Release of Geo Pilot Plant Site for Industrial Use

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Background

The Geo-Pilot plant has been designed and constructed in 1989, by the State Company of Geological Surveying and mining, the main goal of construction this plant was to extract the yellow cake from uranium Ore. The project was operated for a limited and discrete periods, the start of operation was in Dec.1990 until Jan.1991, and then the work has been suspended, the plant has been restarted in May 1991 until middle of June 1991. The provided information shows that the production was also very limited quantity of hydrated yellow cake about (2-3) kg. And due to this limited quantity of product, the radiation level was low, and there was no contamination inside and surrounding the shed. The units constructed as serial production stages to extract hydrated yellow cake from uranium ore. All these units have been installed inside the project's shed except the crasher and the conveyer.

Facility Description

- *Preparation unit (U100)*
- *Leaching unit (U 200)*
- *Filtration unit (U 300)*
- *Activated carbon unit (U 400)*
- *Ion exchange unit (U 500)*
- *Precipitation unit (U 600)*

Geo pilot PMP consist of

- Site preparation plan
- Radiological characterization for plan
- Dismantling plan
- waste management plan

RPC license to start the work in the Geo pilot plant Decommissioning project in March-2009 .

During the RPC inspectors performed inspection visits to the sites for observation processing to monitor activities accomplishment and insure work process according to the safety requirements.

RPC Inspectors make Radiological Survey

Site preparation and fencing

Segregation storage in G.P.P

Decontamination area

RPC inspector make radiological survey

RPC Inspectors collecting water samples which collected from R301A,T301tanks

RPC inspection visit to the relocation of the GPP contamination waste in Tuwaitha site

RPC team make the radiation measurement for each bag before moving to the store and make sure that it is uncontaminated.

Contaminated activated carbon bags

Smear Samples collecting

RPC Inspectors collecting Resin samples from the Ion exchanger unit

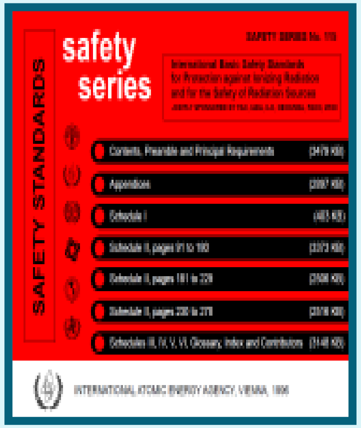
The GPP radioactive waste relocation storage near the RWTS at Tuwitha Site

