

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION
MEETING OF NOVEMBER 28 AND 29 2007
BARSTOW AND LANCASTER, CALIFORNIA**

- ITEM:** 8
- SUBJECT:** AUTHORIZING THE EXECUTIVE OFFICER TO SIGN THE RECORD OF DECISION/REMEDIAL ACTION PLAN FOR ARMITAGE FIELD OPERABLE UNIT, CHINA LAKE NAVAL AIR WEAPONS STATION, CHINA LAKE, KERN COUNTY
- CHRONOLOGY:** This is a new item.
- ISSUE:** The Board will be asked to evaluate whether the Navy's proposed remedy for Armitage field complies with State requirements based on information presented with this item.
- DISCUSSION:** The Armitage Field Operable Unit (OU) at the China Lake Naval Weapons Station (CLNWS) consists of four sites with contaminants in soil and groundwater. The groundwater contains floating free product jet fuel, and dissolved phase jet fuel. The groundwater also contains dissolved phase trichloroethene and tetrachloroethene. The selected remedy consists of free product removal and monitored natural attenuation of dissolved constituents in the groundwater. Soil cleanup will use soil vapor extraction and excavation. The Record of Decision/ Remedial Action Plan (ROD/RAP) presents the Navy's remedial action to protect the environment and remediate the groundwater and soil.
- Prior to selecting the proposed remedy the Navy conducted a site investigation to determine aquifer characteristics and the extent of contaminants present in soil and groundwater. Additionally, the Navy evaluated and is proposing cleanup levels greater than background (drinking water standards). The Navy modeled the groundwater dissolved phase plumes and estimate the largest plume will be remediated in 30 years with the proposed remedy. Smaller plumes will be remediated in less time. In the event that monitoring indicates natural attenuation is not progressing as proposed, the Navy will take measures to augment attenuation.
- The Air Force does not accept that California State requirements such as the Basin Plan Water Quality Objectives for Secondary drinking water standards, Resolution 68-16, and Resolution 92-49 are requirements for this remedial action from a legal perspective. However, it has complied with these requirements from a technical perspective in the proposed action. The ROD includes "agree-to-disagree" language that preserves each party's legal rights.

Water Board staff has reviewed the proposed remedial action. As described in the enclosed staff report, the proposed remedy meets state requirements and is a feasible, cost effective method to remediate soil and restore groundwater quality at the site based on Water Board staff review.

RECOMMENDATION: Adoption of the Resolution as proposed.

Enclosures: 1. Proposed Resolution
 2. Staff Report

DF/rpCLNAWS\Armitage Field ROD\ROD CLNAWS AMTFLD resol gs.doc

ENCLOSURE 1

08-0003

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION**

RESOLUTION NO. R6V-2007-(PROPOSED)

**AUTHORIZING THE EXECUTIVE OFFICER TO SIGN
THE RECORD OF DECISION/REMEDIAL ACTION PLAN
FOR ARMITAGE FIELD OPERABLE UNIT, CHINA LAKE NAVAL
AIR WEAPONS STATION, CHINA LAKE**

_____ Kern County _____

WHEREAS, the California Regional Water Quality Control Board, Lahontan Region, (Water Board) finds:

1. In September 2007, the United States Navy prepared a Record of Decision/Remedial Action Plan (ROD/RAP) for Armitage Field Operable Unit, China Lake Naval Air Weapons Station China Lake. The major components of the selected remedial actions for Armitage Field OU as described in the ROD/RAP consist of free product removal, soil vapor extraction, monitored natural attenuation and land use controls.
2. The proposed remedial actions in the ROD/RAP comply with Applicable or Relevant and Appropriate Requirements of the Water Board and are protective of water quality.

THEREFORE BE IT RESOLVED:

That the Lahontan Water Board authorizes the Executive Officer to:

1. Concur with proposed actions as documented in the ROD/RAP; and
2. Sign the ROD/RAP provided there are no significant changes to the intent of the ROD/RAP from that described in the November 2007 Water Board staff report.

I Harold J. Singer, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Control Board, Lahontan Region, on November 28, 2007.

