infrastructure

Key components of the WPA infrastructure include the main instrumentation building and associated structures and workshops, two radar sites, several prepared and accurately surveyed kinetheodolite sites, rocket launch emplacements, microwave repeater masts and several explosive preparation and test workshops.

The uniqueness of the WPA is in large part due to its remote location and consistent weather. These characteristics mean the WPA can be used for test and evaluation with little or no risk to people and property, in an environment that is devoid of air traffic control restrictions and that is electromagnetically 'clean'. These characteristics make the WPA unique, not only in Australia, but also the world, and it is for these reasons that many foreign countries have either used, or expressed interest in using the WPA for development and evaluation of civil and military aerospace systems.

The existing infrastructure at the WIR has been developed over a period of years and is specific to the unique activities conducted at the WPA. Defence has previously completed an analysis of the likely costs to relocate WIR infrastructure and concluded that expenses in the order of $A180 million could be expected.

3.0 PHYSICAL AND BIOLOGICAL ENVIRONMENT

Key physical and biological environment parameters presented in the Draft EIS that are provided as reasons for the selection of Site 52a as the preferred are detailed below. Information discounting these issues as reasons for the selection of Site 52a over Sites 40a and 45a is also provided.

3.1 Hydrology:

On page 89 of the EIS (in relation to Site 52a): Hydrology: "The surrounding landforms indicate superior surface drainage with little or no run-on of water to the site from adjacent areas. This provides a highly favourable environment for the construction and maintenance of disposal trenches".

On page 30, Table 4 of the EIS Summary section it states that Site 52a and Site 45a have favourable surface drainage features whereas a large canegrass swamp exists near Site 40a.

On Page 89 of the EIS it states "Site 40a did not perform as well against the selection criteria as Site 52a. Though highly suitable, it was considered less favourable mainly because it had more complicated surface features, which could impound water on the site. Site 45a ranked as intermediate, having good surface drainage qualities but a greater prospect for run-on of rainfall than Site 52a".

However, on page 160 of the EIS it states "The surface landforms at the three sites indicate that each would shed heavy and sustained rainfall rather than holding water to cause surface flooding. In an extremely heavy and/or sustained rainfall scenario, run-on and runoff would be shed to adjacent drainage lines and very much lower lying areas faster than water can accumulate at any of the sites".

In addition, on page 178 of the EIS it states "During construction the surface adjacent to the slope would be graded away from the slope crest to minimise the potential for surface water to discharge into the excavation. Diversion drains would be established to divert up catchment surface water generated from storm events away from the repository. This would ensure that there is no accumulation of surface water in the vicinity of the buried wastes or entry of surface water into trenches or boreholes both during operations and after closure".

"The completed repository surface would have a general slope in the order of 10% to minimise the potential for ponding and ensure erosion is not significant over the life of the repository".

Based on this additional information the supposed advantage relating to Site 52a over Sites 40a and 45a in relation to hydrology no longer applies. The proposed construction of surface drains and the final shape of the repository, which is consistent at all the sites, further confirms that no relative advantage applies.

3.2 Geology/Hydrogeology:

On page 89 of the EIS it states "Site 52a is preferred because:

- The rock type that would host the trenches, the Bulldog Shale Formation (a shale), and the groundwater features mean that water drainage characteristics can be modelled more easily for this site than the others;
- The host rock for the trenches is preferred as it consists of materials which are resistant to groundwater flow, and which would therefore provide a highly effective natural barrier to the waste.
- There is no hard silcrete layer in the trench zone, and trenches could therefore be easily constructed".

On page 30 of the EIS summary section it states "The presence of shale provides the availability of lower permeability material for the trench base".

However, on page 324 of the EIS it states "A compacted clay liner installed at the base of the repository would not significantly alter the percolation rate through the repository".

In addition, the Stage 3 Assessment Report prepared by the Bureau of Rural Sciences reports that the base of the Bulldog Shale layer occurs between 13 and 27 m below ground level at Site 52a. This means that with a reported trench depth of 15–20m below ground level, it is likely that there will only be a thin layer of Bulldog Shale remaining, if any at all, in the base of the repository at Site 52a. The Stage 3 report also identifies the underlying Cadna-owie formation at Site 52a as comprising "a coarsening upward sequence from clayey fine sands at the base to fine to medium sands at the top. Bands containing loose sand were encountered at the top of the Cadna-owie Formation in about half of the holes drilled". This indicates that a higher permeability zone exists beneath the base of a thin to non-existent Bulldog Shale layer at Site 52a.

The Stage 3 Assessment Report also identifies that the silt and clay content in the 20 – 40 m below ground level material to be lower at Site 52a compared with both Sites 40a and 45a. This would suggest that at Site 52a, below the base of a potentially thin to non-existent Bulldog Shale layer (at the base of the disposal trenches), there is likely to be a more rapid migration of recharge water relative to Sites 40a or 45a. The depth to groundwater is also shallower at Site 52a (38.8-42.6 m bgl) compared with 65.3-68 m bgl at Site 40a and 51.2-54.2 m bgl at Site 45a).

This information indicates that instead of Site 52a being the preferred site based on the presence of the Bulldog Shale layer it could be the least preferred site because this layer is thin to non-existent below the proposed base of the repository. This assessment process should take into account the material below the base of the trench, given the cap design will be the main mechanism to minimise rainfall infiltration and recharge through the waste material. Data contained in the Bureau of Rural Sciences Stage 3 report indicates the material below the Bulldog Shale at Site 52a has a lower silt and clay content than reported at depths below 20m bgl at Sites 40a and 45a. In addition, the depth to groundwater at Site 52a is shallower than both Sites 40a and 45a. This suggests that if recharge water infiltrates to the base of the repository via leakage through the repository capping layer, it is likely to reach the underlying water table in a shorter time at Site 52a than for the other two sites. Site 52a is likely to be the least preferred site on a hydrogeological basis.

On page 89 of the EIS it states “At all sites the watertable is at considerable depth and surface water will take thousands of years to reach the watertable (14,000, 9,000 and 11,000 years for Sites 52A, 45A and 40A respectively)”.

On page 29 of the EIS summary section it states “The modelling of the movement of water through the unsaturated zone of soil and rock between the ground surface and the watertable in the project area has suggested a transit time in the order of 60,000 years in the presence of vegetation and 6,000 years in the absence of vegetation. These residence times are very long compared to the half lives of key radionuclides in typical wastes (eg. caesium-137, 30 years)”.

Based on the half lives of the radioactive material and reported times it will take for infiltrating water to reach the water table there appears to be no likelihood of radioactive material from any of the sites affecting groundwater quality. Consequently, on this reported information alone there is no advantage between any of the three sites.

In Table 4 on page 30 of the EIS summary section it states that for Sites 40a and 45a that from a geology perspective, “no significant issues identified; may require blasting during construction”.

This statement implies that the silcrete layer located at sites 40a and 45a does not represent a significant impediment to trench construction.

3.3 Biology:

In Table 4 Page 30 of the EIS summary section it indicates that Site 52a has least biological impact, with Site 40a having no significant issues identified and Site 45a having the highest biodiversity. Both Sites 40a and 45a are reported as requiring 35.5 km and 12.5 km of road upgrade construction respectively.

On page 196 of the EIS it states “There are no vegetation communities with a recognised conservation status (Davies 1982; Neagle 1995; Specht et al. 1995; Schedules to EPBC Act and NP&W Act) at or near any of the sites examined during the current survey, nor on the Arcoona Tableland as a whole”.

On page 198 of the EIS it states “The proposal is for an upgrading of access roads within the existing disturbed corridor and using existing material. In this case the biological environmental impacts are likely to be minimal”.
For Site 40a the EIS states “This route does not encounter any vegetation that is significantly different from that recorded at other monitoring sites on the tableland”.

For Site 45a the EIS states “Providing all road material was obtained from the existing, defined road area only, upgrading the track would be practical”.

Based on the above information there is no significant advantage from a biological perspective between the three sites. The issue of road upgrading is highlighted in the EIS but then discounted in subsequent sections of the report. While the report does not identify the extent of road upgrading required for Site 52a (eg Table 4 on Page 30) upgrading of the road will be required if this site is selected as identified in other sections of the EIS.

One of the main impacts on the biological environment will be during the construction phase, which will include "clearing and levelling of part of the final site within the buffer zone for infrastructure and trench development (most of the site will be left as undisturbed buffer)". The location of Site 52a adjacent to the Range E Target Area within the WIR and within the safety template of common weapons tested at the WIR increases the likelihood of a cleanup program being required at this site that would have significant effects on the biology of the site. This risk does not occur at Sites 40a and 45a.

3.4 Heritage:

On page 25 of the EIS summary section it states "Sites 40a and 45a have extremely low background scatters of stone artefacts and their archaeological potential is low to negligible. Site 52a has a few quartzite flaking floors, which can be avoided by the proposed activities of the repository, and a widespread background scatter of artefacts. Extensive but sparse scatters of stone artefacts associated with creeks were confirmed along parts of the access track to Site 40a. Sparse scatters of stone artefacts occur in the dune field section of the access track to Site 45a."

The proposed location of the NRWR at Site 52a, adjacent to the Range E Target Area within the WIR and within the safety template of common weapons tested at the WIR increases the likelihood of a cleanup program being required at this site that could significantly affect the quartzite flaking floors at this site. From a heritage perspective this would make Site 52a the least preferred of the three sites.

4.0 REGULATORY FRAMEWORK/GUIDANCE

On page 37 of the EIS it states that "acceptable practice for the national radioactive waste repository (NRWR) would be achieved by complying with the Australian Radiation Protection and Nuclear Safety Act, 1998 (ARPANS Act) and the relevant licence conditions once licences to site, construct and operate the facility had been issued. The ARPANS Act makes reference to the NHMRC 1992 Code… It also requires compliance with internationally accepted practices, including relevant IAEA safety series and other international documents".

On page 37 it also states that "The NHMRC 1992 Code recommends that the characteristics of the site chosen for the disposal facility and the design of facilities for waste treatment, packaging or conditioning for disposal shall ensure that the following systems of radiation protection is adhered to:

- The magnitude of individual radiation exposures, the number of people exposed and the likelihood of incurring the exposures where these are not certain to be received shall be kept as low as reasonably achievable, economic and social factors being taken into account".

On pages 43 and 44 of the EIS it states that "The United States Department of Energy (US DOE) performance requirements" for its low level and short lived intermediate level waste facilities include:

- "Every reasonable effort shall be made to maintain radiation exposures as low as is reasonably achievable" during the operation of the repository.

- "Stability of the disposal site after closure — The facility must be sited, designed, used, operated and closed to achieve long-term stability of the disposal site and to eliminate to the extent practical the need for ongoing active maintenance of the disposal site to that of only surveillance, monitoring or custodial care are required".

On page 59 and 60 of the EIS it states that "The International Atomic Energy Agency (IAEA) has developed a series of Radiation and Waste Safety Standards based on recommendations made by a number of international bodies, principally the International Commission on Radiological Protection (ICRP)...". The EIS states that "the key ICRP radiation protection recommendations are provided in ICPR Publication 60... These recommendations have been formally adopted in Australia as the National standard for limiting occupational exposure to ionising radiation...".

- "No practice involving exposures to radiation should be adopted unless it produces sufficient benefit to the exposed individuals or to society to offset the radiation detriment it causes".
- "In relation to any particular source within a practice, the magnitude of individual doses, the number of people exposed, and the likelihood of incurring exposures where these are not certain to be received, should all be kept as low as is reasonably achievable, with economic and social factors being taken into account ".

All of the codes and legislative frameworks clearly adopt the "as low as reasonably achievable" (ALARA) principle. The location of the repository at Site 52a within the Woomera Instrumented Range (WIR), adjacent to the Range E Target Area and within known safety templates for more commonly tested weapons means that the risk of a weapon hitting the repository and discharging radioactive material from the repository to the surrounding environment exceeds the risk for Sites 40a and 45a. Based on the ALARA principle Site 52a is unacceptable.

On page 60 of the EIS it states that "Australia signed the joint convention on the safety of spent fuel management and safety of radioactive waste management on 13 November, 1998". One of the stated aims of the joint convention is to:

- Prevent accidents with radiological consequences and mitigate their consequences should they occur.

The location of the NRWR at Site 52a would contravene the joint convention on the safety of spent fuel management and safety of radioactive waste because it has an increased risk of an accident occurring with radiological consequences associated with the operation of the WIR than either Site 40a or Site 45a, which are both located outside the WPA and therefore the WIR.

On page 61 of the EIS it states that "The establishment of a national, radioactive waste repository would ensure that radioactive waste, including sources, **is managed in the safest, most appropriate manner possible".**

The location of the NRWR at Site 52a will not result in safest management of radioactive waste because of the risk associated with a potential weapons impact and therefore penetration of the repository. This risk does not occur at sites 40a or 45a.

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On page 63 of the EIS it states that "The NHMRC 1992 Code is the guide for the management of radioactive waste in Australia. Although pre-dating the more recent IAEA Waste Safety publications, ... the 1992 Code is entirely consistent with current IAEA philosophy and recommendations on the safety requirements for radioactive waste management. **It focuses on the importance of natural site characteristics in providing a barrier to the dispersal of any radioactivity from the waste**".

While the focus is on the importance of natural site characteristics to provide a barrier to the dispersal of any radioactivity from the waste, this process should also include other measures that could result in the dispersal of any radioactivity from the waste such as a weapons impact associated with the location of the NRWR within the safety template area of commonly tested weapons. The potential of a weapons impact should preclude Site 52a based on this criteria.

On page 77 of the EIS it states that "In 1992 the NHMRC released a Code of practice for the near-surface disposal of radioactive waste in Australia, based on internationally accepted criteria adapted for Australia.… The code includes 13 different criteria for the selection of sites for near surface disposal facilities, ***to ensure that the selected site has characteristics that would facilitate the long term stability of the repository, and appropriate isolation for waste".***

Of the 13 different criteria none specifically deals with the impact of a bomb blast associated with weapons designed to penetrate structures. This is not surprising given that when the code was developed it was probably considered highly unlikely that anyone would choose to locate a NRWR on a bombing range and within the safety template area of commonly tested weapons. Perhaps the closest criterion would be criterion d) on page 77 which states:

"d) The disposal site should be located away from any known or anticipated seismic, tectonic or volcanic activity that could compromise the stability of the disposal structures and integrity of the waste".

The location of the NRWR at Site 52a and the potential for war like materials specifically designed to penetrate structures will compromise the stability of the disposal structure and therefore, based on this criterion, Site 52a fails NHMRC site selection criteria d).

Section 12.2.2 (page 267) of the EIS states that "ARPANSA, the NRWR Regulatory Authority, has advised DEST that a risk limit of $1x10^{-6}$ per annum would be desirable".

It is assumed that this is a fatality risk level. Whilst it is recognised that ARPANSA has indicated that this is a "desirable" level, it is important to note that the assessed risk values in the EIS are incorrectly calculated and the actual fatality risk from radioactive waste discharged from the NRWR from "missile" strike alone is in the order of $2x10^{-5}$ per annum. This exceeds the "desired" ARPANSA criteria by over 1 order of magnitude, which is considerable for missile strikes alone. If aircraft strikes and other operational factors are also considered, the risk could well be in excess of 2 orders of magnitude higher than the ARPANSA "desired" criteria.

Levels of risk at these magnitudes exceed the majority, if not all, of generally accepted fatality risk criteria normally used by regulatory authorities throughout the world.

5.0 RISK ASSESSMENT METHODOLOGY

5.1 Summary Of Risk Assessment Outcomes

1. Fatality risk calculated in the EIS for "missile" impact is 6.9×10^{-9} per annum and noted to be below regulatory criteria. This calculation is incorrect and is actually 2.1×10^{-5} per annum, which is an order of magnitude higher than the criteria.

2. The EIS states that the majority of weapons that have the potential to hit the NRWR are cluster bombs of 1.5kg mass. This is incorrect and misleads the reader into thinking there is little risk of penetration and breach of the NRWR. Cluster bombs are not typical of weapons deployed at the WIR; no cluster bombs have been dropped in the area for over twenty years. The facts are that there are over 42 weapons per annum deployed in the vicinity of Site 52a that have the capacity to penetrate and breach the repository.

