

**Sandia National Laboratories
Support of the
Iraq Nuclear Facility
Dismantlement and Disposal Project
(NDs Project)**

Calendar Year 2010

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
for the United States Department of Energy's National Nuclear Security Administration
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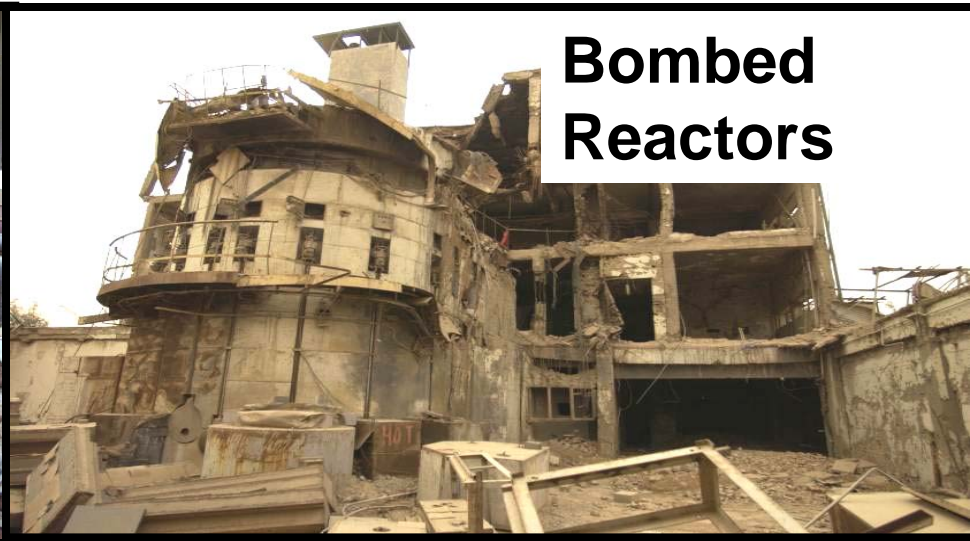
Context

- **Sandia National Laboratories (Sandia) is a member of the U.S. Dept. of State's team, supporting Iraq's decommissioning and waste management work**
- **Sandia has about 8,000 employees and Sandia is a "national laboratory" under the U.S. Department of Energy's National Nuclear Security Administration**
- **Sandia has supported the Iraq NDs work since 2006**
- **Overview calendar year 2010 progress**

Decommissioning & Radioactive Waste Problems at Al Tuwaitha



Radioactive wastes



Bombed Reactors



Old disposal areas



Sealed Sources



2010 Workscope

- **Waste Management Training Program**
- **Radiological Worker II training in Baghdad**
- **Help Setup Ground Water Monitoring Program**
- **Supply Groundwater Sampling Equipment & Training**
- **Draft Overarching Decommissioning Plan for IDP**
- **Draft Project Plan for Monitoring/Maintaining Underground Tanks containing Liquid Radioactive Waste**
- **Support IAEA Progress & Planning Meetings**



Waste Management Training Program



Waste Management Training

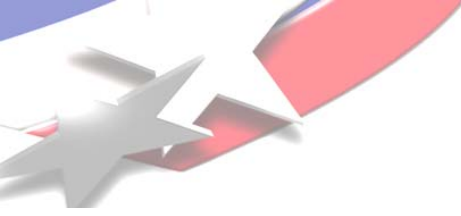
- **Provided radioactive waste management internship**
- **Two weeks, 22 February - 5 March, 2010**
- **Work with Sandia specialists (many with decades experience)**
 - **Facilities, equipment, staff, procedures**
 - **Characterize, condition, store or ship for disposal**
- **Dr. Emad, Director, Radioactive Waste Management and Treatment Directorate (RWMTD) + 2 RWMTD staff Mr. Amir & Mr. Mazin**
- **Last 2 days: MoST Deputy Minister Dr. Al-Musawi, Director General Dr. Ibrahim, Mr. Jarjies Adnan & Ms. Melanie Wong (IAEA)**