HAROLD J. SINGER
EXECUTIVE OFFICER

ENCLOSURE 2

08-0005

Staff Report

For the

**DRAFT FINAL RECORD OF DECISION/
REMEDIAL ACTION PLAN FOR THE
ARMITAGE FIELD OPERABLE UNIT AT THE
CHINA LAKE NAVAL WEAPONS STATION**

**California Regional Water Quality Control Board, Lahontan Region
14440 Civic Drive, Suite 200
Victorville, CA 92392**

November 2007

Prepared by: Doug Feay, Engineering Geologist

Reviewed by: Cindi Mitton, Senior Engineer

08-0006

1. Introduction

This item is for the Water Board to consider whether it concurs with a Record of Decision/Remedial Action Plan (ROD/RAP) for remedial actions at the Armitage Field Operable Unit (OU), at the China Lake Naval Air Weapons Station (CLNAWS) China Lake complex. CLNAWS is located within the Mojave desert, about 150 miles northeast of Los Angeles (Figure 1). This ROD/RAP proposes remediation for four IRP sites (sites 1, 2, 44 and 45) at the Armitage Field OU (Figure 2).

The chemicals of concern (COCs) at the Armitage Field OU are volatile organic compounds, including chlorinated hydrocarbons, in soil and groundwater. Groundwater contaminants occur both in the free product phase and the dissolved phase. The free product phase consists of jet fuel. The dissolved phase contaminants are petroleum hydrocarbons, benzene, toluene, ethylbenzene, xylene (BTEX), trichloroethene (TCE) and tetrachloroethene (PCE).

The selected remedy consists of free product removal where there is free product, and monitored natural attenuation of dissolved constituents in the groundwater. Soil cleanup will use soil vapor extraction and excavation. Land use controls will be used to prevent exposure to contaminants.

The Navy has proposed cleanup levels greater than background for groundwater based on a Technical and Economic Feasibility Analysis (TEFA) as required in California Code of Regulation Title 23. The Water Board may allow cleanup levels greater than background if certain conditions are met. The ROD/RAP documents the remedial actions for contaminants in soil and groundwater, and actions taken to protect public health, and the environment. Remedial actions proposed for the Armitage Field OU meet state requirements and are feasible, cost effective methods to remediate soil and restore groundwater. As discussed further in this staff report, Water Board staff has reviewed the information and evaluation provided by the Navy and the proposed remedy is: 1) consistent with maximum benefit to the people of the State, 2) does not unreasonably affect present and anticipated beneficial uses and 3) complies with plans and policies of the State.

2. IRP Site Information

The Naval Ordnance Test Station at China Lake was established in 1943. The Installation conducts air warfare systems research, development, and testing for the Navy and other branches of the U.S. Department of Defense. Following is a brief description of the four IRP sites requiring remediation at Armitage Field OU. Table 1 lists specific details for each site including contaminant concentrations.

- A. IRP Site 1, Armitage Field Dry Wells, lies within the former Armitage Field fuel supply area which was constructed in 1945 with four 50,000-gallon

concrete underground storage tanks. In 1958 two additional 100,000-gallon concrete underground storage tanks were added. Contaminants at this site are from jet fuel releases (JP-4 and JP-5). Remedial actions include free product removal, monitored natural attention, and soil cleanup using soil vapor extraction.

- B. IRP Site 2, Aircraft Washdown Drainage Ditches, consists of a concrete pad and associated drainage culverts and ditches located next to one of the runways on the east side of Armitage Field. Wash water and waste fuel were drained from the pad into an open ditch that connected to a stormwater runoff drainage system for the airfield. The pads were used from 1945 to 1982. Groundwater at the site has been polluted by TCE and PCE. Groundwater remediation at the site will be by monitored natural attention. There are no residual soil impacts from TCE or PCE.
- C. IRP Site 44, the Old Armitage Field Fire Fighting Training Area, was in service from 1945 to 1988 as a fire fighting training area. During training activities gasoline, jet fuel and water were used to simulate fire fighting. Approximately 10,000 to 20,000 gallons of wastewater were discharged into a ditch during site use each time. The wastewater runoff contained chlorinated solvents, hydraulic fluids, lube oils, antifreeze and jet fuels. Groundwater at this site has been polluted by free product phase and dissolved phase VOCs. Groundwater will be remediated using vapor extraction free product removal. Dissolved contaminants will be remediated using monitored natural attention. The soil has also been impacted by the VOCs. Free product removal and clean up of the soil will be done together using the vapor extraction method.
- D. Site 45, the Naval Air Facility Maintenance Area serviced ground support equipment and vehicles for the airfield from 1945 to 1981. Wastewater was directed to an unlined ditch and may have contained motor oils, brake fluid, hydraulic oils, and antifreeze. Solvents were collected in a solvent tank at the site. Groundwater at this site contains TCE and PCE. Groundwater remediation at this site is by monitored natural attention. Contaminated soil will be excavated and removed from the site.