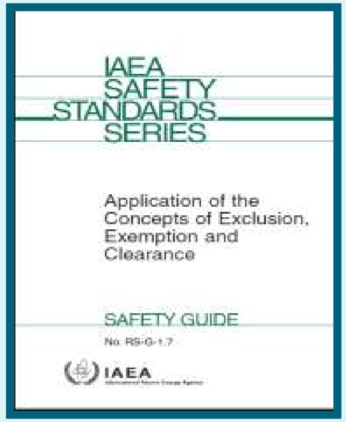
Safety standards of release

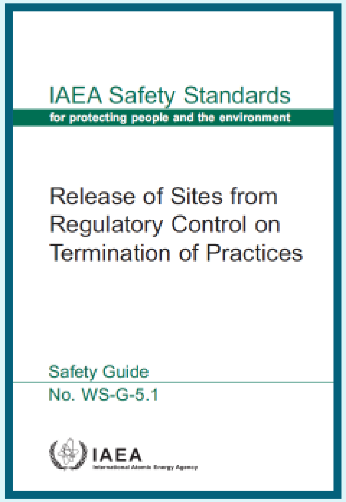
-BSS 115

-Application of the concepts of exclusion , exemption and clearance No. RS-G-1.7

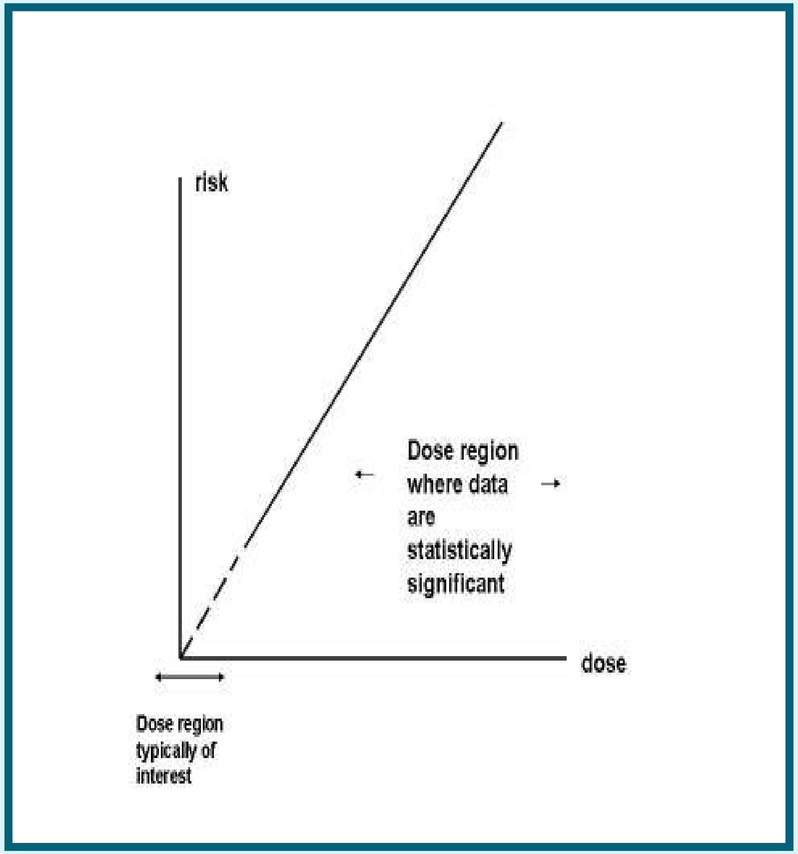
- Release of sites from regulatory control on termination of practices WS-G-5.1