3. The assessment of risk to Defence, using the qualitative risk assessment methodology published by the Chief of Air Force (Directive 1103/2001) indicates risk to occur in three areas. The risk levels in these areas are:

   - Fatality Risk – medium (using RAAF-AVRM)
   - Public/Media Condemnation Risk – Extreme (the highest category using RAAF-AVRM)
   - Financial – High (the highest category using Mil-Std-882d)

In all three cases, under the current Defence risk management policies, Defence cannot operate the WIR without modifying weapons deployment templates such that a number of critical weapon tests cannot be fully instrumented, making the tests ineffective.

4. The EIS did not take into account any of Defence's risk management assessments presented in the pre-EIS publication submission. This is a flaw in the EIS process as the EIS must consider other land users and make the appropriate comments. These were not made in the EIS.

5.2 Radiological Risks

In section 12.2.2 of the EIS, the radiological risk is defined as follows:

$$R = rPH$$

Where: R = is the individual risk (per annum)
H = the effective dose assuming the event takes place (Sv)
r = the dose-to-risk conversion factor (per Sv)
P = the probability of exposure in any one year (per annum)

Defence concurs with the definition of the radiological risk.

The EIS goes on in section 12 to perform a number of risk calculations in relation to the individual risk due to various operations at the proposed NRWR. A summary of the results of this assessment is given in **Table 1.**

TABLE 1 - SUMMARY OF RISK ASSESSMENT CONDUCTED IN THE EIS FROM MISSILE IMPACT ON THE NRWR

Risk Impact	EIS Section	Incident Frequency (Risk - per annum – p.a.)
Risk of contracting a fatal cancer as a result of construction activities	12.3	$1x10^{-6}$ p.a.
Risk of contracting a fatal cancer as a result of operation and surveillance activities	12.4	No value calculated in the EIS
Risk of contracting a fatal cancer as a result of accidental intrusion during WPA activities – missile crash - no dilution (dilution with cover material)	12.5	$6.9x10^{-9}$ p.a. ($4.6x10^{-9}$ p.a.)
Risk of contracting a fatal cancer as a result of accidental intrusion during WPA activities – aircraft crash - no dilution (dilution with cover material)	12.5	$4x10^{-11}$ p.a. ($2.7x10^{-11}$ p.a.)

Not noted in the EIS is that these risks are cumulative, and must be added together to give the total individual risk for the facility. Hence, the total risk of contracting a fatal cancer from incidents at the NRWR is about $1x10^{-6}$ p.a., as presented in the EIS.

However, in calculating the frequency of missile impact on the NRWR, the EIS has made an incorrect assumption. In calculating the probability of a "missile" (which the EIS states may be a bomb, projectile, ballistic weapon, etc.) impact on the NRWR, from Defence activities, the EIS uses the area of the NRWR divided by the area of the WPA. Defence concurs with the approach of using relative areas to calculate the probability of impact. However, the incorrect assumption is that a weapon may fall at any location in the WPA. In fact, a weapon is deployed to land on a specific target and in the event of weapon fault or error, the weapon may land away from the target but within a defined area known as a safety template. Hence, the area in which a "missile" may hit is much smaller than the area of the WPA. A calculation has been performed below taking account of the reduced areas of "missile" impact. The following points are important in this analysis:

1. The NRWR would be within the safety templates of the weapons included in the calculation below. Hence, all weapons included in the calculation have the potential to strike the NRWR.

2. Each weapon included in the calculation below has the potential to penetrate the NRWR resulting in a breach of the repository containment.

3. The weapons assessed in the analysis below do not include any commercial activities, which would increase the risk level calculated below. Note that a recent commercial test resulted in a catastrophic failure that led to a missile hitting the ground with considerable force sufficient to penetrate the NRWR and breach the repository containment. The proposed repository location at Site 52a was within the safety template of this commercial test.

4. The risk assessment conducted in this response does not include probability of aircraft impacts. It is noted that the aircraft impact analysis conducted in the EIS uses the same area ratio probability assessment as that for missiles. The same incorrect assumption has been used in the EIS analysis, that an aircraft will crash anywhere in the WPA. This is incorrect, as the majority of aircraft operate in the vicinity of the Range E Target Area, which is adjacent to the proposed Site 52a location. Hence, the probability of aircraft crash and impact in the Range E Target Area is significantly higher than in other areas of the WPA. Notwithstanding this, we have not included aircraft crashes in the analysis below, demonstrating that, even under very conservative conditions, the risks are above criteria levels (see below).

The calculation of the probability of missile impact and breach of the NRWR is as follows:

42 missiles have the capability to penetrate and breach the NRWR (EIS Section 12.5.3). **It is noted at this point that the EIS (Section 10.7.5) states that the majority of these weapons are cluster bombs with a mass of 1.5kg. This is incorrect. Cluster bombs, as described above, have not been used at the WIR for over twenty years, and the 42 "missiles" regularly deployed at the Range all have the capacity to penetrate and breach the NRWR.**

Of the 42 missiles with the capability to penetrate and breach the NRWR, the numbers of missiles and the template areas are:

No. Weapons	Weapons Type	Safety Template Area
18	Ballistic Weapons	25 squ km
17	Laser Guided Weapons	70 squ kms
7	Stand off Weapons	2,500 squ kms

Hence, the risk of impact of an individual weapon striking the repository is calculated by dividing the repository area (0.01 squ.kms x 9, to account for bombs travelling some distance underground after impact – EIS section 12.5.3) by the area of the template of the individual weapon. The risk of repository breach is calculated by multiplying the number of individual weapons deployed, which have the capability to breach the repository, by the corresponding probability of impact.

The total risk of weapons hitting and breaching the NRWR is the summation of the individual risk of all weapons with the capability to breach the NRWR. The calculations for the 42 weapons deployed each year with the capability to breach the NRWR are shown in **Table 2**.

TABLE 2 - CALCULATION OF RISK OF NRWR BREACH AS A RESULT OF WEAPON IMPACT – USING SAFETY TEMPLATE APPROACH

Weapon Type	No. Deployed Per Annum	Area of NRWR	Area of Safety Template	Risk of NRWR Breach
Ballistic Weapons	18	0.01 squ.km x 9	25 squ.km	0.06480
Laser Guided Weapons	17	0.01 squ.km x9	70 squ.km	0.021857
Stand off Weapons (short range)	7	0.01 squ.km x9	2,500 squ.km	0.000252
Total Risk of Repository Breach from Missile Impact per annum				0.086909

Hence, the total risk of NRWR breach as a result of "missile" impact is 0.087, which is much higher than the value of $3x10^{-5}$ disruptions per annum calculated in the EIS.

The risk of contracting a fatal cancer as a result of radioactive materials being expelled from the NRWR is calculated using the methodology in the EIS.

$R = rPH$

Where: R = is the individual risk (per annum)
H = the effective dose assuming the event takes place (Sv)
r = the dose-to-risk conversion factor (per Sv)
P = the probability of exposure in any one year (per annum)

From the EIS, for no dilution, the effective dose is $3.8x10^{-3}$ Sv. The risk conversion factor is 0.06 per Sv, and, from the calculation above, the risk of contracting a fatal cancer (i.e. the individual risk of fatality) is:

$R = 3.8x10^{-3} \times 0.06 \times 0.087$
$= \underline{2x10^{-5} \text{ per annum}}$

From the EIS for dilution of radioactive wastes with cover material, the effective dose is $2.5x10^{-3}$ Sv, the other values remain unchanged. Hence, the risk of contracting a fatal cancer (i.e. the individual risk of fatality) is:

$R = 2.5x10^{-3} \times 0.06 \times 0.087$
$= \underline{1.3x10^{-5} \text{ per annum}}$

Based on the no dilution calculation, and the cumulative nature of the remaining operations (see **Table 1**), the cumulative risk of contracting a fatal cancer as a result of operations at the NRWR, in conjunction with the adjacent WIR, is:

$2.1x10^{-5}$ per annum.

This value exceeds the risk criteria published in the NHMRC, 1992*, by over 1 order of magnitude. The NHMRC, 1992* requires the individual risk of fatality of a near surface radioactive waste repository, to be less than $1x10^{-6}$ per annum. The proposed Site 52a exceeds the applicable risk criteria and should therefore not be considered at this location.

(National Medical Research Council - Code of Practice for the Near Surface Disposal of Radioactive Waste in Australia)*

5.3 Risk Impact of the NRWR (Site 52a) on Defence Operations

5.3.1 Risk Assessment of NRWR on Defence Operations

There are three factors to consider in the assessment of risk of the simultaneous operation of the WIR (Range E Target Area) and the NRWR (Site 52a). These are:

1. Risk of fatality as a result of a weapon impact on the NRWR from WIR operations;

2. Risk of financial impact as a result of lost operational time, clean up costs and restoration costs.

3. Risk of public/image/morale impacts as a result of a weapon impact on the NRWR from WIR operations.

Whilst the assessment of fatality risk has been covered in the EIS, with respect to meeting regulatory requirements, there has been no consideration in the EIS of the risk management requirements of Defence. There has also been no consideration in the EIS of the impact on Defence operations of the public/media condemnation risk management requirements for Defence operations. The assessment of these risks and the impact on Defence are detailed below.

Chief of Air Force Directive No. 1103/2001 has been issued to assist operational units in assessing risks associated with their operations. The Directive references the use of DI(AF) OPS 1-19 “RAAF Aviation Risk Management” (RAAF-AVRM) for use in risk assessment. This approach has been used for the Defence submission risk assessment.

5.3.2 Fatality Risks

The risk of fatality as a result of a weapon striking the NRWR relates to the contracting of a fatal cancer from radioactive materials harming personnel involved with the operation of the NRWR (site inspection crews, monitoring personnel, clean up crews, etc.). The RAAF-AVRM risk assessment methodology defines a fatality risk as a critical event. Based on the risk analysis conducted above, the likelihood of this event would be in the order of 10^{-5} per annum, which would equate to a remote likelihood under the RAAF-AVRM definition. Note

that values $1x10^{-6}$ and less would be classified as minimal, values above $1x10^{-6}$ would be a higher likelihood value.

Hence, using the risk matrix published in the RAAF-AVRM, the risk equates to a medium level risk. Which, considering a fatality risk is involved, would require considerable risk management, including modification of the range operations to reduce the likelihood of impact on Site 52a. An example would be to ensure the safety templates of weapons tested do not cover Site 52a.

Modification of the range operations (e.g. rearranging safety templates to account for Site 52a) would severely restrict the use of the WIR and it would not be possible to conduct many of the planned and proposed trials as the target zone could not be located whereby the instruments on the range could be used to monitor the weapons test.

The Aircraft Research and Development Unit (ARDU) could not, under existing risk management policies, operate the WIR with the NRWR located at Site 52a.

5.3.3 Financial Risks

RAAF-AVRM indicates that ARDU may also use Mil-Std-882d for assessment of planning and conduct of ARDU activities. It is noted that DI(AF) OPS 1-19 does not cater for financial risk assessment, hence, Mil-Std-882d has been used for financial risk assessment in this case.

After an incident where a weapon has hit the NRWR, there would be a considerable cost impost consisting of:

- Operational losses (range is inactive, loss of range income from external and commercial users, etc.);
- Clean-up costs (monitoring and assessment of contaminated ground and collection, treatment and disposal of the contaminated waste, albeit low level waste); and
- Restoration of the damage.

Defence estimates the costs of such an incident to exceed $1M in total, noting that the $1M includes losses from range use and commercial ventures. The value of $1M is also supported by the KBR review of the Defence submission (see below). A value of $1M equates to a "Catastrophic" event in Mil-Std-882d.

The frequency of such an event has been calculated to be 1 in 11 years (see **Table 2**). This equates to a probable event (but approaching frequent) in Mil-Std-882d.

Comparing these two values to the risk matrix in Mil-Std-882d results in an assessed risk of HIGH. This is the highest risk category in Mil-Std-882d, indicating clearly that the location of the NRWR at Site 52a with simultaneous operation of the WIR is incompatible.

5.3.4 Public/Image/Morale Risks

The RAAF-AVRM requires special considerations to be given to ARDU operations due to the nature of the flight test operations conducted by this unit. ARDU has stated that operations that could result in "Disastrous" consequences must not be undertaken during ARDU activities.

In assessing the criteria for a Disastrous operation, RAAF-AVRM states:

> "Public/Image/Morale: Widespread public condemnation of the ADF, mass resignations and general disaffection within the ADF"

Whilst it is difficult to envisage mass resignations and general disaffection within the ADF from a weapons strike on the NRWR, it is conceivable, if not likely, that there would be widespread public condemnation of the ADF, particularly in the media. Based on the numerical (quantitative) risk analysis conducted above, the likelihood of impact on the NRWR from a weapon deployed at the WIR would be once in 11 years (see **Table 2**). This is a likely event (or one that would occur during the planned activity). The risk, based on the RAAF-AVRM risk matrix is therefore **Extreme**, which is the highest category in the matrix. From this analysis, the NRWR and WIR are incompatible and, under the CAF Directive 1103/2001, it would be necessary for Defence to reconsider their use of the WIR should the NRWR be located at Site 52a.

Estimated costs for WIR relocation are in the order of $180M.

It is noted that in the EIS, there is no consideration of this analysis previously submitted to DEST. Defence re-iterates that it cannot operate the WIR with the NRWR at Site 52a, using the current risk management directives.

5.4 Halliburton KBR (KBR) Review of Defence Submission

In a pre-EIS submission to DEST, Defence highlighted a number of issues with location of the NRWR at Site 52a. The submission gave a detailed analysis of the potential hazards and risks associated with the potential for impact of "missiles" on Site 52a. However, there is no mention in the EIS of the Defence submission and the impact of the NRWR on Defence operations.

Any EIS must consider the impact of the proposed development on current land users. Submissions from current land users must be taken and assessed in the EIS. A key component of any EIS is the compatibility of land use with existing land users. The submission made by Defence to the EIS process was excluded from assessment. It was noted that a response was made by DEST in relation to the Defence submission (Halliburton KBR document no. CK2003.003.Rev2). However, there is no reference in the EIS to the Defence submission nor the KBR review.

In the KBR review of the Defence submission, there are a number of invalid points made by KBR. These are:

- Section 4 – The KBR report states that Defence's submission does not clearly state the risks of the co-location of the NRWR and the WIR. This is incorrect. Section 11.1 b of the Defence submission clearly states:

  "The current and future (expected) operations at Woomera would expose the NRWR located at Site 52a and the WIR to risk levels that exceed the requirements of the ADF's Aviation Risk Management Policy".

  Further in section 11.1 c, "The level of risk associated with aerospace test and evaluation and training activities conducted at the WPA is incompatible with location of the NRWR at Site 52a".

  Both statements clearly indicate the incompatibility of the NRWR and the WIR (WPA) on a risk basis.

- The whole of government argument detailed in section 6 of the KBR response seems to relate to the need for a NRWR; there is no mention of the need for an international weapons instrumented range and its importance to Australia both as a Defence facility and commercial venture.

- Comments in section 7 of the KBR response are worrying. KBR clearly does not understand regulatory requirements with respect to mandatory incident reporting. All regulatory authorities require an owner or operator to report incidents involving a hazardous facility under which the "agency" has oversight. It appears KBR would wish Defence to say nothing regarding dropping a weapon into the NRWR or buffer zone. One only needs to look at the recent incident involving the Japanese aircraft trial and the subsequent media outcry to realise Defence's concerns. There is no doubt that a weapon landing within the NRWR confines would require a report and would become a media and Defence concern. A factor not considered at length in the KBR report is the ensuing investigations and shut down of WIR operations during the ARPANSA review of such an incident.

- KBR's assessment of likelihood of impact is flawed, as demonstrated above, and illustrates KBR's (and possibly DEST's) misunderstanding of the Defence use of the WIR and the deployment of weapons in the area. There are therefore concerns regarding the validity of the KBR assessment.