3. IRP Site Hydrogeology and Groundwater Quality

The hydrogeology at Armitage Field OU is composed of Pleistocene and Holocene alluvial and playa type deposits as unconsolidated sedimentary deposits.

Groundwater beneath the site occurs in three aquifers; the upper, the middle, and the lower aquifers. The upper aquifer occurs at approximately 25 to 35 feet below ground surface (bgs) and extends to about 100 ft. bgs. Groundwater quality of the upper aquifer is marginal with the total dissolved solids (TDS) concentrations averaging about 3,000 milligrams per liter (mg/L). The upper aquifer also contains naturally occurring arsenic levels which exceed the 10 mg/L

drinking water standard. Data from the Remedial Investigation of the four IRP sites indicate that the groundwater contaminants from all the sites are confined to the upper groundwater aquifer.

Data from the Remedial Investigation in 1998 and 2002 for all the IRP sites indicate that the middle and lower aquifers do not contain contaminants and there is no mechanism for the upper aquifer containments to impact the middle and lower aquifers. The lower aquifer is used for municipal supply. Ridgecrest and NAWSCS both get their drinking water from the lower aquifer.

Beneficial uses of the groundwater as listed in the Basin Plan for all aquifers beneath the site are municipal and domestic supply, agricultural supply, industrial service supply and freshwater replenishment.

4. Proposed Corrective Actions

The Navy developed remedial action objectives for Armitage Field OU based on its most likely future land use, which is consistent with its current use as an operating Navy facility. There are two cleanup action objectives for the Armitage Field OU; 1) protect human health by preventing exposure to groundwater that has contaminant concentrations that are above state and federal drinking water requirements and 2) remove free phase product from the groundwater.

The Navy conducted a Feasibility Study that evaluated a no action alternative, two soil remediation alternatives, four groundwater remediation alternatives, and five free product removal alternatives. These alternatives were compared against the nine criteria shown below used by the Navy to evaluate remedial alternatives.

These criteria are:

- 1) overall protection of humans and the environment;
- 2) complies to all applicable or relevant and appropriate requirements (ARARs)
- 3) long-term protection;
- 4) reduction of toxicity, mobility, and volume,
- 5) short-term effectiveness;
- 6) implementability;
- 7) cost;
- 8) state acceptance; and,
- 9) community acceptance.

The Navy proposes to remove free product from the two sites with free product, site 44 and site 1. The Navy is proposing monitored natural attenuation with institutional controls for remediation of the groundwater for all four IRP sites. Data indicate groundwater contaminants are declining in concentration and the dissolved phase plumes are stable at all sites.

Monitored natural attention was evaluated using the Bioplume III computer model. This model evaluates degradation of VOCs in groundwater. Modeling results showed the dissolved phase plumes would reach primary and secondary drinking water standards,

or maximum contaminant levels (MCLs) in 5-30 years over the four sites. The Navy also used the Bioplume III computer model to estimate how many years it would take the natural attenuation process to remediate groundwater contaminants to concentrations less than MCLs and to background levels. The computer model calculated 150 years to remediate to background (non-detectable concentrations) for TCE and PCE, and 30 years for benzene and fuel related compounds. Water Board staff reviewed the model results and the model conditions and agree that it is appropriate for predicting degradation at these sites. The cost estimated to monitor the plumes is an additional \$677,000.00 dollars for each 5 years of monitored natural attenuation. The Navy evaluated remediation to concentration less than the MCLs considering using the additional years to reach lower concentrations, along with the related cost, and evaluated this through a technical and economic feasibility study (TEFA). The TEFA analysis indicated that the cost to monitor natural attenuation to background levels would be up to 20 million dollars. The cost to continue exposure controls is approximately 3.5 million dollars. The additional benefit for continuing the remedial action to reach a concentration less than MCLs is not reasonable in this case, given the site specific conditions and anticipated future groundwater use. Use of the water for Base supply is not anticipated at this time because of the marginal quality and because groundwater supply is from the lower aquifer. The additional data from additional monitored natural attenuation is not reasonably necessary to ensure beneficial uses are protected. Discontinuing monitored natural attenuation when contaminants reach cleanup levels above background (MCLs in this case) is protective of potential beneficial uses considering the quality and location of the groundwater.