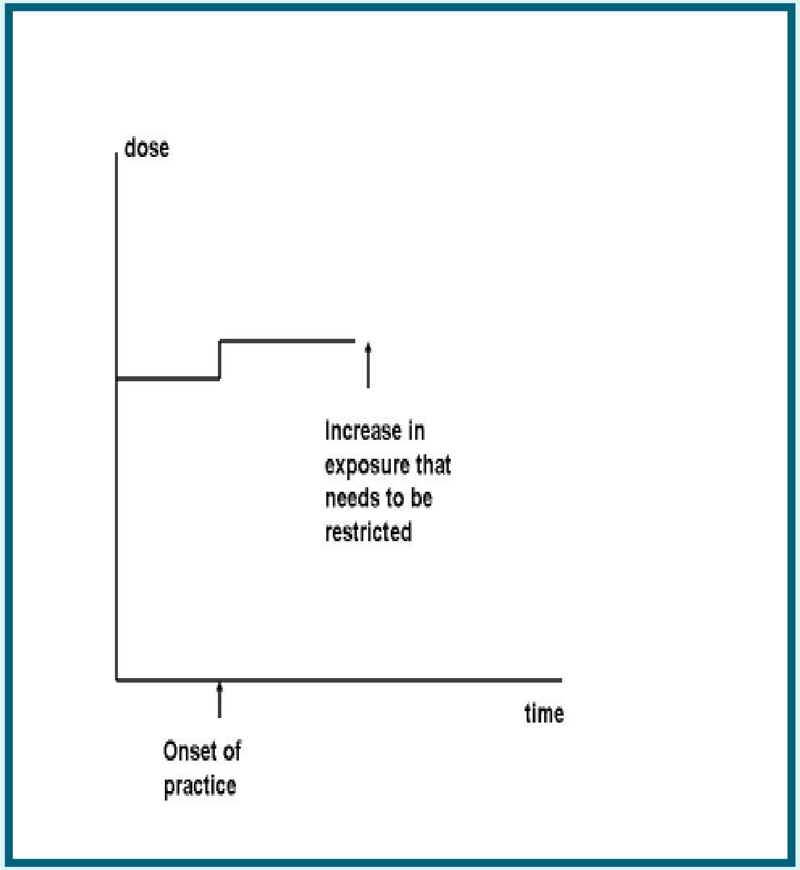


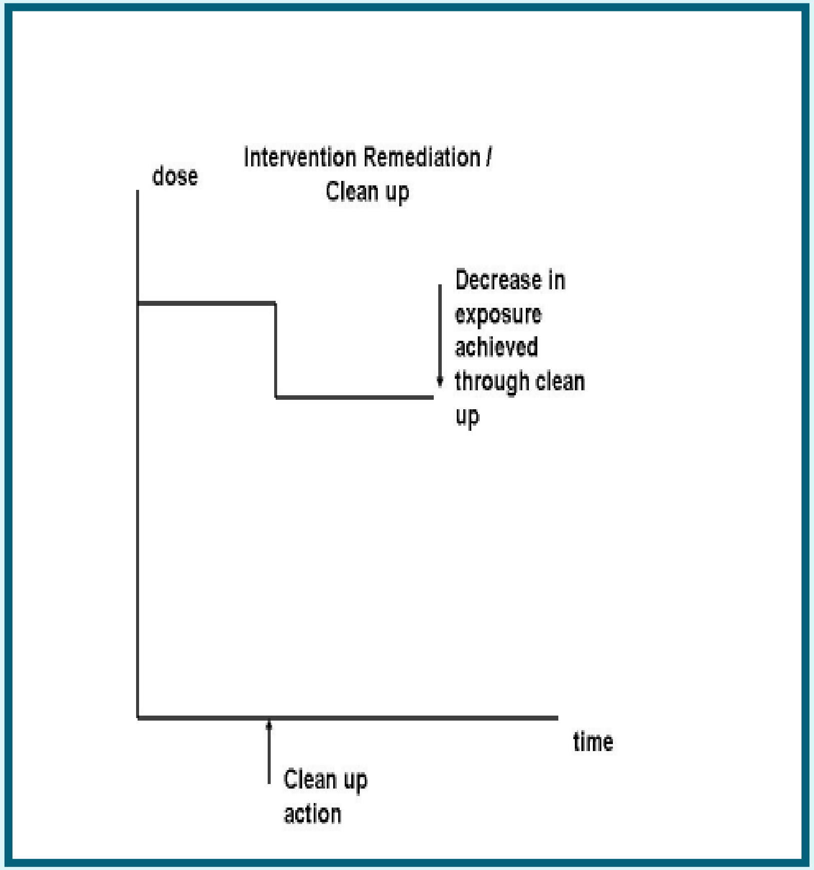
Optimization of protection



Do the best that can reasonable be done in the circumstances to reduce exposure to radiation