Sandia's Radioactive Waste Management Facilities



SPRUNG semi-permanent buildings



DAY 3: Wednesday, February 24, 2010

6:00 a.m.	Pick-up at Hotel	
7:00 a.m. – 11:30 a.m.	RMWMF Demonstrations Observe Plan-of-the-Day meeting Observation of pre-job briefing (if sorting or treatment scheduled) Demonstration of glove box facilities (or observation of waste sorting operation) in Bldg. 6920, Room 103 Demonstration of Rad Protection survey instruments Demonstration of PPE (donning) and (doffing) personnel survey Demonstration of drum survey	RMWMF
11:30 a.m. – 12:30 p.m.	Lunch	Break room
12:30 p.m. – 4:00 p.m.	RMWMF Demonstrations Demonstration of drum survey Demonstration of facility survey (direct surveys, area wipes, floor monitoring, continuous air monitoring, hi-volume air monitoring)	RMWMF
4:00 p.m.	Adjourn & return to hotel	

Additional Information: Be sure to pack a lunch for Thursday.

Training at Sandia's Mixed & Radioactive Waste Management Facility







Building Relationships





Radiological Worker II Training in Baghdad



Radiological Worker II Training

- **Training site**
 - Al Rasheed Hotel in IZ
- **18-22 April, 2010 Rad worker II Class**
 - Course was presented in English
 - Ministry of Science & Technology
 - Ministry of Oil, and
 - Ministry of Environment
- **25-29 April Train the Trainer**
 - Course presented by Iraqi instructors
 - Discussion in Arabic
 - Slides in English







Help Setup Ground Water Monitoring Program



Setup Groundwater Monitoring Program

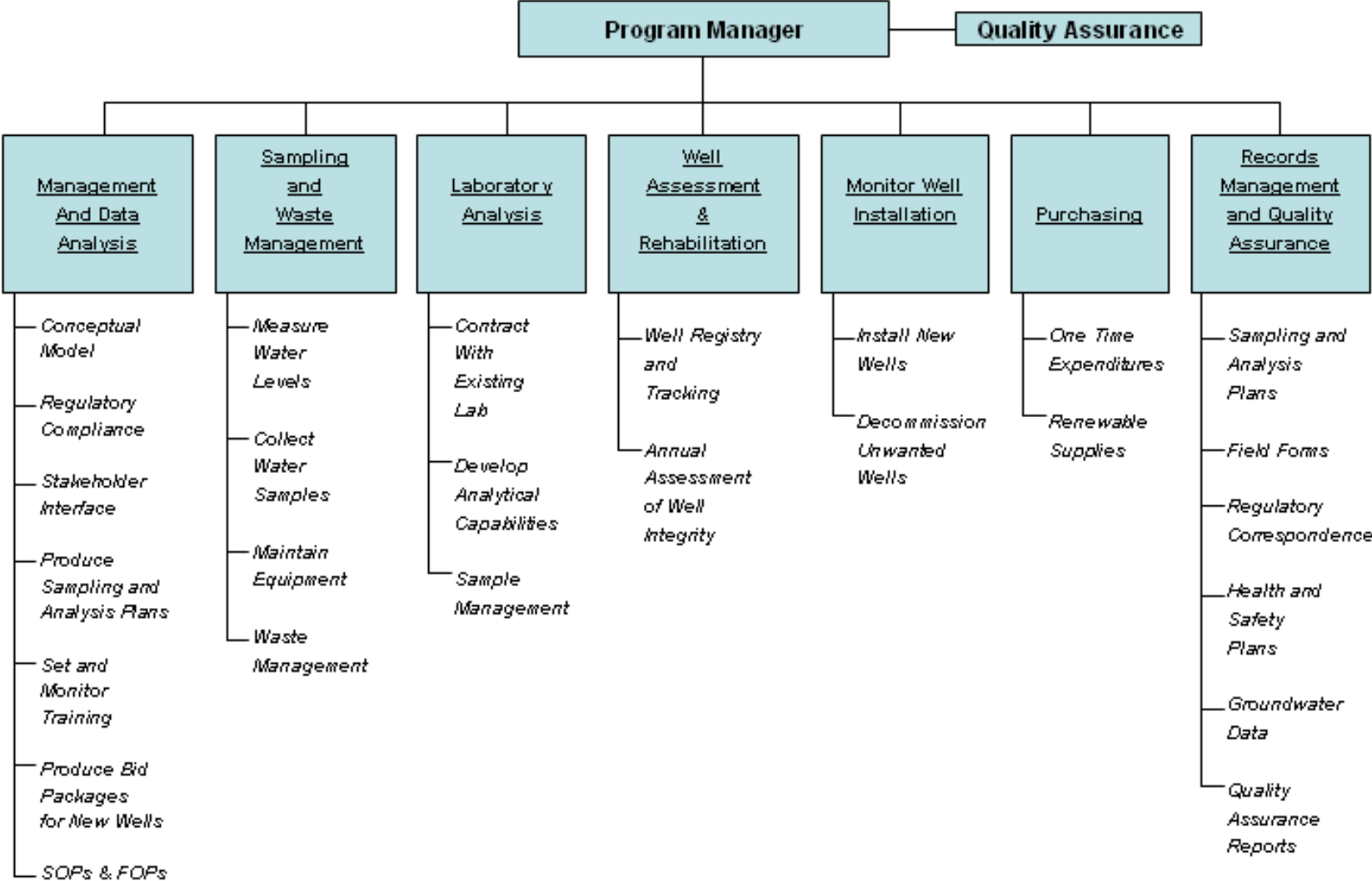
- 4 m to groundwater (GW) under nuclear facilities at Al Tuwaitha
- In 2002, Iraqi Atomic Energy Commission began GW monitoring at Al Tuwaitha
- Assisting RPC in re-establishing GW monitoring program
- Goals:
 - Determine if groundwater contaminated by prior activities, dating to 1960's
 - Determine if waste management activities impacting groundwater
- Sandia drafting GW Monitoring Program Plan
- Draft Plan to RPC mid-November