The ROD/RAP contains plan to follow if monitoring shows natural attenuation is not progressing. Monitoring data for natural attention will be collected quarterly for the first two years. After the first two year period monitoring may be reduced to semiannual or annual with Water Board staff concurrence. During the remedial design phase the Navy will establish performance criteria that will be used to evaluate data obtained while the remedy is implemented. Water Board staff will be reviewing the performance criteria and monitoring data, as well as any necessary methodologies proposed for augmenting the natural attention process.

5. Compliance with State Requirements

Regional Water Quality Control Board (Water Board) staff's evaluation of the proposed remediation actions for the four IRP sites at Armitage Field OU has determined that the remedy meets requirements of the Basin Plan, State laws, policies and regulations. See the summary below.

- A. Section 13304 of the California Water Code requires dischargers that have polluted groundwater to clean it up. Water Board staff agrees that the Navy proposed technical solution to cleaning up the groundwater at the Armitage Field OU will satisfy Section 13304.
- B. SWRCB Resolution No. 92-49 states that a regional board must ensure that dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of either background

water quality, or the best water quality which is reasonable if background levels of water quality cannot be restored, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible. Resolution 92-49 provides that cleanup and abatement actions are to implement applicable provisions of Chapter 15 to the extent feasible. This resolution also requires the application of section 2550.4 of Chapter 15 when approving any alternative cleanup levels less stringent than background. The Navy has completed an evaluation of the proposed remedy and cleanup levels as required by Chapter 15. In complying with the substantive requirements of 92-49, III.G and California Code of Regulations, title 23, section 2550.4 the Navy chose maximum contaminant levels (MCLs) as cleanup levels. Additionally, the Navy has removed contaminant sources and will be removing additional contaminants from the soil and groundwater. Water Board staff agree that Navy proposed remedy complies with Resolution 92-49 and Chapter 15.

- C. SWRCB Resolution 68-16 provides that no degradation may unless certain conditions are determined by the Water Board to be met. Where polluted groundwater migrates to areas of high quality groundwater, the Water Board has determined there to be a discharge of waste. In order to comply with this resolution a mechanism is needed in place to stabilize the plume or there needs to be evidence that the plume is stable. The Navy has submitted groundwater sampling data that demonstrate that the plumes at Armitage Field OU are stable. Data from the Feasibility Study indicate there has been a reduction in concentration of plume contaminants since 1996. The reduction in plume contaminants indicates the plumes are stable or shrinking. The reduction of contaminants is attributed to the process of natural attenuation.
- D. Water Quality Control Plan for the Lahontan Region (Basin Plan)-The Basin Plan designates groundwater beneficial uses and establishes water quality objectives to protect those uses. The Basin Plan requires the beneficial use of polluted groundwater to be restored. Water Board staff agree the proposed technical solution to cleaning up groundwater at Armitage Field OU complies with the Basin Plan.

6. The Navy's and State's Position Regarding Applicable or Relevant and Appropriate Requirements

The Navy and Water Board staff agree with the proposed technical remedial actions for the four IRP sites at the Armitage Field OU. However, the Navy does not consider some parts of the Basin Plan, and some State Water Resources Control Board resolutions and some portions of the California Water Code as ARARS for this ROD/RAP. To preserve the State's right for future actions at Armitage Field OU or other Federal Sites, agree to disagree language has been incorporated into the ROD/RAP confirming each party's legal basis and position.