Practices and Interventions

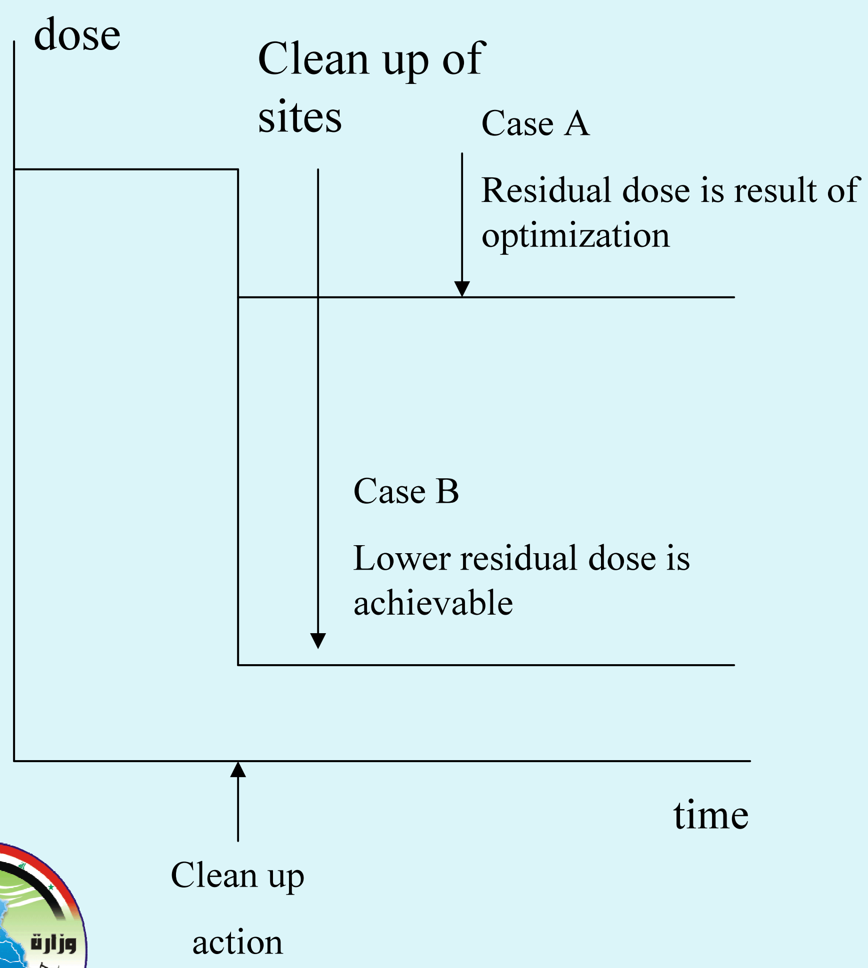




Optimization of protection IAEA Basic safety standards

The form , scale and duration of … remedial action shall be optimized so as to produce the maximum net benefit , under the prevailing social and entomic circumstances .