Draft GW Monitoring Program Plan

- **Recommends program structure**
- **Personnel and skills for structure**
- **Equipment for structure**
- **Administrative processes for structure**
- **Draft Conceptual Site Model for AI Tuwaitha**
- **Recommended next steps**
- **Copies of SOP and FOPs**

Figure 1. Groundwater Monitoring Program





Supply Groundwater Sampling Equipment & Training



Supply GW Monitoring Equipment and Training

- **Purchased pump, tubing bundle, water quality meters (~ \$ 25,000)**
- **Cleared U.S. export controls and shipped to Iraq**
- **Trained Dave Kenagy & Dr. Abbas on how to use – 7-9 Sept 2010 (merged training at Sandia with IAEA-funded RPC trip to U.S.)**
- **Dave and Dr. Abbas transfer equipment to RPC and trained RPC staff – 14 September**



Pump, tubing and reel



D. Kenagy and Dr. Abbas
being trained at Sandia



Interior Sandia sampling truck



Demonstration of video-logging
monitoring well



D. Kenagy and Dr. Abbas training
RPC on use of equipment



Draft Decommissioning Plan for all Decommissioning in Iraq



Overarching Decommissioning Plan


- **Successful decommissioning requires planning**
- **Sandia drafted the Overarching Decommissioning Plan for IDP – overview of scope, goals, schedule, regulatory process, waste management ...**
- **Process**
 - **Outline at IAEA meeting May 2010**
 - **Draft Plan to IDP – 9 July 2010**
 - **IDP updates & takes ownership – 15 September**
 - **Sandia improves the “presentation” – 13 October**
 - **Sandia supports IAEA Consultancy – 27 October**
- **Iraqi Decommissioning Inventory and Waste Worksheet**




Outline of Overarching Decommissioning Plan for IDP

- 1.0 Introduction and Objective**
- 2.0 Iraqi Nuclear Complex Description**
- 3.0 Decommissioning Strategy**
- 4.0 Project Management**
- 5.0 Decommissioning Activities**
- 6.0 Monitoring and Maintenance**
- 7.0 Waste Management**
- 8.0 Cost Estimate and Funding Mechanism**
- 9.0 Safety Assessment**
- 10.0 Environmental Assessment**
- 11.0 Health and Safety**
- 12.0 Quality Assurance**
- 13.0 Emergency Planning**
- 14.0 Physical Security and Safeguards**
- 15.0 Community Outreach**
- 16.0 References**