- The Defence consequence analysis, in the original submission, was based on the impacts of "public image/morale criterion" (CAF Directive 1103/2001). The assessment concluded that an impact of a weapon on the NRWR from Defence operations would result in a disastrous media impact, causing significant Defence problems. ARDU has stated that impact in the disastrous range must not be undertaken. KBR point out that under Draft DI(AF) OPS 1-19, "Pubic image/morale criterion will rarely be a basis for deciding not to undertake a task, but may be significant in determination of how the task is performed or in highlighting the need for management strategies as risk treatments". It is noted that this statement refers to activities undertaken for example by ARDU initiated programs, not as a result of external "forces" requiring ARDU to re-evaluate their activities. DEST (and subsequently KBR) appear to want Defence to adjust their activities as a result of the NRWR, not the other way around. This is further highlighted in Section 12 – Risk Treatment, where KBR suggests Defence can modify their activities to cater for the

NRWR. Let us ask the question – would the regulator let Defence put a bombing range adjacent to the NRWR?

- In regard to suggested risk treatment strategies, any incident of impact within the buffer zone should be reported to ARPANSA; Defence believes that a reportable incident includes a weapon landing outside the repository buffer zone and penetrating beneath the buffer zone fence.

Based on the publication of the draft EIS and the risk assessment methodology used in this document, the conclusions in the KBR report are no longer valid. The KBR risk assessment indicates the likelihood of an impact on the NRWR as being remote. This is not the case; the incident has been shown to occur once in 11 years, which is in the likely range (i.e. "expected to occur during the activity under consideration"- Ref. CAF 1103/2001). Hence, selecting a major consequence level, as proposed by KBR, the risk would be very high, requiring review of the site location and its compatibility with the Defence operations.

6.0 MISHAP RISK MITIGATION

On page 244 of the EIS it provides a mishap risk mitigation strategy to reduce the risk level. The first strategy is to increase the cover protection on the NRWR. For modern penetrating weapons this would need to be very substantial and provide protection from impacts through the top and side of the NRWR. This is not a cost effective practical solution as it also precludes reopening the NRWR to support future waste storage requirements.

The second approach is to restrict the operations in the WIR, which is again not practical with fixed instrumentation sites. This approach has implications on the ability to obtain optimum accuracies from the range instrumentation. Operational restrictions would also limit the ability to fully test onboard sensors and weapons requiring various attack headings and light conditions. Even with restrictions on the operations in the WIR, the Aircraft Research and Development Unit (ARDU) could not guarantee the NRWR would not be hit. During the past two years there have been five incidents resulting in total failure of the system under test within the WIR, these are;

- ADF Kalkara aerial drone has crashed twice prior to engagement in the weapons test target area;
- National Experimental Supersonic Transport crash during launch at the range head;
- Hyshot research SCRAM jet experiment failed to achieve its flight path and crashed; and
- C130J parachute trials payloads failed and departed the aircraft.

All of the above incidents occurred in the WIR, and tests could not be moved due to the fixed nature of the instrumentation.

The third approach is to review the weapons system templates (or trace) to ensure the NRWR is outside the trace (template) boundary. This again lacks understanding of weapons Test and Evaluation (T&E). Weapon safety templates are not designed to suit the local conditions, but are based on weapon performance and failure modes, therefore it is not feasible to design special templates to suit the NRWR.

7.0 LAND USE (CURRENT AND FUTURE) AND TEMPORARY STORAGE SITES

7.1 Land Use - Current

On page 23 of the summary section of the EIS it states "The 100 x 100 m disposal area would be enclosed in a 1.5 x 1.5 km site, which would provide an extensive buffer and separate the operation from potentially incompatible land uses now and in the future. Security fencing would prevent unauthorised intrusion into the repository site".

A 1.5 x 1.5 km buffer zone contained within the safety trace of commonly used weapons/bombs at the Woomera Instrumented Range (WIR) is inadequate for isolating the disposal area from potential weapons impacts given the proximity to the WIR. This information has been provided to DEST as part of the EIS process and has been ignored.

On page 26 of the summary section of the EIS it states "Site 52a is located in the WPA, approximately 10km west-southwest of the Range E range head. Sites 40a and 45a are to the east of the eastern edge of the WPA".

This statement is misleading as it fails to point out that Site 52a is located 3 km from the Range E Target Area and is contained in the safety trace (template) of commonly used weapons aimed at this target. It also fails to acknowledge that Sites 40a and 45a are approximately 60 km from the Range E Range Head and Range E Target Area.

On page 42 of the EIS, referring to the Nevada Test Site, it states "The NTS is used by the USA to test military devices and, similar to the Woomera Prohibited Area, is now being considered for additional uses such as launching satellites and various industrial uses."

This statement is misleading in that it does not state whether the disposal sites are contained within the safety trace of existing or proposed new developments. Any weapons training and test areas are clearly separated from the waste storage sites in the NTS.

On 12 Sep 2002 the Director of Trials, Defence Science and Technology Organisation, visited the NTS. During the visit the opportunity was taken to view and be briefed on radioactive waste management sites (RWMS) on the NTS. There are two such sites. Both sites are designed for low level waste and both utilise trenches for disposal. At the Area 3 site the opportunity is taken to use the depressions or subsidences resulting from underground nuclear weapon tests. These craters are typically 15 to 20 metres deep and as much as 50 to 100 metres wide. The site in Area 5 uses excavated trenches. After careful assessment, recording and placement in the trenches, the waste is covered with approximately 2 to 3 metres of soil. The waste is subject to ongoing and continuous monitoring.

The NTS was used for testing nuclear weapons from 1953 until 1992 and approximately 984 weapons were detonated, including 100 atmospheric tests. The balance of the tests were underground tests conducted in Area 3. Since 1992 no weapon tests of any type have been conducted over, on or under the NTS. A range of test and experimental work is conducted, including in areas 3 and 5. None of the current work is in any way a threat to the safety or integrity of the RWMS sites as none of it involves projecting, dropping or firing weapons of any type. There are no proposals for launching any satellites or any other rockets from the NTS and launches from Nellis Air Force Base have been limited so that trajectories do not cover the NTS. In fact since the NTS was established there has been only one ballistic

weapon firing. The RWMS sites were established after nuclear weapon testing was stopped. Even if nuclear weapon testing re-commenced on the NTS, it would not affect the RWMS as all testing would be underground and the effects of underground testing are highly localised.

The entire NTS is covered by permanently restricted airspace and even though it is surrounded by the Nellis Air Force Base bombing and gunnery range, no aircraft enter the NTS airspace at any time and the boundaries are at significant distances from the RWMS sites.

Both RWMS sites are extensive in size and consist of high quality sealed road access, large hard standing areas for trucks, three phase electrical energy supply, approximately five large permanent buildings, and a number of temporary structures. The entire NTS is covered by intensive security, including surveillance systems and armed guards authorised to use deadly force. Security coverage includes the RWMS sites as well as other facilities on NTS.

It is clear that any claim indicating that the RWMS at NTS demonstrates that locating the NRWR at site 52a in the WPA is acceptable on the basis of US practice is completely without basis, and the claims made in the draft EIS could be regarded as misleading. No weapon testing is conducted at NTS and none of the activities conducted there have the potential to affect the RWMS sites.

The key point here is that the suggestion in the draft EIS, that radioactive waste storage is compatible with the testing of weapons in the US (and by extension ought to be acceptable at Woomera), is unfounded. Therefore, there is no international precedent for the storage of radioactive waste on an operational defence test and evaluation facility.

On page 229 of the EIS it underestimates the usage of the range. ARDU normally has three 2 to 3 week slots booked each year with support being provided to both military and commercial operations for a significant portion of the rest of the year. Table 3 details the current programmed usage of the area until 2004. This information was provided to DEST as part of Defence's earlier submission but has been ignored.

The Woomera Prohibited Area is not owned by the Commonwealth. It is declared a Prohibited Area under Defence Force Regulation 35 for the purposes of testing war materiel, and while Defence owns small pockets of land, the majority is State Crown land covered by mining and pastoral leases. Site 52a is not on Commonwealth owned land, but rather is on State land which is held as a pastoral lease by the owners of Wirraminna Station. Should Site 52a be chosen as the final site for the establishment of the NRWR, storage of radioactive waste would be inconsistent with the terms of a pastoral lease, and the Commonwealth would be required to compulsorily acquire this land. Thus no advantage exists between the three sites regarding the acquisition of the land.

Table 3 – WPA Program 2001 – 2004

Expected Dates	Activity	Status
Late 2001		
15 Oct – 2 Nov	**Hyshot (Complete)**	Complete
2002		
March	**NAL – SST (R1 & TDC Total System Test)**	Subject to change
March	**NAL – SST (R1 & TDC EMC Test)**	Subject to change
March	**ASRI: Falcon, FARISpace, Hankuk (Korea), Hyshot x2)**	Tentative
TBA	**Hyshot 2**	
6 – 31 May	**ARDU Missile Tests**	Confirmed
17 – 28 Jun	**National Aerospace Laboratory (NAL) – SST Flight Test #1 (JAPAN)**	Subject to change
15 – 31 Jul	**NAL – SST Flight Test #2 (JAPAN)**	Subject to change
12 Aug – 6 Sep	**ARDU – Bombing Tests**	Confirmed
15 –26 Jul	**NASA – X38 Pallet Drop Test (USA)**	Subject to change
16 Sep – 5 Oct	**DIRECTOR of TRIALS – Explosive Trial**	Confirmed
8 – 25 Oct	**ARDU – Bombing Tests**	Confirmed
TBA	**Falcon Launch Test (UK)**	Proposed Activity
TBA (2-3 weeks)	**16 Air Defence Regt. (ADR) – Air Defence Exercise**	Annual Event
TBA (2-3 weeks)	**RSAF - Air Defence Exercise**	Annual Event
2003		
Jan	**Instrumentation installation and Training**	Proposed Activity
10 – 28 Feb	**NAL – SST Flight Test #3 (JAPAN)**	Subject to change
2 –14 Mar	**NAL – SST Flight Test #4 (JAPAN)**	Subject to change
Feb (4 wks)	**Taurus Captive Carriage Trial**	Tentative
Mar/Apr (3 wks)	**Taurus Flight Test (Germany)**	Tentative
Mar (3 Weeks)	**NASA – X38 CRV Flight Test (USA)**	Subject to change
5-30 May	**ARDU Deployment**	Confirmed
Jun (2 weeks)	**ARDU – AGM-142 Flight Test**	Tentative
Jul	**ARDU-Stormshadow Flight Test (UK)**	Tentative
21 – 28 Jul	**RAF Bombing Tests following Stormshadow Tests**	Tentative
11 Aug – 5 Sep	**ARDU Deployment**	Confirmed
20 Oct – 14 Nov	**ARDU Deployment**	Confirmed
TBA	**Falcon Launch Test (UK)**	Proposed Activity
TBA (2-3 weeks)	**16 ADR – Air Defence Exercise**	Annual Event
TBA (2-3 weeks)	**RSAF - Air Defence Exercise**	Annual Event
2004		
4 weeks	**Maintenance / Training**	As Required
3 – 28 May	**ARDU Deployment**	Confirmed
9 Aug – 3 Sep	**ARDU Deployment**	Confirmed
18 Oct – 12 Nov	**ARDU Deployment**	Confirmed
TBA (2-3 weeks)	**16 ADR – Air Defence Exercise**	Annual Event
TBA (2-3 weeks)	**RSAF - Air Defence Exercise**	Annual Event

In addition to these scheduled tests, research on electronic warfare can or will be undertaken. This includes the Advanced Medium Range Air to Air Missile (AMRAAM), Global Positioning System (GPS) Interference projects, jamming activities and other projects.

On page 322, Table 14.1 the EIS states that Site 52a will have limited impact on the land use. This is assumption is incorrect. The proposed NASA X-38 trial was moved to another area of the range at a large additional expense to the customer and will not have the full benefit of the instrumentation available at the WIR. NASA's reason for moving was related to the possible public impact if the NRWR was compromised. The RAAF is also in the process of acquiring a family of Stand Off Weapons (SOW) that will need the full operational capability of the WIR to evaluate the series of weapons for both the F/A-18 and F111. This co-existence argument also does not take into account the risk of a weapon impact on the NRWR, as calculated incorrectly (under-estimated the risk) in Appendix E7 of the EIS. The fact there has not been an incident at the above ground temporary storage sites does not guarantee an incident will not occur over the next 50 years of range operations.

The EIS has clearly ignored the expert advice provided in Defence's previous submission, and repeatedly indicated that Site 52a will not impede operations on the WIR. This is not the case as Site 52a will severely disrupt operations on the WIR and secondly the NRWR will be put at increased risk of an incident which again breaches the As Low As is Reasonably Achievable (ALARA) level of risk considering there are two alternate sites available.

7.2 Land Use – Future

On page 232 of the EIS it states that the South Australian Government Planning Strategy considers Defence and Aerospace as areas of potential economic growth in the region. Placement of the NRWR at Site 52a severely limits operational effectiveness of the WIR, as detailed in Defence's previous submission, and thus will stifle growth in this area.

Defence is in the process of procuring a new family of aerospace weapons known as Stand Off Weapons (SOWs). SOWs possess significantly greater range and performance than the current in-service precision guided weapons and consequently require a larger range area to provide for their safe operation. As a result, the ability to utilize range facilities other than Woomera for testing and training is likely to be extremely limited. As these weapons are introduced to service, extensive testing to determine their limitations and capabilities will be required. This will be followed by an increase in the use of Woomera for training in the use of these weapons. Examples of systems of this type include the US Joint Stand Off Weapon (JSOW), UK Storm-shadow and German Taurus. These weapons have launch to target capabilities in excess of 200 km. It is important to note that the WPA is one of the few remaining facilities available in the world for the test and evaluation of these systems. It is for this reason that foreign defence agencies have previously used the area to test SOWs and will continue to seek approval from the Australian Government for the use of the area for this purpose.

Other Defence projects such as Project Air 87, Armed Reconnaissance Helicopter and Project Air 6000, are also likely to make extensive use of the range facilities for both developmental and in-service test and evaluation. Both of these projects will acquire advanced platforms with weapons systems that will significantly out perform those of the current generation and it is likely that the facilities at the WIR will be among only a few in the world capable of supporting the Test and Evaluation (T&E) programmes required.

The WPA will also be increasingly used to support ground based weapons training exercises. Currently, ground to air missile firing training exercises are conducted at the WPA for four to six weeks per year by the Australian Army and Republic of Singapore Air Force (RSAF). These operations are conducted at the Lake Hart Impact Area and due to the proximity of the WIR, flight operations over Site 52a occur regularly.

7.3 Co-Location

While Defence has strong objections to the selection of Site 52A as the preferred location for the NRWR, Defence is willing to work with DEST to identify an alternative solution should Sites 40A, 45A and 52A be deemed unsuitable options for the Commonwealth. Selection of a site within the WPA would be subject to compatibility with Defence use of the WPA.

7.4 Temporary Storage Sites

On page 229 of the EIS it states "Over recent years there has been significant diversification at the WPA and it is used for various research projects, the storage of radioactive waste and the detention of asylum seekers".

The storage of radioactive waste is a temporary measure until the NRWR is established. The waste storage at Hangar 5 is adjacent to a very old target area that has not been in use since well before the waste arrived. None of the waste stored in the WPA is inside the safety traces covering Site 52a and when necessary Defence is prepared to move the waste to facilitate safe use of the WPA.

On page 231 of the EIS it states that "More than half of the national holdings of low level and short lived intermediate level radioactive waste are stored in a corrugated iron annexe attached to an aircraft hanger at the Rangehead, 10 km to the east of Site 52a and close to a target area".

This statement is highly misleading given that the Evetts Field Target is no longer used as a target area. Additionally, approximately 90% of the material stored at this site is not actually radioactive waste, but contaminated soil being stored by Defence on behalf of CSIRO.

On page 239 of the EIS it states that current activities on the WPA have co-existed with the storage of radioactive waste in above ground facilities for a number of years without inhibiting activities aimed at diversification or expansion.