7. Conclusions

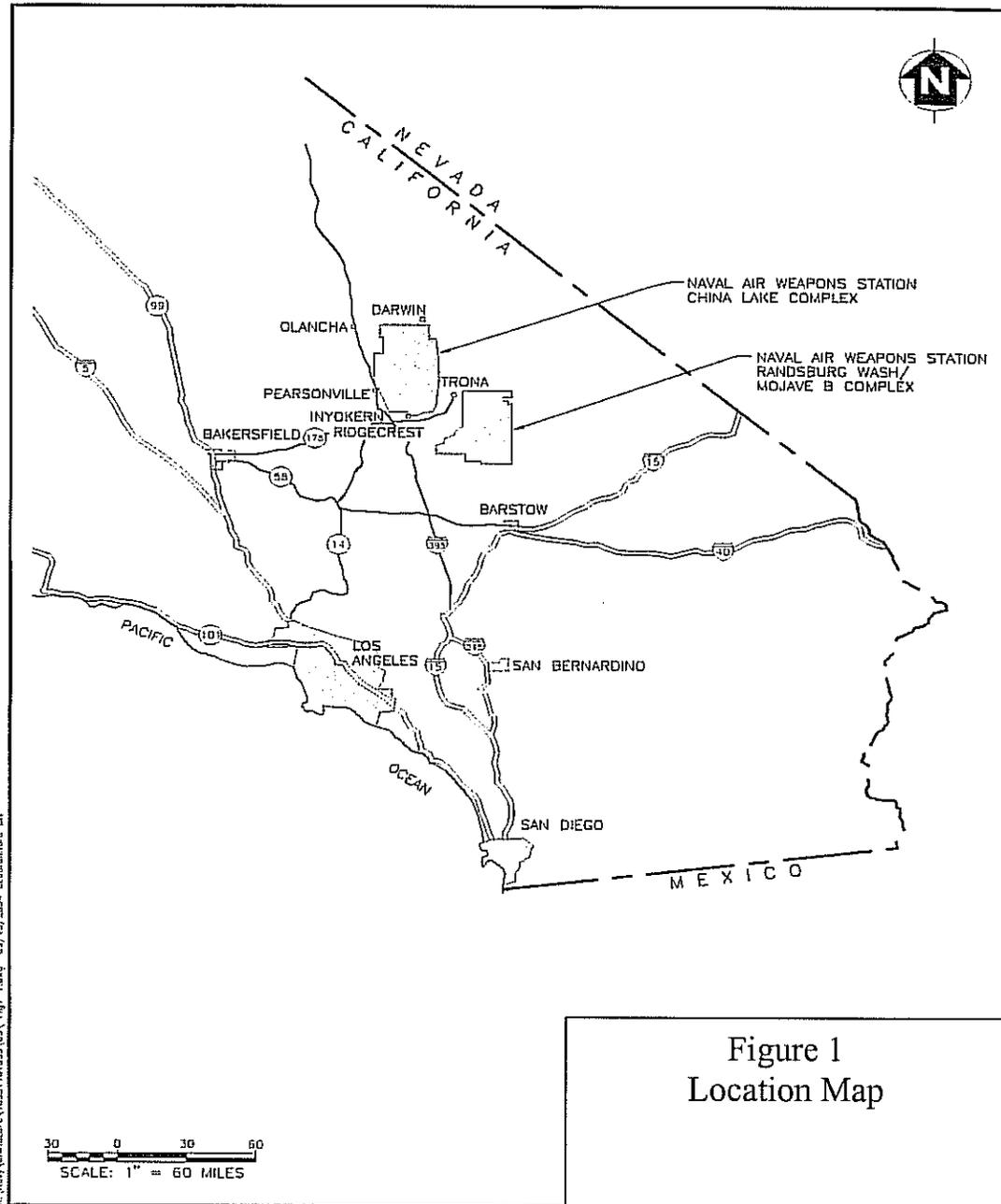
Water Board staff has reviewed the ROD/RAP and other available data and information for the Armitage Field OU. Based on our review the proposed remedies for groundwater and soil remediation meet state requirements. Additionally, appropriate language is included in the ROD/RAP stating each party's position regarding its legal position and preserving its legal rights.

8. Recommendations

Based on our review of the ROD/RAP, staff recommends that the Water Board adopt a resolution authoring the Executive Officer to sign the ROD/RAP.