Appendix A Facility Database

Facility Number:	Facility Name: Al-Tuwsitha Building 9 Radiochemistry Laboratory
Facility History: This building contains Italian-supplied equipment including labs, hot-cells, glove boxes, ventilation trap filters and storage tanks for liquid radioactive wastes. This lab was used for extraction of radionuclides and reprocessing the irradiated fuel to extract plutonium for research purpose.	Facility Photo: 
Current Condition: This building was destroyed in the 1991 war. Some areas inside the building are heavily contaminated. The hot cell area was heavily damaged during the war but the glove box line for Pu work survived intact - concrete was poured inside all of these glove boxes by IAEA inspectors to make them unusable. Areas outside the glove boxes are contaminated, but not heavily. The storage tank contains about 3 m ³ of high level liquid waste of alpha, beta and gamma emitters resulting from the dissolution of radionuclides from the irradiated fuel. The access to the tank is very difficult. The total solid waste is estimated to be about 33 tons and the liquid waste 3 m ³ possibly 10 m ³ .	
Size:	
Contaminants of Concern: The internals of the glove boxes will have some Pu contamination. Fission product and actinide	



Facility Number:	Facility Name: Al-Tuwaitha Building 40 Russian Silos
Facility History: Used for both solid (98 wells/silos) and liquid waste: - liquid wastes evaporated to solid many years ago. Former liquid waste tank still shows high activity. Contents of the silos and liquid tank are unknown: some waste probably originated from the IRT upgrade but the origin of the higher activity waste is unknown. Known leakage to ground after nearby bomb explosion - further information on ground contamination would be desirable.	Facility Photo: 
Current Condition: Structure still present but in decayed state. Roof structure might be unsafe. Surrounding ground areas show spotty contamination. 98 wells/silos contained about 20-30 te solid waste from IRT (including upgrade); 1967-90. 70-80 te solid waste added around 1991 from unknown origin. There were unconfirmed rumors of buried contaminated items in the surroundings.	
Size:	
Contaminants of Concern: Co^{60} , Cs^{137} and others	



Iraqi Decommissioning Inventory and Waste Worksheet (revision 2)

Site or Facility Name:	Facility Function:	Date:
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Site or Facility Location (description and GPS of boundaries):

Team Leader:

Team Members:

FACILITY DESCRIPTION

Brief Site or Facility History (for example, list dates and uses of facility):
Attach a map or drawing to end of report:

How reliable is this information? (for example, based on records, based on second-hand verbal account):

Site or Facility Description (include boundaries of unit, is this a building or a building and surrounding land):

Describe each building (foot print size, number stories, basement, type of construction, current condition):
Attach a map and photograph(s) to end of report:



**Draft Project Plan for
Monitoring/Maintaining
Underground Tanks containing
Liquid Radioactive Waste**




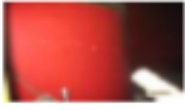



Liquid Radioactive Waste Tank Maintenance and Monitoring Program

- **Approximately 30 tanks in 9 locations**
- **Half were not intended for long-term storage**
- **Drafted Plan to characterize, maintain and monitor tanks**
- **Eleven tanks pose the greatest risk because: no secondary containment (e.g., not inside basement) or they contain a substantial percentage of liquid waste**
- **Draft Plan in Sandia-internal review**



Outline of Liquid Radioactive Waste Tank Maintenance and Monitoring Program

- 1. Introduction**
- 2. Liquid Radioactive Waste Tank Inventory**
- 3. Radioanalytical Methods and Associated Equipment**
Hand-held Detectors, Gamma Spectrometry Off-Site Laboratory Testing
- 4. Procedures for Accessing Radioactive Waste Tanks**
 - 4.1 Tank Location Hazard Assessment**
 - 4.2 Debris Removal and Site Preparation**
 - 4.3 Tank Integrity Assessment**
 - 4.3.1 Visual Inspection**
 - 4.3.2 Corrosion Assessment**
- 5. Determining Tank Contamination.**
- 6. Contamination Mitigation.**
 - 6.1 Access Controls and Postings**
 - 6.2 Tank Segregation from the Environment**
- 7. Routine Maintenance, Monitoring and Leak Containment**
Maintenance and Monitoring, Soil Sampling, Borehole Monitoring
- 8. Summary and Conclusions**
- 9. References**
- 10. Appendices**