This type of argument has been pushed a number of times in the EIS. The fact is that the temporary storage sites have limited WIR operations to date. Defence was also of the understanding that the material would be moved if required to conduct a trial safely.

8.0 SECURITY

Table 4 in the summary section of the EIS lists advantages and disadvantages of the preferred and two alternative sites. In this table perceived advantages are highlighted in a non objective manner which include security being described as good for Site 52a and more security measures required for Sites 40a and 45a.

This statement is false and misleading. DEST has previously been advised by Defence that the WPA is not monitored except during operations. In this regard Site 52a is effectively no more secure than Sites 40a and 45a. Consequently all three sites will require more security measures.

On page 222 of the EIS it states "this region (Woomera region) has attracted regular protests and demonstration events, which are aimed at displaying opposition to nuclear activity and have focussed on Olympic Dam".

If this is the case, protests should also be expected for the NRWR. Although the WPA is a restricted site, it can be accessed freely via station roads and tracks. It must also be noted that there is no security presence at the range except when specific trials require it. Protest action at the NRWR during trials would cause an immediate stop to the trials until it could be confirmed that the site had been cleared. Protestors within the WIR also have the potential to compromise national security as trials conducted within the WIR are often highly classified. As Site 52a is within the WIR and very close to the range head and various instrumentation sites it would also put the range itself at risk of being damaged/vandalised. It must also be noted that there are a number of fouled areas on the range that contain unexploded ordnance. Protesters moving around the WIR would also be putting themselves at risk.

On page 236 the EIS states "The other risks that need to be addressed relate to possible unauthorised intrusion and security breaches. Because of its location within the WPA, these risks would be lower at Site 52a than at either Site 40a or Site 45a".

This would not be the case for organised protesters that are familiar with the local area.

On page 239 the EIS states that "Site 52a, within the WPA, would have built-in public access restrictions and other security coverage and offers security advantages to the alternative sites".

As discussed above during periods of no trial activity there is no physical means in place to prevent access to Site 52a.

On page 332, Table 14.1 the EIS states 40a and 45a require additional security over 52a.

Due to an incorrect assumption on range access this statement is incorrect. All three proposed NRWR sites are equally accessible by the public if they have an understanding the local area. The cost of implementing security measures similar to that at ESK, QLD would be the same for each site. Is DEST assuming Defence will be responsible for the security of the NRWR once it is in place? Defence is not resourced for this role and, as with the detention centre, would expect DEST to be responsible for its own facilities.

9.0 COST IMPLICATIONS

Security – The cost of establishing and monitoring the NRWR at any of the three sites would be the same. Defence Support Centre Woomera is not resourced to monitor even existing sites within the WPA, let alone the proposed Site 52a location, to a level similar to that at the ESK, QLD site.

NRWR Construction Costs – One of the main reported differences between the three sites is the level of access road upgrade required for each site. Site 52a and 45a will have a similar level of construction with Site 40a requiring substantially more. The road from the Technical area to the Range head (40km) for 52a is currently in need of repair and thus would need maintenance to ensure the construction vehicles do not degrade it any further.

Moving the WIR – It is estimated that the cost of moving the WIR would be around $180M, comprised of the following amounts.

WIR INSTRUMENTATION ASSETS – TOTAL REPLACEMENT COSTS

	Original Cost	**Replacement Cost (millions)**
Tracking Data Centre	1.25	5
Optical	10.984	60
Radars	5.271	34
Communications	10.047	10.047
Facilities		70.9
Miscellaneous	0.621	0.621
Total		$180.568Million

These figures were presented in detail in the report "Impact on Australian Defence Organisation Operations of Locating the National Radioactive Waste Repository at Site 52a within the Woomera Prohibited Area at Woomera, South Australia" prepared by HLA-Envirosciences in11 February 2002. This report was made available to DEST at the time.

Not included in this total is the additional cost of relocating services, such as water and power, and the cost of constructing extra roads to a new site, should a suitable replacement be found. The loss of income from commercial and other users of the WIR, which would result from the range closure, is another cost element that is not included in the above matrix. Thus, a figure of $180M to relocate the WIR is an extremely conservative estimate.

It is therefore clearly not cost effective to move the WIR so Site 52a can be used safely and WIR operational capabilities will not be effected. It is also not practical to move the range as there are no geographically acceptable sites within a practical distance from Woomera and the range down time would not be acceptable to Defence.

In addition, the costs and complexity associated with the identification of a suitable alternative location for a facility that is capable of providing the unique characteristics of the WPA must be considered. Any relocation is also likely to move the range facilities further from the Woomera township. This has major implications for transport and support of people and equipment on the range and is likely to result in increased costs of range operations. The movement of the range facilities further from Woomera airfield will also have an effect on airborne operations in the WPA. Increased distance from the airfield to the range and target areas will mean increased transit time and reduced time for actual weapons release. This has the potential to also significantly increase the costs of operations in the range area. Finally, the significant non-effective operating time for the range during the relocation process combined with the requirement to re-establish, calibrate and validate the instrumentation systems from the WIR would also be a major activity which would severely reduce the ability

of the Aircraft Research and Development Unit (ARDU) to support programmed Defence test and evaluation activities.

Based on cost alone, Site 52a will incur significant additional costs above Site 40a and 45a because of the $180 million cost implication associated with the need to move the WIR if Site 52a is selected as the site for the NRWR. This assumes another suitable site can be found and acquired.

10.0 OTHER ISSUES

Two key issues that need to be considered in the location of the NRWR are:

- Access Roads
- UXO (Unexploded Ordnance) Management

10.1 Access Roads

Table 4 in the summary section of the EIS lists advantages and disadvantages of the preferred and two alternative sites. In this table perceived advantages are highlighted in a non objective manner which include access roads from Woomera – only 1.5 km requires minor upgrade for Site 52a, whereas 35.5 km and 12.5 km is required for Sites 40a and 45a respectively.

This statement is completely misleading as supported by the EIS in Section 7.4.1 page 133 where it states "The current access (Site 52a) comprises 45 km of two lane sealed road in flat to undulating terrain to Koolymilka (old town); and then a further mainly unsealed 10.5 km of road to the west. This mainly unsealed road includes an initial 1.5 km of narrow seal (4 m wide), which is in a very poor condition. The existing unsealed surfacing is weak and becomes sandy under traffic, and slippery when wet. The road is currently suitable for dry weather travel; however, use by heavy vehicles in wet weather would lead to accelerated deterioration. Options covered include upgrading the road to be useable in all weather or no-use of the road in wet weather".

Based on this assessment at least 10.5 km of road will require upgrading not 1.5 km, unless it is being proposed to extend any disposal and construction phase due to wet weather thereby potentially closing down the WPA for extended periods of time.

10.2 UXO Management

The EIS does not raise the issue of UXO management associated with Site 52a. If Site 52a is selected, clearance of the area for UXO will be required. This is a time consuming and expensive task and will result in significant down time for the WPA while this activity occurs. The cost associated with this activity has not been considered in the EIS process. This cost will not be incurred at either Site 40a or Site 45a.

11.0 CONCLUSION

The NRWR Draft EIS released for comment/review on the 29 July 2002 has concluded that Site 52a, within the WPA, remains the preferred site for the location of the NRWR. Defence

contends that use of this site will seriously disrupt Defence's operational capability at the WIR. The EIS also states that the alternative Sites 40a and 45a are acceptable sites subject to the implementation of certain additional management procedures.

The review of the Draft EIS report undertaken by Defence has identified that the recommendation of Site 52a is based on incorrect information and when an objective and accurate assessment of the three sites is undertaken Site 52a can no longer be considered as an acceptable location for the NRWR.

Key issues, which clearly demonstrate that Site 52a is an unacceptable location include:

- The EIS has reported an incorrect assumption in calculating the frequency of missile impact on the NRWR if located at Site 52a. The EIS uses the area of the NRWR divided by the area of the WPA. However, the incorrect assumption is that a weapon may fall at any location in the WPA. In fact, a weapon is deployed to land on a specific target and in the event of a weapon fault or error, the weapon may land away from the target but within a defined area known as a safety template.

  Using the safety template areas of the 42 weapons with the capability to penetrate and breach the repository per annum, a total risk of repository breach from a missile impact per annum is 8.7×10^{-2} compared with 3×10^{-5} disruptions per annum calculated in the EIS.

  Using the EIS methodology to assess the risk of contracting fatal cancer as a result of radioactive material being expelled from the NRWR a risk of 2.1×10^{-5} for the "no dilution" case was calculated. This value exceeds the risk criteria published in the NHMRC – Code of Practice for the Near Surface Disposal of Radioactive Waste in Australia, 1992 by over 1 order of magnitude. The NHMRC, 1992 requires the individual risk of fatality of a near surface radioactive waste repository to be less than 1×10^{-6}, consequently on this basis alone Site 52a is an unacceptable site for the location of the NRWR.

  Based on a numerical risk analysis, the likelihood of impact on the NRWR from a weapon deployed at the WIR would be once in 11 years.

- Defence risk management processes detailed in this submission show that:

  - Based on fatality risk alone, a medium level risk exists, meaning that ARDU could not, under existing risk management policies, operate the WIR with the NRWR located at Site 52a.

  - Based on financial risk criteria, using Mil-Std-882d the risk is assessed as high, which is the highest risk category. The location of the NRWR at Site 52a and the simultaneous operation of the WIR is therefore incompatible.

  - Based on Public/Image/Morale criteria using the RAAF-AVRM risk matrix the risk is assessed as extreme, which is the highest risk rating. Under CAF Directive 1103/2001, it would be necessary for Defence to reconsider their use of the WIR should the NRWR be located at Site 52a.

- The location of the repository at Site 52a within the Woomera Instrumented Range (WIR), adjacent to the Range E Target Area and within known safety templates for more commonly tested weapons, means that the risk of a weapon hitting the repository and

discharging radioactive material from the repository to the surrounding environment exceeds the risk for Sites 40a and 45a. Based on the ALARA principle Site 52a is unacceptable.

- While Defence has strong objections to the selection of Site 52A as the preferred location for the NRWR, Defence is willing to work with DEST to identify an alternative solution should Sites 40A, 45A and 52A be deemed unsuitable options for the Commonwealth. Selection of a site within the WPA would be subject to compatibility with Defence use of the WPA.

- Access to Site 52a will require at least 10.5 km of road upgrading not 1.5 km, unless it is being proposed to extend any disposal and construction phase due to wet weather thereby potentially closing down the WPA for extended periods of time. This is similar to Site 45a, therefore no significant advantage exists associated with site access. The EIS also does not address the 40km of road to the range head that would require maintenance to repair damage by heavy vehicles used for the NRWR construction and delivery of waste. The road is not designed for heavy vehicle use and has a number of sections that have been damaged by heavy vehicles in the past.

- Site 52a will not have superior security to Sites 40a and 45a because the WPA is not monitored except during operations. In this regard Site 52a is effectively no more secure than Sites 40a and 45a. Consequently all three sites will require equally additional security measures.

- The low permeability material (Bulldog Shale) at Site 52a, supposedly offering a greater protection from radioactive leakage into Sites 40a and 45a, may be very thin or non-existent beneath excavated repository trenches. The sediments underlying the Bulldog Shale at Site 52a are likely to be more permeable than at the other two sites. In addition, the water table is shallower at Site 52a. This is strong evidence that Site 52a is likely to be the least preferred site on a hydrogeological basis.

- No advantage exists between the three sites regarding favourable surface drainage characteristics because drains will be constructed no matter which site is selected to divert water away from the repository and the final shape of the repository and capping design will ensure surface water is shed off the site.

- Significant cost implications exist if the NRWR is located at Site 52a, with approximately $180 million cost associated with the relocation of the WIR, if a suitable location can be found. Additional cost implications include the loss of economic development for the Woomera area and South Australia associated with loss of commercial operations at the site. These costs do not include costs associated with UXO clearance for Site 52a, costs associated with an EIS process for the location of a new facility and down time and loss of Defence's weapons test and evaluation and training capabilities.

Based on these objections and given two acceptable sites remain for the location of the NRWR, which do not impact on the operation of the WIR, Site 52a should not be selected as the site for the location of the NRWR.

Impact on Australian Defence Force Operations of Locating the National Radioactive Waste Repository at Site 52A within the Woomera Prohibited Area

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06 December, 2001

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1 INTRODUCTION

1.1 Background

The Department of Defence (Defence) has prepared this report to provide information to the Department of Industry Science and Resources (DISR) and the EIS process regarding the implications for Defence operations at the Woomera Prohibited Area (WPA) if the proposed low level National Radioactive Waste Repository (NRWR) is located within the WPA at Site 52A, DISR's currently preferred location. Defence wishes to ensure that the current Environmental Impact Statement (EIS) process takes into account the nature of activities undertaken by Defence within the WPA which include the release of bombs and other air to ground and air to air weapons in close proximity to Site 52A. The locating of the NRWR within the WPA is seen as a significant land use conflict by Defence and will result in restrictions to ongoing activities at the site and could result in the closure of the Woomera Instrumented Range (WIR) site based on current regulatory guidelines. The information presented in this report will demonstrate the significant issues associated with the co-location of these two conflicting land uses and will demonstrate the substantial economic impact on Defence and the Woomera township if the NRWR is located at Site 52A.

The report specifically addresses the implications of the selection of an NRWR location for the following:

a. Existing military operations at the WPA.

b. Future military usage of the WPA.

c. Risks applicable to the NRWR due to WPA activities.

Discussion of the implications for commercial space launch activities and the potential costs associated with a decision to locate the NRWR at site 52A are presented for completeness but should not be considered comprehensive.

1.2 Background to the EIS

Australia has accumulated over 3,500 cubic metres of low level radioactive waste as a result of operations involving radioactive materials and this material is stored temporarily at over 50 sites around Australia. The process of finding an appropriate site to locate the NRWR to store this low level radioactive material commenced in 1992. A series of studies and investigations have occurred since that time and in 1997 the preferred region for the location of the repository based on specified site selection criteria was narrowed down to the central-north of South Australia. In January, 2001 a preferred site and two alternative sites were identified as potential locations for the NRWR. Site 52A (within the WPA) was selected as the preferred location and two alternative sites, Site 45A and Site 40A, east of the Woomera to Roxby Downs road were also identified as suitable locations. The location of the WPA and of sites 52A, 45A and 40A are illustrated in Figure 1.

1.3 The EIS Process

An environmental assessment is now being undertaken to determine the suitability of the three proposed locations. The EIS process is part of the requirements of the Commonwealth Environment Protection and Biodiversity Conservation Act (1999). The EIS process is required to consider amongst other things the need for the repository, transportation of waste

to the repository, impacts and risks to the natural and human environments and environmental safeguards to minimise these impacts and risks.

A draft EIS is currently being prepared and is anticipated that it will be released for public comment in early 2002. A supplementary EIS will be prepared in response to public comment. Following a final decision on the location of the site, three licences must be obtained from ARPANSA for the siting, construction and operation of the facility.

Of concern to Defence is the announcement of the preferred site for the location of the NRWR prior to the commencement of the EIS process. If all three locations have been identified as highly suitable locations by DISR, then a decision on the final location should be based on the findings of the EIS process and should not precede the process.

2 THE WOOMERA PROHIBITED AREA

2.1 Background

The WPA is an area of land of approximately 130 000 square kilometres (13 million hectares). The south-eastern corner of the area is located approximately 450 kilometres north of Adelaide and immediately adjacent to the townships of Woomera and Roxby Downs. Figure 1 shows the dimensions of the WPA and the relative locations of the nearby townships as well as the location of the NRWR sites under consideration (sites 40A, 45A and 52A).