Optimization and residual cleanup levels



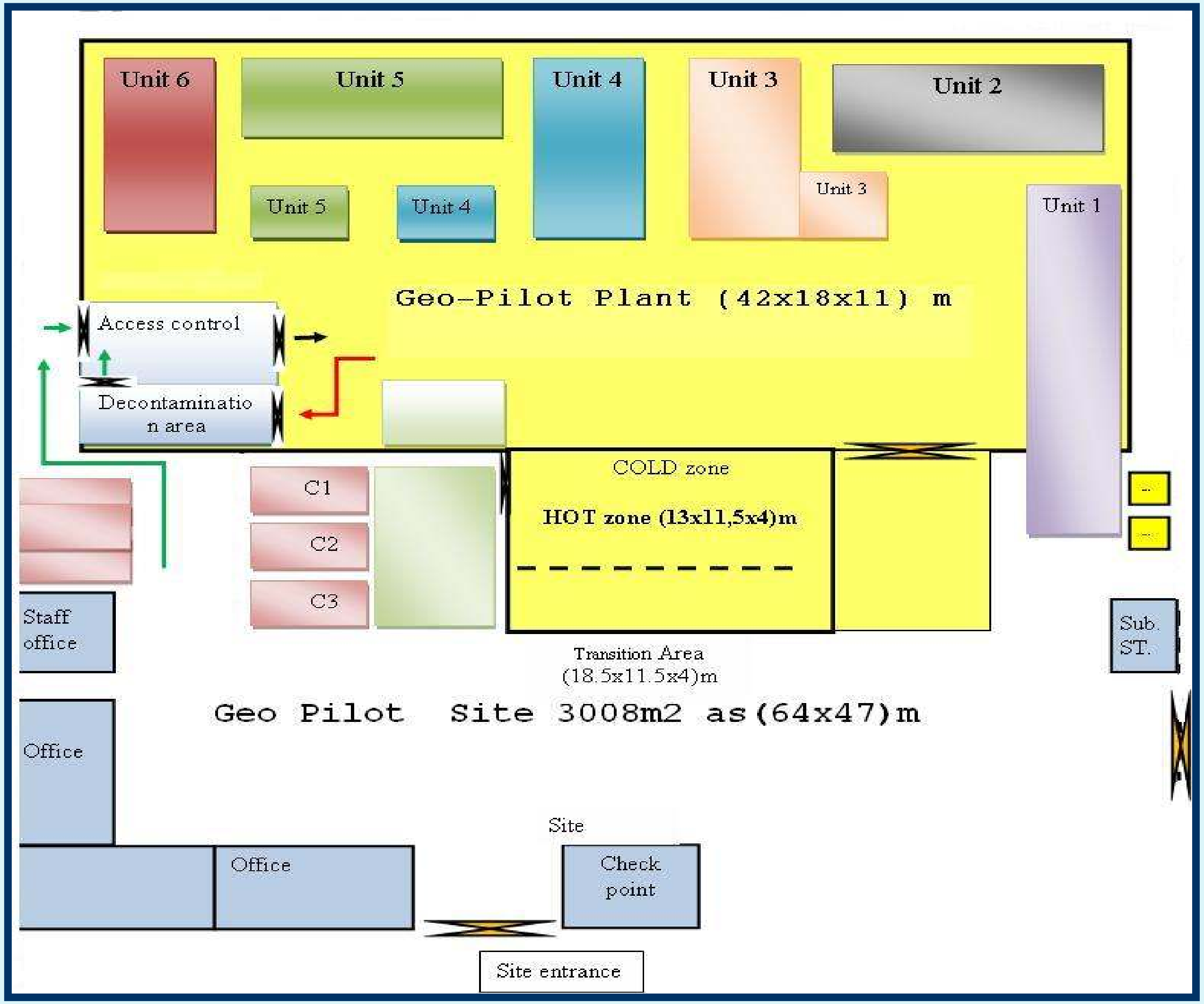
The principal requirement (BSS) is to optimized protection . The optimum clean up action may result in different residual levels in different circumstances