Picture					
Tank Facility Location	Radioactive Waste Treatment Station (RWTS)	Radioactive Waste Treatment Station (RWTS)	Radioactive Waste Treatment Station (RWTS)	Radioactive Waste Treatment Station (RWTS)	Radioactive Waste Treatment Station (RWTS)
Building Number (1)	35	35	35	35	35
Tank Material	SS304	SS304	SS304	SS304	SS304
Engineering Drawings Available					
Reused/Scraped	Reuse	Reuse	Reuse	Reuse	Reuse
Connected Underground Piping (Yes/No)	Yes	Yes	Yes	Yes	Yes
Secondary Confinement (Type)	Yes (first floor) (S)	Yes (first floor) (S)	Yes (first floor) (S)	Yes (first floor) (S)	Yes (first floor) (S)
Accessibility Description	first floor of building (S)	first floor of building (S)	first floor of building (S)	at the pit -2 m (S)	first floor of building (S)
Rated Capacity [m ³]	60 (S)	60 (S)	60 (S)	10	2 (1) 3 (2,4) 1.5 (5)
Estimated Remaining Quantity [m ³]	Empty (S)	Empty (S)	Empty (S)	10 (1,5) ~10 (2,4)	2 (1) <1 (2,4) 0.5 (5)
Percentage Liquid	0	0	0	100 (5)	30
Percentage Solids/Sludge/etc.					
Material Origin	Treatment of RW (S)	Treatment of RW (S)	Treatment of RW (S)	Decontamination (2) RadChem Waste Treatment (4) Drainage (5)	Concentration (2,4,5)
Radionuclides				Co60,Cs137 (2,4,5) FP (4,5)	Co60,Cs137 (2,4) FP (4,5)
Activity Concentration (Bq/ml)				1500 (1)	900 (1)
Activity Concentration (Ci/m ³)				0.04	0.02
Dose Rate (µSv/h)				64 @ 3m (4)	46 @ 3m (4)
	MLW (S)	MLW (S)	MLW (S)	MLW (4)	HLW (4)



Report Makes Recommendations

- **Acquire radioanalytical equipment**
- **Initial tank hazard assessment**
- **Remove debris & prepare for active tank interrogation**
- **Formal external radiological survey**
- **Post and control radiological areas**
- **Begin routine monitoring**
- **Sample contents**
- **Sample soil and groundwater**



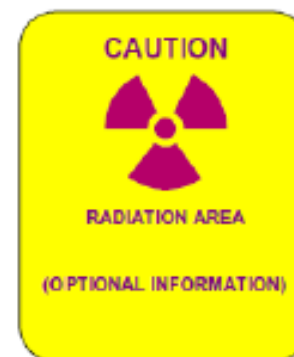
Controlled Area



Radioactive Material(s)



Radiation Area



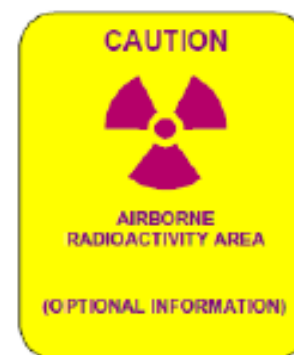
High Radiation Area



Very High Radiation Area



Airborne Radioactivity Area





Support IAEA Progress & Planning Meetings



May 2010 Meeting

- ***Begin with the End in Mind - Outline of a License Application for a Near-Surface LLW Disposal Facility*** Bill Arnold & John Cochran
- ***Outline of a Decommissioning Plan for Al Tuwaitha*** Alicia Aragon & John Cochran



2011 Workscope

- **Establish a near-surface disposal facility for Iraq's radioactive wastes**
 - Detailed Project Plan
 - Tour / learn from licensed facilities in arid US
 - Comprehensive training in Baghdad
- **Support “planning basis” for all decommissioning and rad waste management**
- **Support work on Overarching Decommissioning Plan**
- **Continue development GW monitoring program**
- **Support emergency response training**
- **Support database development for GW and rad waste**
- **Continue IAEA Progress & Planning Meetings**



Thank You