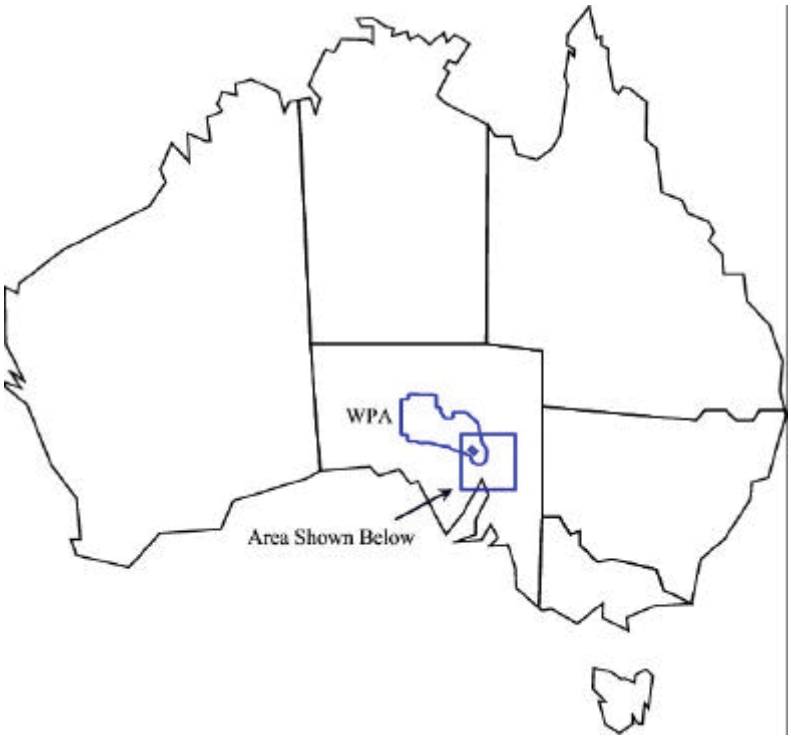
The WPA has been set aside for the testing of war materials under Defence Force Regulation 35. The majority of the WPA is state owned land, about half of which is leased to pastoralist or mining companies. Portions of the WPA are also designated lands of the Maralinga Tjarutja Aboriginals.

The WPA and its associated weapons test ranges were initially developed in the late 1940's for the test of guided weapons and other rocket powered vehicles. The vehicles were launched in a westerly direction from sites near the range head which is located adjacent to the disused Evatts Field aerodrome approximately 40 kilometres North-West of the town of Woomera.

2.2 Range Areas

Within the WPA the Department of Defence has nominated several areas as Defence Practice Areas where weapons practices and test activities may be conducted. These areas provide an environment in which the flight dynamics and other physical properties of aircraft and weapons systems can be assessed. Large numbers of air to ground and air to air weapons have been tested at these facilities. The primary practice areas located within the WPA are at Lake Hart, the Woomera Instrumented Range (WIR) and the Range E Target Area (RETA).

The WIR is an area approximately 55 kilometres long and 25 kilometres wide orientated in a north-west direction from the Range head at Lake Koolymilka, some 40 kilometres from the Woomera township. Within the WIR there are four main target areas; RETA, the Parakylia Standoff Target Area (PASTA) and Targets A and B. Figure 2 shows the relative locations of Targets A and B and the RETA within the WIR and the proposed DISR Site 52A.



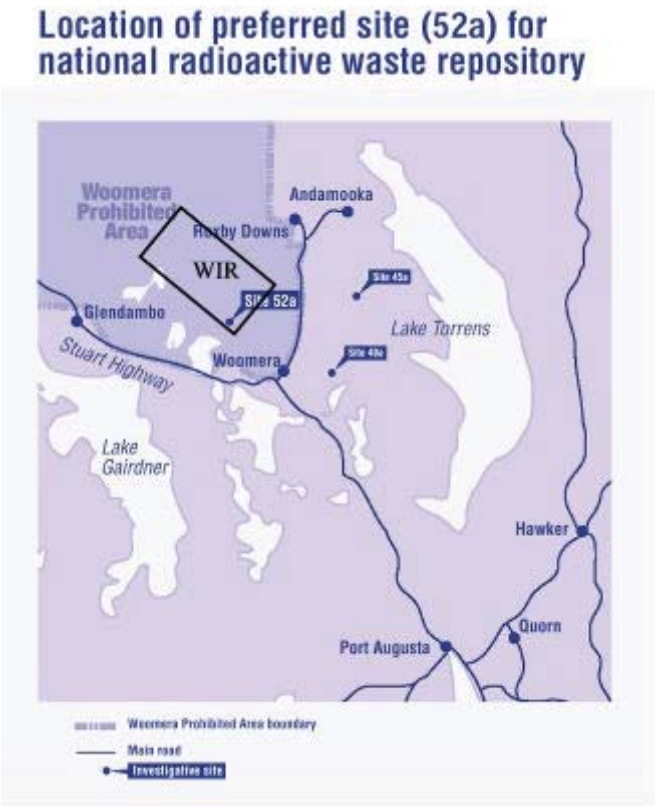


Figure 1 – Woomera Prohibited Area

2.3 WIR Infrastructure

The WPA and, in particular the WIR, have an extensive suite of facilities and equipment for the conduct, control and reporting of weapons testing and rocket launch activities. The facilities currently in service include communications, telemetry and tracking infrastructure incorporating surveyed instrumentation and tracking equipment emplacements, launch sites and rocket preparation and recovery facilities. The range has the capability to track, via radar

and optical means, a wide variety of aircraft and aerospace systems including weapons in free flight and rockets. The instrumentation is also used to assess weapon performance including impact scoring and miss distance measurement.

Key components of the WPA infrastructure include the main instrumentation building and associated structures and workshops, two radar sites, several prepared and accurately surveyed kinetheodolite sites, rocket launch emplacements, microwave repeater masts and several explosive preparation and test workshops. Defence has previously compiled information on the costs associated with the replacement costs of these facilities should it become necessary to move the WIR. A discussion of these costs and the viability of moving the WIR is contained at section 6 of this paper. A diagram detailing the relative locations of these facilities is provided at figure 2.

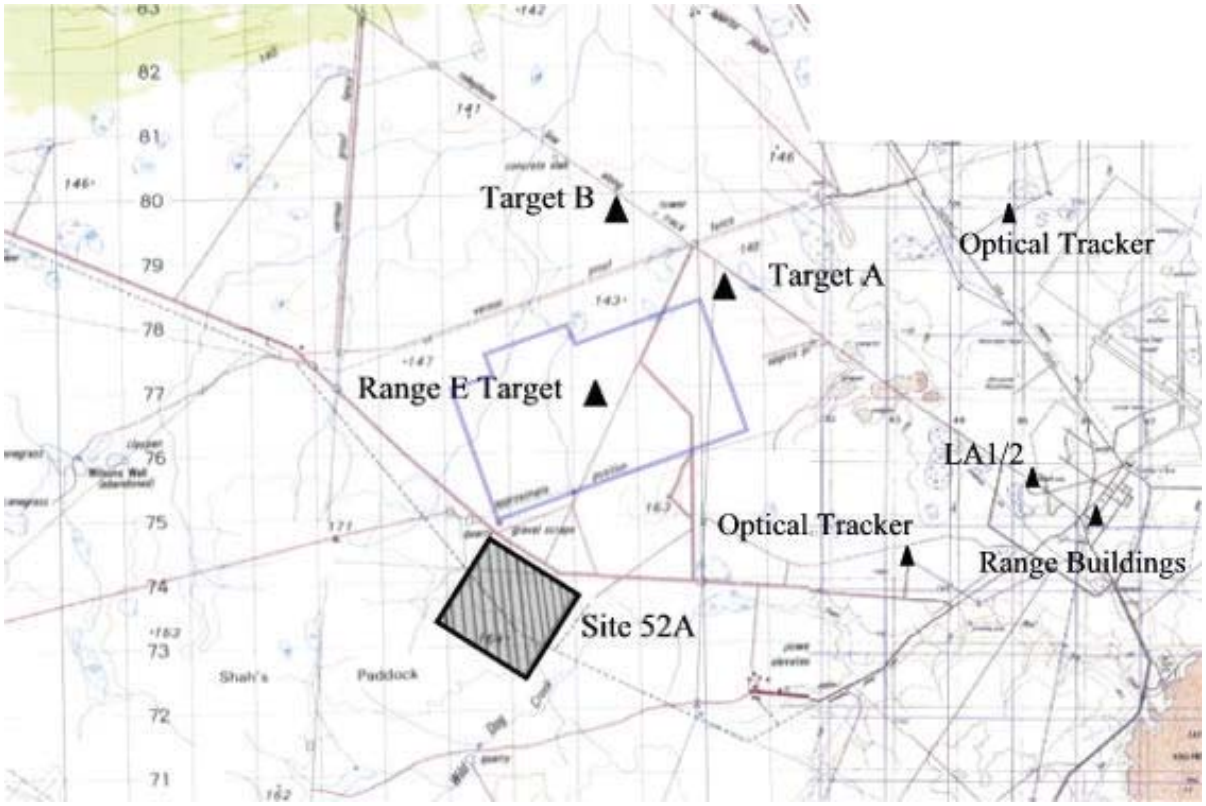


Figure 2 – WIR Infrastructure

2.4 Operational Control of the WPA and WIR

Defence Instruction (General) 38-1 details the management responsibilities for the WPA. The Area Administrator Woomera who is the head of the Defence Support Centre Woomera and Commander, Aircraft Research and Development Unit (ARDU) are responsible for the operational and administrative management of the Woomera Prohibited Area. Users of the WPA are required to adhere to the regulations applicable to the area and work in consultation with defence who in turn co-ordinate with other defence and commercial users of the area.

2.5 Unique Characteristics of the WPA

The WPA was created for the testing of space launch and war like materials. The uniqueness of the WPA is in large part due to its remote location and consistent weather. These characteristics mean the WPA can be used for test and evaluation with little or no risk to people and property and in an environment that is devoid of air traffic control restrictions and

that is electromagnetically 'clean'[1]. These characteristics make the WPA unique, not only in Australia, but also the world, and it is for these reasons that many foreign countries have either used, or expressed interest in using the WPA for development and evaluation of civil and military aerospace systems.

Instrumentation has been positioned at the WIR to take maximum advantage of these features for the purpose of testing complex weapon systems. Radars have been located to provide highly accurate coverage of a wide expanse of airspace and optical tracking devices are able to be positioned at various points on the WIR to provide extremely accurate tracking and recording of weapon system behaviour in free flight.[2]

The facility is also located in relatively close proximity to the Woomera Township which provides domestic and commercial support for the activities at the range. The township is used for the domestic accommodation of range personnel and as a convenient nearby airfield for test aircraft to operate from.

[1] Low electromagnetic activity is frequently important for the testing of navigation and communication systems and the operation of Flight Termination Systems associated with aerospace weapons systems.
[2] Optical tracking methods provide the best source of high accuracy weapons free flight behavioural and trajectory information.

3 OPERATIONS AT THE WPA

3.1 General

Operations in the WPA cover a range of activities including test and evaluation of both military and civilian aerospace systems, training by the Australian Defence Force and overseas forces and in the future, commercial space launch activities.

3.2 Test and Evaluation of Aerospace Systems.

The test and evaluation of new and existing weapons systems conducted in the WPA has and will continue to include the following:

a. Acceptance testing of new systems to confirm performance.

b. Concept demonstration of experimental systems under consideration for possible future acquisition.

c. Identification and rectification of problems identified with in-service systems.

d. Collection of experimental data for the evaluation and enhancement of in-service systems by agencies such as DSTO.

e. Research and development activities using mature and experimental systems by commercial agencies.

These activities encompass the entire spectrum of aerospace weapon systems. They include the testing of ballistic free fall weapons such as 500 and 2000 lb general purpose bombs, precision guided bombs such as the Paveway II and III Laser guided 500 and 2000 lb bombs, air-to-air missiles including the AIM-7 Sparrow and AIM-9 Sidewinder missiles, air-to-ground missiles including the CRV-7 unguided missile and the AGM-142 3000 lb stand off weapon and ground to air missiles such as the Rapier Air Defence missile. There have also been numerous atmospheric and space research vehicles and high speed aerodynamic test vehicles launched from the various launch areas at the WPA. In the past 10 years, in excess of 600 weapons have been released at the WPA by the ADF alone.

It is well accepted that the early test iterations of complex weapon systems are likely to experience higher failure rates than for similar mature in services systems. ARDU's experience with the test and evaluation of aerospace systems over the past 50 years confirms this axiom.[3]

Significant effort is employed to analyse and assess the likely behaviour and risks associated with the test and evaluation of experimental weapons systems. However, the possibility of an unexpected occurrence is extremely difficult to preclude and problematic to quantify for such experimental test activities. The risks and implications of such failure rates for operations at the WPA are further discussed in more detail later in this paper.

[3] Meeting-Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / T Bearman Nova - 21 Nov 01

The failures usually encountered during the operation of these systems can be broadly divided into three categories; Launch or Release Failures, Guidance and Control System Failures and Functional Failures.

Launch or release failures generally include the failure of the weapon to correctly separate from the test aircraft or the launch vehicle to lift as expected from the launch pad. At best, this mode of failure for the system will usually result in the weapon and or launch vehicle returning to the preparation area for fault investigation. At worst the system will separate from the test aircraft or launch from the launch pad in an uncontrolled and unpredictable manner, resulting in the damage or loss of the launch aircraft or launch facility.

Guidance and control system failures encompass a wide spectrum of in-flight control system failures broadly relating to the failure of the weapon or launch vehicle to follow an allowable and/or predicted trajectory. This mode of failure will almost certainly result in the weapon or launch vehicle diverging from the predicted / allowable trajectory and impacting in an area of much larger dimensions than the desired impact zone applicable to a correctly functioning system. The impact point resultant from such a failure is likely to be dislocated from the desired point of impact by a distance proportional to the severity of the failure mode encountered and actual performance of the weapon.

Functional failures are of a similar nature to guidance and control system failures and encompass a broad range of failures related to the correct operation (detonation of explosives or operation of engines/rockets) of the weapon system or launch vehicle under test. This mode of failure may also result in the system diverging from the desired trajectory or failing to behave as expected (detonate, penetrate, deploy sub-munitions, etc). It will therefore be important to the test agency to recover the test article (or wreckage thereof) as soon as possible in order to investigate the cause of the failure. In the case of military weapon systems, recovery will typically involve excavation of the article and in the case of explosive ordnance, specialist activities required to make safe the explosive content of the weapon. Such a recovery would of course be problematic if it occurred in the vicinity of the NRWR.

Even for in-service systems the underlying premise of these activities is that uncertainty exists as to the correct operation of the system under test, hence the test activity. This makes the activities performed in the WPA vastly different to those performed at other weapons ranges in Australia where operations will generally be limited to in-service, certified and functional weapons. A result of the unique experimental activities performed in the WPA is that safety templates that provide protection for personnel and equipment during weapons employment can be less accurately determined for much of the operations in the WPA when compared to activities performed at other ranges, and as such may be significantly larger than for in-service weapons of the same class. There are numerous Defence documents[4,5,6,7] applicable to range operations that discuss in detail the various requirements for safety assessments and the philosophy applied to these assessments that must be made prior to the operation of experimental systems at the WPA.

[4] DI(G) ADMIN 59-1
[5] DI(AF) AAP 8600.001 RAAF Air Weapons Practices (Operations and Operational Requirements Manual) Issued 15 April 1999
[6] Range Commanders Council Range Safety Group, Standard 321-97, Common Risk Criteria for National Test Ranges, February 1997
[7] Safety Criteria for Australian Defence Force Aerospace Training and Test Ranges, Dr M Choa and Mr M Tutty, ARDU

3.3 Current Use of the WPA

Since its establishment the use of the range has significantly changed. The WPA and in particular the Woomera Instrumented Range (WIR) are now an essential component of the Defence's ability to test and evaluate warlike material. The importance of the geography and infrastructure at the WPA for space operations including launches and recovery of space vehicles is also relevant to any discussion of the function of the WPA.