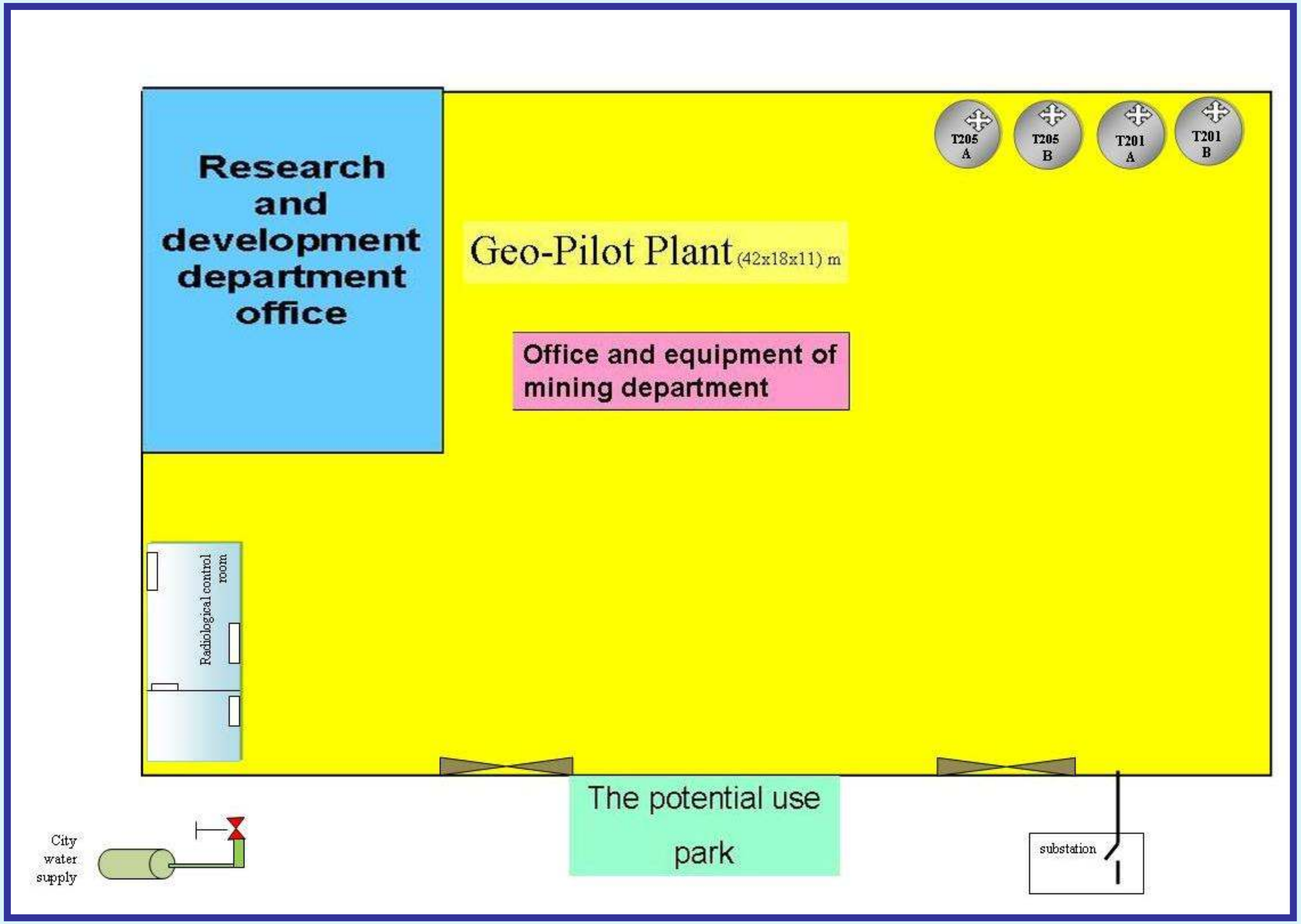
Review the clean up plan for release the site

RPC received the clean up plan of a site as apart of the decommissioning process consist :

- Site characterization
- clean up objective
- Project management
- dose assessment
- measures for radiation protection and safety
- Management of waste
- Environmental impact assessment
- Final radiological survey

The dose assessment include the scenario which defined the potential uses of the sites





Research and development department office
Geo-Pilot Plant (42x18x11) m
T205 A
T205 B
T201 A
T201 B
Office and equipment of mining department
Radiological control room
City water supply
The potential use park
substation

Decision to release the site

RPC inspectors performed to the site being considered for release include review of the clean up and monitoring procedures review of the management system independent monitoring and analysis of compliance with release criteria.

Inspection

The final survey of the clean up plan divided the site into :

- Plant shed class (2) … including ground and 2m up the ground divided into (2x2)grids.
- plant shed class (3) … include wall up to 2m divided in to (3x3) grids.
- Cold zone include un contaminated equipment.
- hot zone include contaminated equipment.
- the area surrounding the site.