Table 1
 Armitage Filed Chemicals of Concern

IRP Sites	Groundwater Impacts				Soil Impacts
	Free Product Phase	Area of Dissolved Phase in Acres	Dissolved Phase (ug/L) Maximum Concentrations 1996 2003		
1	Yes, Jet Fuel (14 acres)	38	benzene=1,000	benzene=660 toluene=18 e.benzene=36 xylenes=120	Yes
2	No	10	TCE=123 PCE=9.3	TCE=64 PCE=5.4	No
44	Yes, Jet Fuel (10 acres)	10	benzene=18 xylenes=480	benzene=0.1 toluene=0.7 e. benzene=2 xylenes=30	Yes
45	No	12	TCE=370 PCE=140	TCE=69 PCE=15	Yes



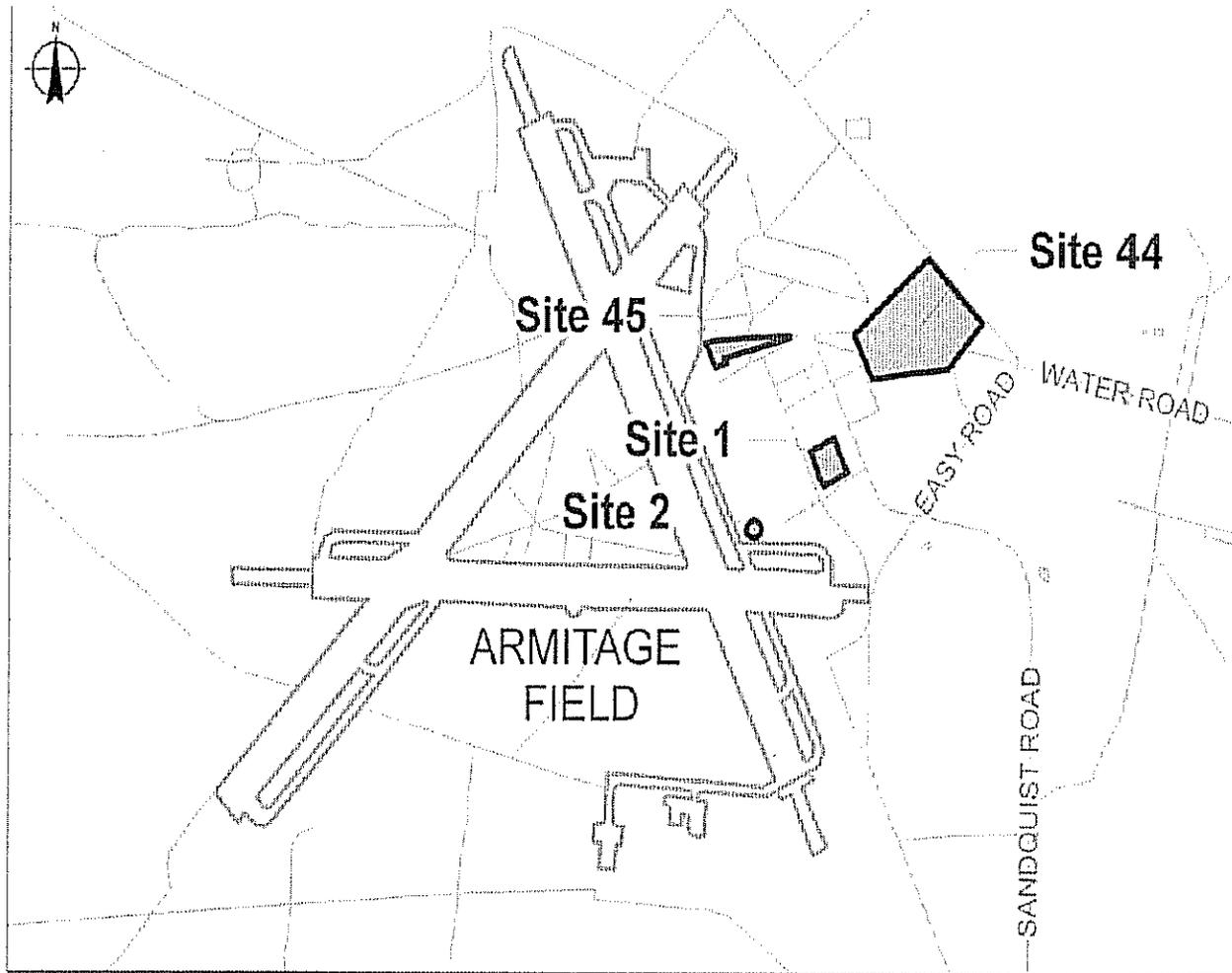


Figure 2 IRP Site Locations