ARDU regularly operates at the WPA to collect data on the performance of aircraft and aerospace weapon systems. Range usage for these test activities typically involves activation of the instrumented range facilities for weapons testing operations using any suitable area with the field of view of the optical and radar emplacements. Recent activities have included the testing of a wide variety of air-to-air and air-to-ground guided and unguided weapon systems, including both in-service and experimental systems. Among the more significant programmes undertaken have been the evaluation of GBU-24 and GBU-10 2000 lb and GBU-12 500 lb Laser Guided Bombs dropped by the F-111 strike aircraft, and the MK-82 500 lb and MK-84 2000 lb General Purpose bombs dropped from the F/A-18 aircraft. Both of these test activities were focussed on the assessment of the aircraft bomb aiming system as well as the correct functionality of the weapon. The WPA has also been used recently for test firing of the AIM-120 Advanced Medium Range Air to Air Missile (AMRAAM), AIM-7 Sparrow Radar Guided air to air missile and AIM-9 Sidewinder heat seeking air to air missile. These test activities were conducted to verify the integration of the missile with the launch aircraft weapon system and the correct function of the missile guidance system in free flight.

Other users of the WPA include agencies performing weapons employment practices, explosive demolition activities and atmospheric research activities. In the past ten years Defence has used the WPA for the test, evaluation and employment of in excess of 600 individual weapons and research vehicles.[8] These activities have included the testing associated with the introduction to service of air-to-air and air-to-ground missiles, ballistic and precision guided bombs and the launch and recovery of atmospheric research vehicles by Australian and overseas agencies. Imposition of restrictions on the scope and frequency of these activities is therefore likely to adversely affect the continued viability of the WPA for these activities.

3.4 Future Use of the WPA

Defence has a policy to promote the use of the WPA by commercial organisations and foreign defence forces. Considerable interest has been expressed by a number of commercial organisations for the use of the unique capabilities of the WPA. In particular, strong domestic and international interest has been expressed in the development of the WPA as a centre for commercial space launch activities and in the use of the range for advanced aeronautical research activities.

Future WPA bookings and the WPA annual program are managed by the AAW, DSCW. In the near term the primary user of the area will continue to be Defence. However, several proposals for use of the range by commercial agencies have the potential to significantly increase the range use for non-military activities.

Table 1 details the current programmed usage of the area until 2004. The table demonstrates that increasing usage of the range by commercial space launch operators and a steady usage

[8] ARDU –Range Operation Plans 1990 - 2001

by ARDU and other defence users is expected.[9] In anticipation of this increase in the predicted rate of usage of the WPA facilities, ARDU has booked three four week blocks for exclusive use of the area during each of the next three years.[10]

[9] The WPA bookings presented at Table 1 are indicative of the heavy usage of the area expected in the near future

[10] ARDU has booked these periods for the exclusive use of the WPA in order to be assured of an opportunity to use the range for anticipated ADF test and evaluation exercises in response to the numerous WPA bookings now becoming apparent.

3.4.1 Future Commercial Use

Four commercial projects are currently at various stages of their planning process.[11] The National Aerospace Laboratory of Japan is close to completing construction of a launch

Expected Dates	Activity	Status
Late 2001		
15 Oct – 2 Nov	**Hyshot (Complete)**	Complete
2002		
March	**NAL – SST (R1 & TDC Total System Test)**	Subject to change
March	**NAL – SST (R1 & TDC EMC Test)**	Subject to change
March	**ASRI: Falcon, FARISpace, Hankuk (Korea), Hyshot x2)**	Tentative
TBA	**Hyshot 2**	
6 – 31 May	**ARDU Missile Tests**	Confirmed
17 – 28 Jun	**NAL – SST Flight Test #1 (JAPAN)**	Subject to change
15 – 31 Jul	**NAL – SST Flight Test #2 (JAPAN)**	Subject to change
12 Aug – 6 Sep	**ARDU – Bombing Tests**	Confirmed
15 –26 Jul	**NASA – X38 Pallet Drop Test (USA)**	Subject to change
16 Sep – 5 Oct	**DTRIALS – Explosive Trial**	Confirmed
8 – 25 Oct	**ARDU – Bombing Tests**	Confirmed
TBA	**Falcon Launch Test (UK)**	Proposed Activity
TBA (2-3 weeks)	**16 AD – Air Defence Exercise**	Annual Event
TBA (2-3 weeks)	**RSAF - Air Defence Exercise**	Annual Event
2003		
Jan	**Instrumentation installation and Training**	Proposed Activity
10 – 28 Feb	**NAL – SST Flight Test #3 (JAPAN)**	Subject to change
2 -14 Mar	**NAL – SST Flight Test #4 (JAPAN)**	Subject to change
Feb (4 wks)	**Taurus Captive Carriage Trial**	Tentative
Mar/Apr (3 wks)	**Taurus Flight Test (Germany)**	Tentative
Mar (3 Weeks)	**NASA – X38 CRV Flight Test (USA)**	Subject to change
5-30 May	**ARDU Deployment**	Confirmed
Jun (2 weeks)	**ARDU – AGM-142 Flight Test**	Tentative
Jul	**ARDU-Stormshadow Flight Test (UK)**	Tentative
21 – 28 Jul	**RAF Bombing Tests following Stormshadow Tests**	Tentative
11 Aug – 5 Sep	**ARDU Deployment**	Confirmed
20 Oct – 14 Nov	**ARDU Deployment**	Confirmed
TBA	**Falcon Launch Test (UK)**	Proposed Activity
TBA (2-3 weeks)	**16 AD – Air Defence Exercise**	Annual Event
TBA (2-3 weeks)	**RSAF - Air Defence Exercise**	Annual Event
2004		
4 weeks	**Maintenance / Training**	As Required
3 – 28 May	**ARDU Deployment**	Confirmed
9 Aug – 3 Sep	**ARDU Deployment**	Confirmed
18 Oct – 12 Nov	**ARDU Deployment**	Confirmed
TBA (2-3 weeks)	**16 AD – Air Defence Exercise**	Annual Event
TBA (2-3 weeks)	**RSAF - Air Defence Exercise**	Annual Event

Table 1 – WPA Program 2001 – 2004

facility within the WIR for flight trial of the Japanese Small Supersonic Experimental Aircraft

[11] DISR – SLASO 'Launching Safely Into Space' August 2000

(SSEA). These trials will involve the rocket boosted launch of a large scale model of the proposed aircraft design for the purpose of gathering aerodynamic data on the vehicle performance. Other interests include the Falcon Project (a consortium from the UK), Kistler Aerospace (an American company) and Spacelift Australia. These three organisations propose to use the WPA for the establishment and operation of space launch and recovery facilities. Significant funds have been invested in the area for this purpose. As an example the existing space launch facilities at the Lake Hart launch area are estimated to be worth more than $20 million[12] and are planned to be used by the Falcon Project. Of note is that the launch flight path for this project traverses Site 52A[13] and so any decision to continue will probably require the resiting of the launch facility if the NRWR is placed at Site 52A.

3.4.2 Future Defence Use

Defence is in the process of procuring a new family of aerospace weapons know as Stand Off Weapons (SOWs). SOWs possess significantly greater range and performance than the current in-service precision guided weapons and consequently require a larger range area to provide for their safe operation. As a result, the ability to utilize range facilities other than Woomera for testing and training is likely to be extremely limited. As these weapons are introduced to service extensive testing to determine their limitations and capabilities will be required. This will be followed by an increase in the use of Woomera for training in the use of these weapons. Examples of systems of this type include the US Joint Stand Off Weapon (JSOW), UK Storm-shadow and German Taurus. These weapons have launch to target capabilities in excess of 200 km. It is important to note the WPA is one of the few remaining facilities available in the world for the test and evaluation of these systems. It is for this reason that foreign defence agencies have previously used the area to test SOWs and will continue to seek approval from the Australian government for the use of the area for this purpose.[14] Further discussion is contained later in this paper on how the increasing requirement to test and train with SOWs will affect the proposed NRWR location at Site 52A.

Other defence projects such as Project Air 87, Armed Reconnaissance Helicopter and Project Air 6000, are also likely to make extensive use of the range facilities for both developmental and in-service test and evaluation. Both of these projects will acquire advanced platforms with weapons systems that will significantly out perform those of the current generation and it is likely that the facilities at the WIR will be among only a few in the world capable of supporting the T&E programmes required.

The WPA will also be increasingly used to support ground based weapons training exercises. Currently ground to air missile firing training exercises are conducted at the WPA for four to six weeks per year by the Australian Army and Republic of Singapore Air Force.[15] These operations are conducted at the Lake Heart Impact Area and due to the proximity of the WIR flight operations over the proposed 52A site occur regularly[16].

3.5 Defence Risk Management - Safety Templates

To mitigate the risks associated with the weapon release activities conducted at Woomera, Defence has applied an acceptable risk factor per test (i.e. per drop) of 1×10^{-6}. This risk factor is then used to determine safety templates that provide the bounds of a danger area for

[12] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01
[13] DISR – SLASO 'Launching Safely Into Space' August 2000
[14] The UK has exercised the ALARM air-to ground missile and the US have employed the AGM-142 air to ground missile (both SOWs) at Woomera in recent years.
[15] CSIG – Director Training Area Management – E-mail 02 Nov 01, 09:50
[16] CSIG – Director Training Area Management – E-mail 02 Nov 01, 09:50

the different hazards associated with the conduct of aerospace vehicle testing, trials and training including weapons launch, release and impact activities[17]. Safety templates are used to describe a ground area in which personnel and equipment are in danger of injury or damage due to the impact, fragmentation or ricochet of a functioning military or commercial aerospace system.

Figure 3 shows an example of an air to ground weapons safety template applied to the target area on the Woomera Instrumented Range. The template is representative of an extended range weapon released with Target A as the intended point of impact and dropped in a South-West direction. It is important to note that this template is indicative of in-service weapons systems that are currently tested and trained with at the WIR.[18] The templates associated with the experimental systems that defence will continue to test at the WIR are likely to be commensurately larger than this example due to the uncertainties associated with systems under test and the expansion of capabilities being procured.

The template in Figure 3 clearly demonstrates that the proximity of the proposed Site 52A will place it well within the danger area for a significant proportion of the weapons Defence will be required to test at the WIR (The template presented is for a relatively low capability weapon system). The proximity of the Range E Target Area (RETA) to the proposed NRWR means that safety templates for the majority of weapons employed at this target area will overlay the NRWR. It is probable that the application of even the smallest safety template will preclude operations at this target.

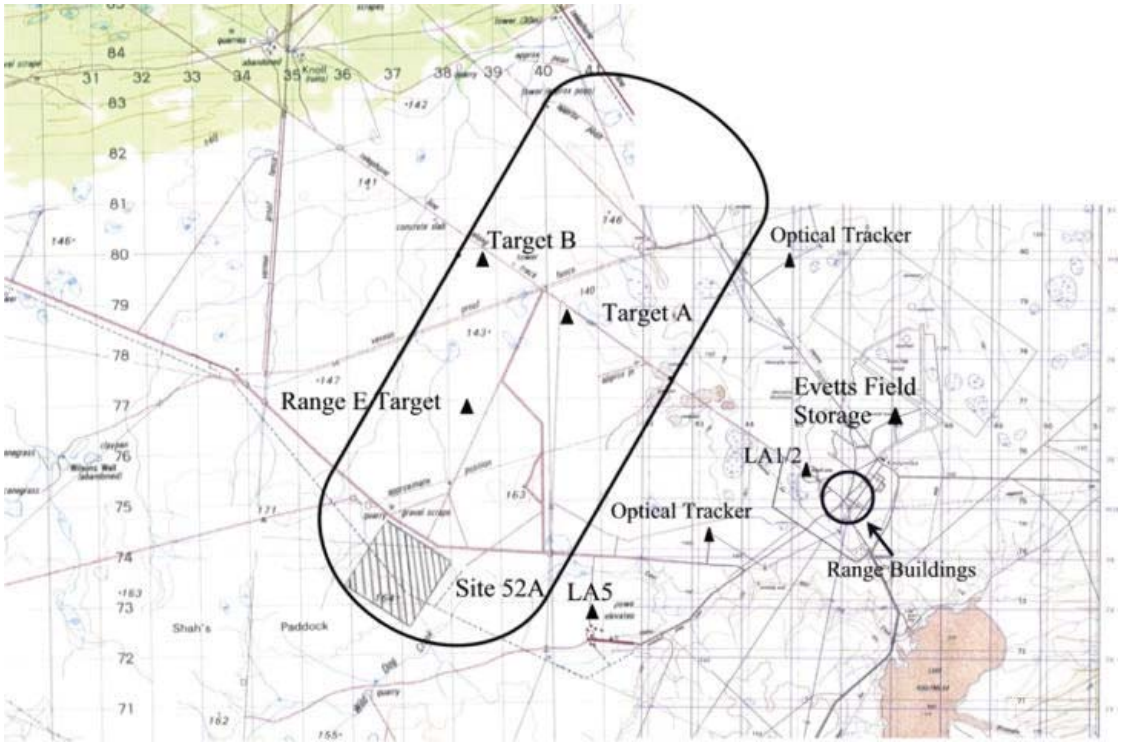


Figure 3 – Application of Safety Templates at the WIR

Not shown on Figure 3 is a representation of a safety template for any of the Stand Off Weapons Defence is in the process of procuring. As previously discussed, these systems are

[17] AAP8600.001-RAAF Air Weapons Practices (Operations and Operational Requirements)
[18] The size of these templates should therefore be considered conservative in comparison to experimental systems of the same class likely to be tested at the WIR.

designed to be employed long distances from the intended target and consequently have very large ground safety templates associated with their flight paths. Figure 4 gives a representation of a previously used ground safety template for a medium range version of such a weapon.

Defence is in the process of procuring systems with the capabilities represented by Figure 4 as well as a new class of Stand Off Weapon designated Long Range SOW (LRSOW). These weapons will have range capabilities in the order of several hundred kilometres and will require extremely large safety templates and innovative operating protocols to accommodate their associated testing. The testing required to confirm the correct functionality of these systems, in particular the terminal phase of operation of the weapon, often requires analysis using data obtained from the WIR instrumentation systems. As part of the development of systems required for the test and training of these new weapons, ARDU has already completed trials of a prototype upgrade of the optical trackers used on the range. This upgrade will allow their unmanned operation so that the next generation of weapons with significantly larger safety templates can be assessed at the WPA. Use of un-manned facilities and tracking equipment means that the range will be able to used for testing these weapons without the requirement to expose personnel to the increased risk associated with operating inside a weapon safety template. However, the result of the requirement to test these weapons at the WIR is that the proposed NRWR at Site 52A will be exposed to an even higher risk of weapon impact.

The use of these unmanned facilities will allow testing of these weapons whose safety templates will overlay components of the range infrastructure. However, placing the NRWR at Site 52A will negate any benefit the development of these unmanned facilities will provide, thereby rendering the current range facilities and targets useless for the testing of these weapons.

Not shown in either Figures 3 or 4 is a representative safety templates for an air to air missile system and its associated targets (usually an unmanned drone aircraft). Defence has an ongoing requirement to assess the performance of these missiles as they are procured (two procurement programs are currently underway)[19] and to train with these missiles in a controlled environment. The range capabilities of these missiles are of the same order as that of stand off weapons and the safety areas required to employ them are of similar dimensions.