The result of final survey

Survey unit (1) G.P.P. ground contamination and dose rate measurement													
Grid No.	CAB(α+β)c/s			Ludlum (α+β)c/s			Grid No.	CAB(α+β)c/s			Radeye(α+β)c/s		
	Max.	Min.	Ave.	Max.	Min.	Ave.		Max.	Min.	Ave.	Max.	Min.	Ave.
G00	1.1	0.3	0.64	2.0	0.5	1.17	39	0.8	0.4	0.56	0.64	0.45	0.52
01	0.8	0.2	0.58	0.85	0.69	0.76	40	0.7	0.4	0.52	0.62	0.38	0.46

Survey unit (1) - G.P.P. Brick walls contamination and dose rate measurement													
Grid No.	CAB(α+β)c/s			Radeye(α+β)c/s			Grid No.	CAB(α+β)c/s			Radeye(α+β)c/s		
	Max.	Min.	Ave.	Max.	Min.	Ave.		Max.	Min.	Ave.	Max.	Min.	Ave.
W1/01	0.8	0.2	0.49	0.6	0.35	0.49	W3/01	0.7	0.3	0.56	0.63	0.37	0.48
W1/02	0.8	0.3	0.54	0.63	0.42	0.52	W3/02	0.7	0.3	0.53	0.63	0.37	0.5

Survey unit (2) - G.P.P. Metal sheet walls (with fans and I-beam structures) and ceiling contamination and dose rate measurement													
Grid No.	CAB(α+β)c/s			PCM5(α+β)c/s			Grid No.	CAB(α+β)c/s			PCM5(α+β)c/s		
	Max.	Min.	Ave.	Max.	Min.	Ave.		Max.	Min.	Ave.	Max.	Min.	Ave.
W1/05 window	0.8	0.2	0.46	1.8	0.4	1.08	W4 /50 I-Fan	1.0	0.3	0.41	1.5	0.4	0.77
W1/12 Ed.	0.9	0.3	0.5	0.61	0.4	0.5	W4/ 50 I-beam Z3	0.5	0.2	0.3	0.9	0.4	0.52

Survey unit (3) – Transition Area ground contamination and dose rate measurement													
Grid No.	CAB(α+β)c/s			Radeye(α+β)c/s			Grid No.	CAB(α+β)c/s			Radeye(α+β)c/s		
	Max.	Min.	Ave.	Max.	Min.	Ave.		Max.	Min.	Ave.	Max.	Min.	Ave.
G00	0.9	0.2	0.47	0.53	0.37	0.42	G27	0.9	0.3	0.67	0.69	0.44	0.6
G01	0.7	0.2	0.46	0.61	0.38	0.5	G28	0.9	0.4	0.66	0.68	0.41	0.56

Survey unit (4) Transition Area walls and ceiling contamination and dose rate measurement													
Grid No.	CAB(α+β)c/s			Radeye(α+β)c/s			Grid No.	CAB(α+β)c/s			Radeye(α+β)c/s		
	Max.	Min.	Ave.	Max.	Min.	Ave.		Max.	Min.	Ave.	Max.	Min.	Ave.
W1/01	0.7	0.3	0.51	0.52	0.42	0.5	C00	0.9	0.3	0.68	0.66	0.35	0.47
W1/04	0.9	0.4	0.64	0.61	0.4	0.51	C04	0.8	0.3	0.64	0.56	0.35	0.43

Survey unit (5) Site yard contamination and dose rate measurement

Grid No.	CAB(α+β)c/s			Radgam(α+β)c/s			Grid No.	CAB(α+β)c/s			Radgam(α+β)c/s		
	Max.	Min.	Ave.	Max.	Min.	Ave.		Max.	Min.	Ave.	Max.	Min.	Ave.
G06	0.9	0.1	0.55	0.6	0.37	0.54	G77	0.9	0.2	0.65	0.62	0.35	0.47
G15	0.9	0.3	0.58	0.61	0.36	0.47	G80	1.0	0.2	0.55	0.7	0.41	0.55

Equipment name	CAB(α+β)c/s			Radgem (α+β+γc/s)		
	Max.	Min.	Ave.	Max.	Min.	Ave.
The Crasher	3.8	0.4	2.1	4.2	0.3	2.25
The Belt B101/L1	0.9	0.2	0.59	0.58	0.3	0.45

Equipment name	CAB(α+β)c/s		
	Max.	Min.	Ave.
The reactor R201A/ inner surface before shaving	1.8	0.4	0.8
The reactor R201A/ inner surface after shaving	2.4	0.4	1.12
The reactor R201B /outer surface	1.6	0.2	0.61
The reactor R201B / inner surface before shaving	2.2	0.6	1.09

First Inspection in March 2010

First region (ground under 2m)

(0.011 -0.021) mrem/h

Hot spot 1 after decontamination

0.011 - 0.012 mrem/h

Hot spot 2 (the crusher & the transfer belt) before decontamination

The crusher (0.034-0.046)mrem/h

Hot spot 2 (the crusher & the transfer belt)

The crusher after decontamination (0.008 – 0.013) mrem/h

The transfer belt after decontamination

(0.007-0.010)mrem/h

Hot spot 3 & 4 transfer belt 2 after decontamination

(0.008 – 0.01) mrem/h

Wall inside under 2m after decontamination

(0.005 mrem/h)

Wall up to 2m after decontamination

(0.005 – 0.008) mrem/h

Second Inspection in April 2010

Tanks reactors

T201A after decontamination

(0.029 – 0.032)mrem/h

T201B tank after decontamination

(0.020-0.022)mR/h

T301 after decontamination

(0.011-0.013)mrem/h

T301A,T301B after decontamination

outside (0.003-0.006)mrem/h

T506 after decontamination

(0.007-0.011)mrem/h

Filters

FT401A,FT401B after decontamination

(0.008-0.010)mrem/h

Transport T201A, T201B to AL-Tuwaitha Site

Third Inspection in May 2010

Hot zone after decontamination

(0.06- 0.013)mrem/h




Release criteria

radionuclide's	Un restricted release Bq/gm *
U-235	1×10^{1}
Pa-231	1×10^{0}
Ra-223	1×10^{2}
Th-234	1×10^{3}
Pa-234	1×10^{1}
Ra-226	1×10^{1}
Pb-214	1×10^{2}
Bi-214	1×10^{1}

* BSS 115

Criteria for Clearance

- For exemption and clearance of radioactive material containing more than one radionuclide, using the levels given in the table, the condition for exemption or clearance is that the sum of the individual radionuclide activities or activity concentrations, as appropriate, is less than the derived exemption or clearance level for the mixture (X_m), determined as follows:

$$X_m = \frac{1}{\sum_{i=1}^{n} \frac{f(i)}{X(i)}}$$

where

X_m is derived exemption or clearance level for the mixture ;

f(i) is the fraction of activity or activity concentration, as appropriate, of radionuclide (i)in the mixture;

X(i) is the applicable level for radionuclide i as given in Table I-1 or Table I-2; and

n is the number of radionuclides present.

Problems Encountered, Solutions and Lessons Learned

1. Lack of regulatory requirements for decommissioning
2. Management of non-radioactive waste
3. Improvised Storage Facility
4. Loss of relevant documentation
5. Inadequate record keeping, before and during decommissioning
6. Inappropriate selection of decontamination method
7. Inadequate infrastructure and funds for decommissioning
8. Deriving clearance levels for decommissioning a tanks that used ^{235}U

Summary

By review the final survey Data and Inspection monitoring , it is determine that compliance with the release criteria for the site can be achieved with unrestricted use.

Conclusions

1. Existing constraints associated with funding, the waste management systems and human resources imposed deferred decommissioning on the facilities. Several unexpected problems were encountered and overcome during the implementation of the decommissioning projects.
2. In the case of small nuclear programmes with limited resources, international involvement and cooperation is needed to help in planning and conducting decommissioning projects.
3. The RPC is working cooperatively with the Iraqi Decommissioning Programme (IDP) staff on approaches to identify and preserve decommissioning lessons learned because decommissioning knowledge management is critical to the continued expansion of nuclear sites. Decommissioning experience will be developed in Iraq over the next several years that will be invaluable to the decommissioning of the next wave of plants in Iraq.

THANK YOU