Defence has recently obtained the only certification outside of the continental United States for the test and evaluation of one of these systems.[20] The approval to test this weapon outside the USA was, amongst other reasons, provided specifically as a result of the unique characteristics of the WPA, the availability of instrumentation in the WIR and the ability to test the weapon using operationally representative profiles that were not unduly restricted by weapon and aircraft flight path constraints. Restrictions on the use of the WIR and the airspace available at the WPA to employ such weapons systems have the potential to compromise Defence's ability to continue the testing and in-service firing of these weapons, and will reduce Defence's ability to accurately evaluate current and future air to air weapons.[21]

[19] Defence Materiel Organisation – Project Air 5400 – Acquisition of the AIM-120 and AIM-132 air to air missile systems
[20] Approval to test the AIM-120 AMRAAM air to air missile system at the WPA has been obtained from the US DOD.
[21] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01

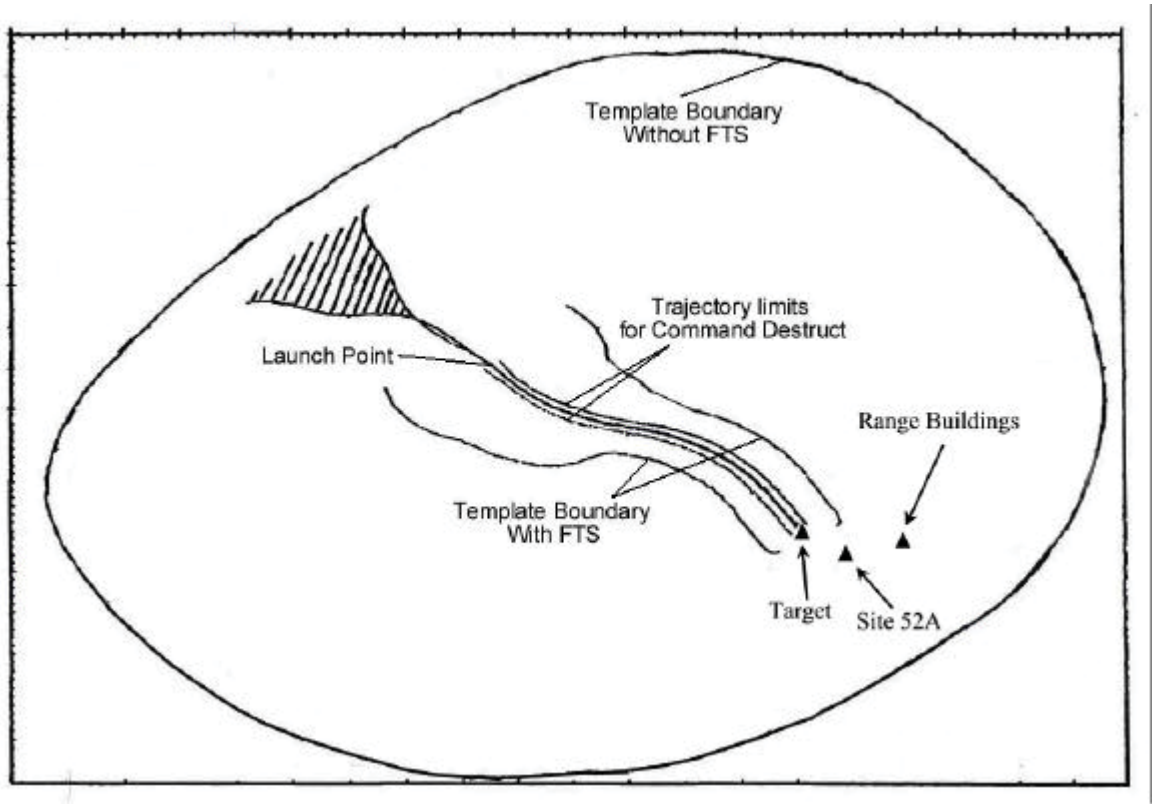


Figure 4 – Medium Range SOW Template

3.6 Flight Termination Systems

The incorporation of Flight Termination Systems (FTS) into these missiles, a system to destroy the missile if ground tracking shows it has deviated from its authorized flight path, has the potential to reduce the dimensions of the ground safety template as shown in Figure 4. The large circle shown in Figure 4 illustrates the safety template for a missile without an FTS fitted and is approximately 70 nautical miles across. The parallel lines at the centre of the image illustrate the containment area for the missile when an FTS is fitted. The area within this corridor represents the boundaries of the 1×10^{-6} risk level area applicable to the missiles flight path and in consideration of a functioning FTS. The larger area then represents a level of risk not greater than 1×10^{-6} if the FTS fails.

Understanding the potential reduction in size of the template possible by the incorporation of a FTS and the consequent reduction in restrictions to the operation of the missile are important in that it makes the usage of the instrumented range for the measurement and analysis of the missile's performance possible. However, even with the incorporation of an FTS the dimensions of the safety area required remains significant, as can be seen from Figure 4, and would still infringe site 52A if Target A, B or RETA were utilised (a requirement for terminal phase testing).

Commercialisation of the Radio Frequency (RF) spectrum is causing increasing difficulty to Defence with respect to allocation of frequencies used for telemetry and flight termination systems. These issues have the potential to reduce or remove the reliability and effectiveness of utilising flight termination systems as a means of safety template reduction, further increasing the risk of impact to facilities in or around a surface target. It should also be noted that in some cases it may be impractical or prohibitively expensive to fit flight termination systems to many experimental and in service weapons, which once again creates that requirement for large safety templates.

While testing of a FTS and non-FTS equipped systems require the installation and utilisation of procedures to reduce the risk to manned and unmanned range facilities, these procedures are currently workable and do not unduly effect operations. However, the locating of the NRWR at site 52A will result in significantly more limitations on weapon releases, and could remove the capability to evaluate and train with such systems as a result of the NRWR's proximity to the target areas.[22]

3.7 Target and Attack Direction Selection

It is clear from Figure 3 that moving target and the direction in which weapon launches are performed has the potential to remove Site 52A from some of the safety templates discussed, in particular those for some of the current generation weapons. However, the targets and attack directions used at Woomera are specifically selected to ensure correct weapons performance and operation and to also ensure satisfactory tracking of weapons and launch aircraft.

The location of the optical tracking devices, for example, takes into account the existence a line of native vegetation approximately 12 km from the instrumentation building. It is important during weapons test activities to be able to accurately determine not only the trajectory and in-flight performance of a weapon but also the so called 'Terminal Behaviour' of the system. This is particularly the case for precision guided weapons where the ability of the weapon to strike a target in a particular manner is integral to the correct function and performance of the system. The tree line limits the ability of the optical tracking devices to record this behaviour and hence the available area for the positioning of ground targets is also restricted. Moving targets into the tree would make this issue even more problematic. Firstly because of the tracking difficulties already discussed and secondly because locating and recovering weapons that has impacted within the tree line will be extremely difficult. Recovery of such weapons is essential for the investigation of malfunctions and the T&E process as a whole.

Being able to accurately track the weapons used on the range is vital, particularly for many of the experimental and in service systems under test. As the WPA begins to be utilised more and more for the test and training of stand off weapons it will become even more important that restrictions to flight path of weapons and launch aircraft are minimised. For the next generation of weapons change of attack direction is also unlikely to take site 52A out of the safety templates specified, even when flight termination systems are provided. Relocation of the targets and the imposition of restrictions on attack directions is therefore impractical unless the range facilities themselves are relocated.

3.8 Space Launch Safety Requirements

The Australian approach to space launch safety is mandated by the Space Activities Act 1998. Licences, Permits and Certificates may not be issued unless the Minister responsible is satisfied that the risk associated with the activity is low.[23] The Space Licensing and Safety Office (SLASO), an office of the Department for Industry, Science and Resources (DISR) is responsible for advising the Minister on the granting of the required permissions and the implementation of the applicable regulations for Australian space activities. The required set of approvals encompasses every matter of environmental protection, safety and operation and design of the vehicle itself. In particular they address the flight path approval for the vehicle. SLASO has also recently commissioned the Commonwealth Scientific Investigation and Research Organisation (CSIRO) to produce a paper detailing the risk benchmarks to be

[22] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01
[23] DISR – SLASO 'Launching Safely Into Space' August 2000

applied when evaluating the risks associated with space launch activities[24].

Defence Estate Organisation has highlighted the proximity of proposed NRWR sites to the proposed launch corridors for the Kistler, Spacelift Australia and Falcon Projects respectively.[25] Any proposal to locate the NRWR in proximity to the airspace and ground areas required for these activities should consider the potential adverse implications for their conduct. Defence has also highlighted to DISR that one of the identified alternative NRWR sites (45A) has no impact on any Defence activities at the WPA and one has no impact on either commercial or Defence activities at the WPA (site 40A)[26].

While it is not within the scope of this paper to present a detailed analysis of the implications for Space Launch activities due to the proposed site 52A location for the NRWR, these comments have been included for completeness.

[24] CSIRO, Benchmark Public Risk Levels for Australian Space Launch Activities, 28 August 2000
[25] ASPM 857/99, National Radioactive Waste Repository Site Selection Study, dated October 1999
[26] ASPM /00, National Radioactive Waste Repository Site Selection Study, dated March 2000

4 DESIGN AND OPERATION OF THE NRWR

4.1 The NRWR

The proposed design for the NRWR comprises an outer area of 1.5 km by 1.5 km with the actual repository located within a 100 m by 100 m area located centrally within the larger set aside area.

It is proposed that the repository will be constructed to a maximum depth of 15-20 m below ground level. The waste will be placed in a trenches and be contained within steel or concrete drums. A layer of 2.0-5.0 m comprising material suitable to control surface and groundwater ingress to the waste will cap the repository.

The repository will be operated for a period of 50 years and monitoring will occur for a period of approximately 200 years following closure. Low level radioactive waste is generated at a rate of 50 cubic metres per year and it is anticipated that once the repository is constructed, material will be placed into the facility annually.

4.2 Effect of Weapon Impact on the NRWR.

As part of the analysis process for this submission an Operational Risk Assessment of the risks associated with the location of the NRWR at site 52A was conducted. The Risk Assessment is presented as Appendix A to this document.

As previously discussed the location of the NRWR at Site 52A will place it in close proximity to targets currently used for Defence weapons test and training activities. The following discusses the mechanics of a weapon impacting the NRWR or nearby surrounding area. Figure 5 shows examples of possible weapon trajectories and penetration profiles. It is important to note that a bomb may not continue on a direct trajectory once the ground is penetrated. The bomb may encounter objects (rocks, etc.) underground which cause its course to deviate. This is not an uncommon occurrence with ARDU having experienced several examples of bombs at the range entering the ground and resurfacing significant distances from the original impact point.[27] For a direct penetration, potential travel distances into the ground are provided at Table 2.

It is evident from Figure 5 and Table 2 that the bomb types tested at the WIR have the potential to penetrate the repository. The consequence of such a penetration will be breach off the repository confinement, leading to the potential release of stored materials via the crater or hole created by a bomb travelling through the repository.

In the worst case scenario, a bomb may strike the ground clear of the repository, ricochet from an underground object, or defract through the ground, travel through the repository and remain in the ground in or on the opposite side of the store. In this case, it may not be readily evident that the repository has been breached.

[27] ARDU has experience with ballistic weapons exhibiting this type of behaviour during weapons test activities at the WPA.

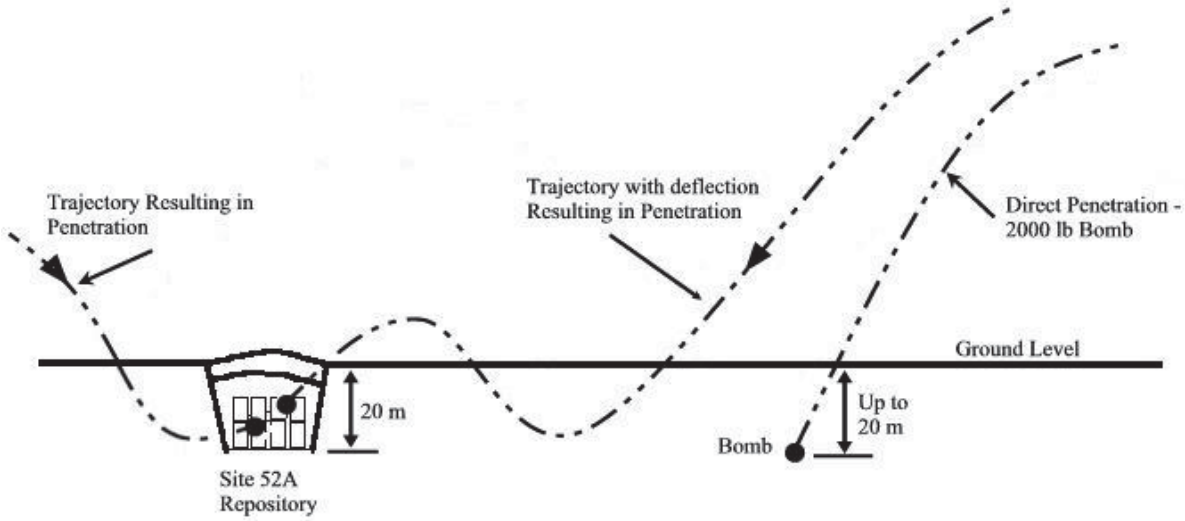


Figure 5 – Ballistic Trajectory and Penetration Profiles

Bomb Type	Penetration Distance (m)
2000lb Bomb	5-20m
500lb Bomb	5-10m
25lb Practice Bomb	0-5m

Table 2 – Ballistic Ground Penetration Distances

5 RISK ASSESSMENT

5.1 ARPANSA Safety Requirements

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has adopted the National Heath and Medical Research Council's Code of Practice for the Near Surface Disposal of Radioactive Waste in Australia.[28] The risk analysis presented at Appendix A lists a number of criteria in relation to the siting of a radioactive waste repository, including a fatality risk criteria of $1x10^{-6}$ per annum (pa) (i.e. fatality risk from a waste repository must not be higher than $1x10^{-6}$p.a.) ARPANSA, have advised that the following risk criteria would be generally applied to the NRWR[29]:

a. where the risk of fatality was below $1x10^{-7}$p.a. ARPANSA would accept the facility as clearly meeting the required criteria;

b. where the risk criteria was in the order of $1x10^{-6}$p.a. ARPANSA would enter into discussion with the proponent regarding the assessed risks; and

c. where the risk is above $1x10^{-5}$p.a., the risk is not acceptable.

The ARPANSA criteria matches the generally accepted risk criteria for hazardous facilities. Notwithstanding the application of the general risk criteria to the radioactive waste repositories, it should also be noted that ARPANSA's position on risk criteria for the location of the NRWR would be subject to review based on two main factors; consequence and frequency.

The consequences of release of radioactive materials at the remote sites around Woomera are highly unlikely to result in fatalities. Hence, it can be argued that incidents at the proposed NRWR sites will never exceed the risk criteria. However, ARPANSA have stated that despite the fact a breach of the NRWR may not result in fatalities, they would apply the same probability requirements to such an event, due to the significant damage such an event is likely to cause[30]. Therefore, where the probability of such an event was greater than $1x10^{-5}$p.a. ARPANSA would find the site unacceptable for storage of nuclear waste.

5.2 Probability of Weapon or Aerospace Vehicle Impact on NRWR

The methodology for the risk assessment conducted to assess the probability of a weapon or aerospace vehicle impacting on the NRWR is detailed in Appendix A and the findings of this assessment are discussed below. It is important to note that the assessment provided only considered the Defence activities at the WPA and not any Space Launch activities that may be conducted there.

The safety templates discussed in section 3 provide the boundary of a 1×10^{-6} probability of weapon impact. It should be remembered that the templates provide a probability based on a single weapon release. It should also be noted that the closer the NRWR is to the intended

[28] National Health and Medical Research Council (1992), "Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia".
[29] Private Communication (Telecon) – S.Sylvester, HLA-Envirosciences/V.Diamond, ARPANSA, 19 October 2001.
[30] Operational Risk Assessment – Appendix A

target, the higher the probability of a weapon impact.

A major number of the weapon releases carried out in the WPA are of experimental weapon systems, and as such the safety templates used will be significantly larger than for comparable in service, proven weapons of the same class. The template provided in section 3 has been used as the basis of discussion due to the large variations in safety templates applicable to experimental weapons systems, and the large varieties of weapons on which actual testing is performed. The safety template provided is therefore optimistic, and the probabilities of impact within the areas discussed (and in particular site 52A) are necessarily higher

In the last 10 years the number of releases by Defence alone in the WIR has averaged in excess of 50 per year. The probability calculation contained in Appendix A show that for 50 weapon releases per year the probability of impact on the proposed NRWR at Site 52A is 5 x 10^{-5}. Since this is an optimistic figure the actual probabilities may be assumed to be significantly higher. This is particularly the case for the next generation of SOW that will have significantly greater kinematic performance than that of the weapons for which safety templates have been provided at Section 3. As discussed, this is the case even when an FTS has been fitted. It should further be noted that the WPA is likely to be the only range in Australia on which these weapons will be able to be released. As such the number of releases to occur in the future is likely to increase due to the requirement for training to be carried out at the WPA as these systems are introduced to service and consequently the probabilities of impact within the safety templates will also increase.

5.3 ADF Risk Assessment-ARDU and LEA View

Defence has recently implemented an Aviation Risk Management policy[31] that will designate the different consequences of any single or series of events. In line with this policy, ARDU has recommended that a weapon impact on the NRWR be classified as falling into the 'disastrous' category[32] and as such would treat such an event in a similar way to that of a fatality. Applying the 1 x 10^{-6} criteria used for determining safety templates as a basis for acceptable level of risk means that Defence would potentially violate its own risk management policy if the NRWR was located within such a template and hence would be required to cease operations in the area.

Land Engineering Agency (LEA), an organisation within the Department of Defence has included amongst its responsibilities the provision of risk and hazard analysis for ADF weapons ranges. LEA have provided information relating to the locating of the NRWR at site 52A which discusses the construction of safety templates, and in particular those required for experimental systems. It is LEAs opinion that the necessary adherence to the safety template approach for weapons test activities at Woomera is likely to preclude the employment of many experimental and long range weapons in the WIR. In correspondence received by LEA they have recommended that the co-location of the NRWR at site 52A and WIR be avoided[33].

[31] Chief of Air Force Directive 02/01-RAAF Aviation Risk Management (RAAF AVRM) dated12 Sep 01.
[32] E-mail-Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance - 28 Nov 01
[33] LEA 751/Y/18 National Radioactive Waste Repository – Woomera Implications dated 6 Dec 01

6 IMPLICATIONS IF SITE 52A SELECTED

6.1 Implications for Defence Activities

The risk assessment process detailed in Appendix A demonstrates that the risk of a weapon impacting the NRWR if located at site 52A could be significantly higher than 1 x 10^{-5} p.a. for any given year. Whilst it is recognised that the consequences of such an impact would not result in fatalities, ARPANSA have indicated that they would have serious concerns regarding the siting of the facility in a location where the frequency of impact was higher than 1x10^{-5}p.a. Based on this analysis, it is likely that ARPANSA would be unwilling to certify the site for storage of Nuclear waste if aerospace test and evaluation and training operations were to continue within the confines of the WIR.

If the decision was to made to keep the range facilities in situ it would be necessary to ensure safety templates for weapons released on the range did not infringe the NRWR. The only way this could occur would be to ensure high performance, long range and experimental weapons systems were not employed on the range. Such a decision would compromise Defence's ability to test and operate such weapons and would have significant implications for Australia's weapons T&E and training capabilities.

6.2 Implications for Commercial Operations.

A similarity exists between the test of military weapons systems at the WIR and the launch into space or recovery from space of large objects. It is therefore apparent that the design of the NRWR is also unlikely to completely protect the contained material in the event of the accidental impact of space launch debris. As an example the Japanese SSEA booster rocket (which weights approximately 2200kg or 4800 lbs) is expected to impact the ground at a velocity in excess of mach 1.5 (or 1500 km/h)[34] a velocity comparable to that of many of the weapons evaluated on the range.

[34] ARDU Japanese SSEA Safety and Operations Liaison Officer, Record of Conversation 13Nov01.

7 POTENTIAL ALTERNATIVE SITES AND COSTS OF RELOCATING THE WIR

7.1 Costs of Relocating the WIR

In appendix A and section 4, a discussion on the likely consequences of direct hits and near misses at the NRWR from military weapon systems is presented. It is also apparent from this discussion that the design of the NRWR is unlikely to protect the contained material from damage due to an accidental impact by a weapon of the class likely to be tested at the WIR. As discussed previously the probabilities of such an impact are also significant and as such Defence would have little choice but to move the range instrumentation and targets to ensure the NRWR was removed from the areas of possible weapon impact, based on current ARPANSA and LEA guidelines. This would be the only alternative if the NRWR is located at site 52A and the Commonwealth wished to maintain is current capability to test ballistic, precision guided and stand off weapons.

The existing infrastructure at the WIR has been developed over a period of years and is specific to the unique activities conducted at the WPA. Defence has previously completed an analysis of the likely costs to relocate WIR infrastructure and concluded that expenses in the order of $ A180 million could be expected[35]. A detailed breakdown of the asset value of WPA infrastructure, commissioned by Defence is presented at Appendix B. In addition, the costs and complexity associated with the identification of a suitable alternative location for a facility that is capable of providing the unique characteristics of the WPA must be considered. Any relocation is also likely to move the range facilities further from the Woomera town ship. This has major implications for transport and support of people and equipment on the range and is likely to result in increased costs of range operations. The movement of the range facilities further from Woomera airfield will also have an effect on airborne operations in the WPA. Increased distance from the airfield to the range and target areas will mean increased transit time and reduced time for actual weapons release. This has the potential to also significantly increase the costs of operations in the range area. Finally, the significant non-effective operating time for the range during the relocation process combined with the requirement to re-establish, calibrate and validate the instrumentation systems from the WIR would also be a major activity which would severely impact ARDU's ability to support programmed Defence test and evaluation activities as detailed at Table 1.[36]

Any decision to locate the NRWR at site 52A must acknowledge the high probability of having to relocate a significant portion of the existing WIR infrastructure. The cost savings associated with selection of site 52A over the other alternatives must therefore be considered in comparison to the costs associated with moving the range facilities if site 52A is selected.

7.2 Existing Repositories at Evetts Field and Launch Area 5

Figure 3 shows the proximity of the existing Evetts Field and Launch Area 5 storage sites to the WIR. These two facilities are the current temporary storage sites for low level radioactive waste and will be replaced by the NRWR. Current ARDU policy is to restrict test activities at the WIR for systems that require safety templates that may impinge the LA5 and Evetts Field facilities. Aircraft operating on the instrumented range are also required to avoid direct overflight of either of the sites. The limitations imposed by these sites reduce the flexibility with which testing is able to be performed on weapons at present. To ensure overflights with

[35] CSIC – SA Infrastructure Division, Cost Estimates – Woomera Asset Value Spreasheet compiled for DEO
[36] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01

experimental system are not conducted attack headings must be carefully selected (taking into account other restrictions relating to the position of the target and radar and optical tracking devices). The combined effect then, is to substantially reduce the flexibility currently available to Defence for the conduct of the core business of the WPA. Defence has also operated in the presence of these restrictions with the understanding that the facilities are temporary and if required could be removed. Importantly, the Evetts Field and LA 5 sites are displaced from the WIR target areas a considerably larger distance than the proposed site 52A repository and so are exposed to a correspondingly lower probability of impact due to WPA activities. The relocation of the waste currently stored in these sites to the NRWR will remove these restrictions, however, the location of the NRWR at site 52A will create an entirely new set, which will be far greater, for operations at the WPA, and which cannot be easily moved.

8 SECURITY IMPLICATIONS OF SITING THE NRWR WITHIN THE WPA

8.1 Existing Security Infrastructure

DISR have stated that one reason site 52a has been selected as the preferred location for the NRWR is that its location will provide additional security[37]. This is despite the advice that the WPA has no permanent security presence.

An inspection of the proposed site 52A location and the WPA in general will confirm to even the most casual observer that the WPA is a prohibited area in name only. Access to the area is virtually unrestricted during periods of inactivity. In addition, the limitations imposed on the locally employed private security guards with respect to powers of arrest and denial of access and the extended reaction for the deployment of Australian Protective Services and South Australian STAR Division personnel in the event of an incident further erode the actual level of security enforcement possible in the WPA. The public's perception of the WPA as a secure site is likely to remain only whilst ignorance of the actual physical security precautions at the site exists. This is true of all three of the short listed sites.

It is likely that environmental and political action groups will object to the construction of a NRWR irrespective of it's location. Security of the site will therefore need to be more robust than that which exists at the WPA presently. Advice from DSCW indicates that access to site 52A is currently uncontrolled and unrestricted[38].

Defence has additional concerns that the possibility for uncontrolled protestor activity at the site will increase the risk of damage to nearby Defence facilities and the uncontrolled access of personnel to the range areas will unacceptably delay and disrupt important and high cost range operations for safety reasons[39].

Weapons performance information of the type typically collected during test and evaluation operations at the WIR is often highly classified. The increase in public awareness and associated reporting requirements in the event of an incident within the NRWR site could unacceptably increase the awareness of sensitive defence trials where need to know security principles are typically applied.[40]

Therefore, when considering the security provided by the geographic location of the NRWR, each of the three short listed sites should be considered equal and the assumption that site 52A is preferable to other sites based on the perceived protection provided by the WPA should be removed from consideration. It may be more pertinent to include for consideration the potential adverse public perception generated when the situation of the NRWR in close proximity to an active Defence bombing range and proposed commercial space launch facilities becomes widespread regardless of the actual outcome of a weapon impact. Based on current public sentiment towards the NRWR there should be little doubt that a facility of this type will attract protests.

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[37] DISR – 'The Monitor' January 2001 and 'Radioactive Waste The facts, not the fiction' July 2001
[38] Telecon Mr Bruce Henderson DSCW – Ranges Safety Manager / T Bearman ARDU – 15 Nov 01
[39] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01
[40] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01

9 ALTERNATIVE LOCATIONS FOR THE NRWR AT SITE 40A OR 45A

DISR have identified three potentially acceptable locations for the NRWR (including site 52A). The other alternative locations are sites 40A and 45A (see Figure 1). The two alternative sites are well displaced from the range area and will have little of no impact on Defence operations in the WPA. If the NRWR is located at site 52A it may become necessary for Defence to relocate the infrastructure of the WIR in order to maintain the T&E and training capabilities the current site provide. As discussed, the cost of moving the infrastructure of the WIR is likely to be in the order of $180M and will necessitate a significant period of reduced activity in the WPA while an alternative site is found and constructed. However, If the NRWR is located at one of the alternative sites (40A or 45A) the increase in cost to the Commonwealth over that required for site 52A, is likely to be small in comparison to the overall cost of the NRWR and will be significantly less than the cost (both in financial and capability terms) of relocating the range facilities.

10 ECONOMIC AND STRATEGIC IMPLICATIONS OF THE NRWR ON THE WPA

10.1 Defence Activities

Defence is likely to remain the major user of the WPA in the near to medium term thereby providing significant revenue to the Woomera economy and contributing to the continued development of the WIR infrastructure. In addition, it is likely that foreign military users, who are experiencing increasing difficulty identifying suitable test locations for their emerging systems, will increase their usage of the WPA facilities. The Republic of Singapore Air Force currently use the WPA for missile firing exercises annually. The USAF and the Royal Air Force have previously used the area for missile firings and are likely to request further use in the future. The German Department of Defence is currently investigating use of the range for firing trials of a Long Range SOW. Restrictions on operations at the WPA that require the use of the WIR will adversely affect the ability of the WPA to support these activities.[41]

If a decision was made to proceed with the NRWR at site 52A, Defence would have little option under current guidelines to either move the range facilities (at significant cost in both time and resources to the Commonwealth), or severely limit the profiles and types of weapon releases able to be performed on the WPA. Limiting the types of weapons and weapon release profiles that can be used in the WPA would severely impinge on Defence's ability to test and evaluate not only current in-service weapons, but also weapons likely to be acquired by Defence in the near, medium and long term. The inability to effectively test and assess such weapons would have major implications for Australia's ability to make informed acquisition decisions and to effectively determine the operational capabilities and deficiencies of such weapons. It would also reduce the ability to accurately determine the capabilities of in service weapons systems and thus will significantly affect Defence's offensive operational capabilities.[42]

In the future it is intended to upgrade the current optical and radar tracking devices at the WIR to allow their unmanned operation and hence reduction in safety template requirements to allow the testing of the next generation of SOWs[43]. Placement of the NRWR at site 52A will negate the advantage provided by this upgrade and will remove the capability of the range to test these types of weapon systems under current guidelines.

10.2 Commercial Operations

Several commercial users of the WPA have already been identified in this paper. In summary the Japanese National Aerospace Laboratory, NASA and several commercial space launch organisations are identified users of the WPA. Restrictions to operations at the WPA may preclude the conduct of proposed activities and are likely to reduce the attractiveness of the WPA for commercial operations. The end result of this may be a decision by such operators to relocate their operations outside Australia with the consequent loss of revenue generated by these activities and the commercial operations supporting them.

The number of sites within the WPA suitable for launch and recovery of space craft are

[41] The UK MOD has expressed interest in using the WPA to trial the 'Stormshadow' SOW and the German MOD is in the planning phase for trials of the 'Taurus' SOW at the WPA.
[42] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01
[43] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01

limited due to the proximity of the Woomera and Roxby Downs townships and the mining complex at Olympic Dam. In addition to these restrictions, the launch inclinations required by civil users and the launch site topography further restrict the availability of suitable launch sites within the area. The sites that have been selected as suitable are located near the WIR, the Woomera airfield and at Lake Hart. It is known that the launch azimuth required for at least one of these proposed sites and the associated ground danger area is in direct conflict with the proposed Site 52A location for the NRWR[44].

The risk of a space vehicle impacting the proposed NRWR at site 52A is difficult to quantify and is beyond the scope of this paper. However, the proposal to use site 52A for the NRWR has already precipitated the re-location of a planned National Air and Space Administration (NASA) activity at considerable cost to the customer[45]. The site also has implications for one proposal to operate a space launch facility from the existing Lake Hart launch area infrastructure.

It is feasible to assume that the location of the NRWR at site 52A will continue to preclude some commercial operations at the WPA and contribute to a negative impression of the ability of the facility to achieve cost effective outcomes for potential commercial operators of the range.

[44] DEO – AD Property Services – Issue Paper 01 Nov 00
[45] Meeting -Mr Malcolm Tutty ARDU Director of Aircraft Stores Clearance / Mr T Bearman Nova - 21 Nov 01

11 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

Defence remains concerned that the siting of the NRWR within the WIR in the WPA will preclude the use of parts of the WPA for its designated purpose. Any restriction on the Commonwealth's ability to conduct test and training activities will have a negative impact on the development and maintenance of the nation's military capabilities. The proposed location of the NRWR at site 52A within the WIR and the proposed commercial space launch centres at the WIR and Lake Hart, will result in a loss of this test and training capacity, and this will only be regained at substantial cost.

It remains Defence's position that potential new users of the WPA must take into account, and accommodate the existing use of the area. This is particularly important when it is considered that the existing use of the WPA is for the testing of warlike material in the national interest.

The review conducted for Defence on the implications of locating the NRWR at site 52A has identified the following major concerns:

a. The experimental nature of the materiel tested at the WPA generates higher than normal levels of risk of failure.

b. The current and future expected operations on the WIR would expose the NRWR located at Site 52A to a risk level in excess of ARPANSA limits.

c. The level of risk associated with aerospace test and evaluation and training activities conducted at the WPA is incompatible with location of the NRWR at Site 52A.

d. The level of security currently available at the proposed site 52A is unlikely to provide sufficient protection from outside intrusion, and is likely to require significant upgrade.

e. Of the three technically acceptable sites for the NRWR selected by DISR, sites 40A and 45A do not impact Defence operations at the WPA that require the use of the WIR.

f. Selection of site 40A or 45A may require greater expenditure than that required for site 52A, however this is likely to be extremely small in comparison to the whole of government cost of relocating the range facilities in order for the Commonwealth to retain the existing weapons T&E and training capability provided by the WPA.

11.2 Recommendations.

It is recommended with respect to the proposal to locate the NRWR at site 52A in the WPA that:

a. Site 52A should be removed from consideration for the NRWR.

b. Based on the results of an environmental impact study, one of the identified alternative sites should be selected as the preferred location for the NRWR.

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E. SLASO, Launching Safely Into Space, Proposed Safety Regime for the Australian Space Launch Industry, August 2000

F. CSIRO, Benchmark Public Risk Levels for Australian Space Launch Activities, 28 August 2000

13 APPENDICES

A. The Australian Defence Force Aerospace Test Range and National radioactive Waste Repository at Woomera, South Australia. Operational Risk Assessment.

B. Woomera Instrumented Range Asset Value Estimation.