

# Decontamination of NORM Contaminated Facilities & Equipment A Case Study

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## Introduction

The contamination of oil and gas processing equipment with NORM bearing scales can present a radiological hazard in addition to restricted operability. Once NORM contaminated equipment cannot be released for sale or re-use as it has enhanced levels of radioactivity which can lead to exposure of workers, the general public and the environment if not managed appropriately [1].



Fig.1. NORM contaminated tubulars.

## NORM Management

Part of a successful NORM management strategy is the ability to decontaminate equipment which has become contaminated with NORM. The removal of relatively insoluble NORM scale which has become adhered to equipment surfaces requires aggressive agitation of the surface to remove the NORM contamination. The control of NORM contamination removed from contaminated equipment and the protection of workers during the decontamination process are achieved primarily by engineering controls, however these must be supported by administrative procedures and personal protective equipment.



Fig.2. Screening suspect NORM contaminated equipment



Fig.3. Handling NORM contaminated equipment

## Design Specification

The design specification detailed the operating criteria key areas required to ensure the safety of workers and adequacy of controls to restrict the spread of NORM contamination.

- Operating Criteria
- Required Operating Areas
- Liquid Recirculation System
- Control of Equipment
- Inspection of Equipment
- Monitoring of Equipment
- Safety Related Systems

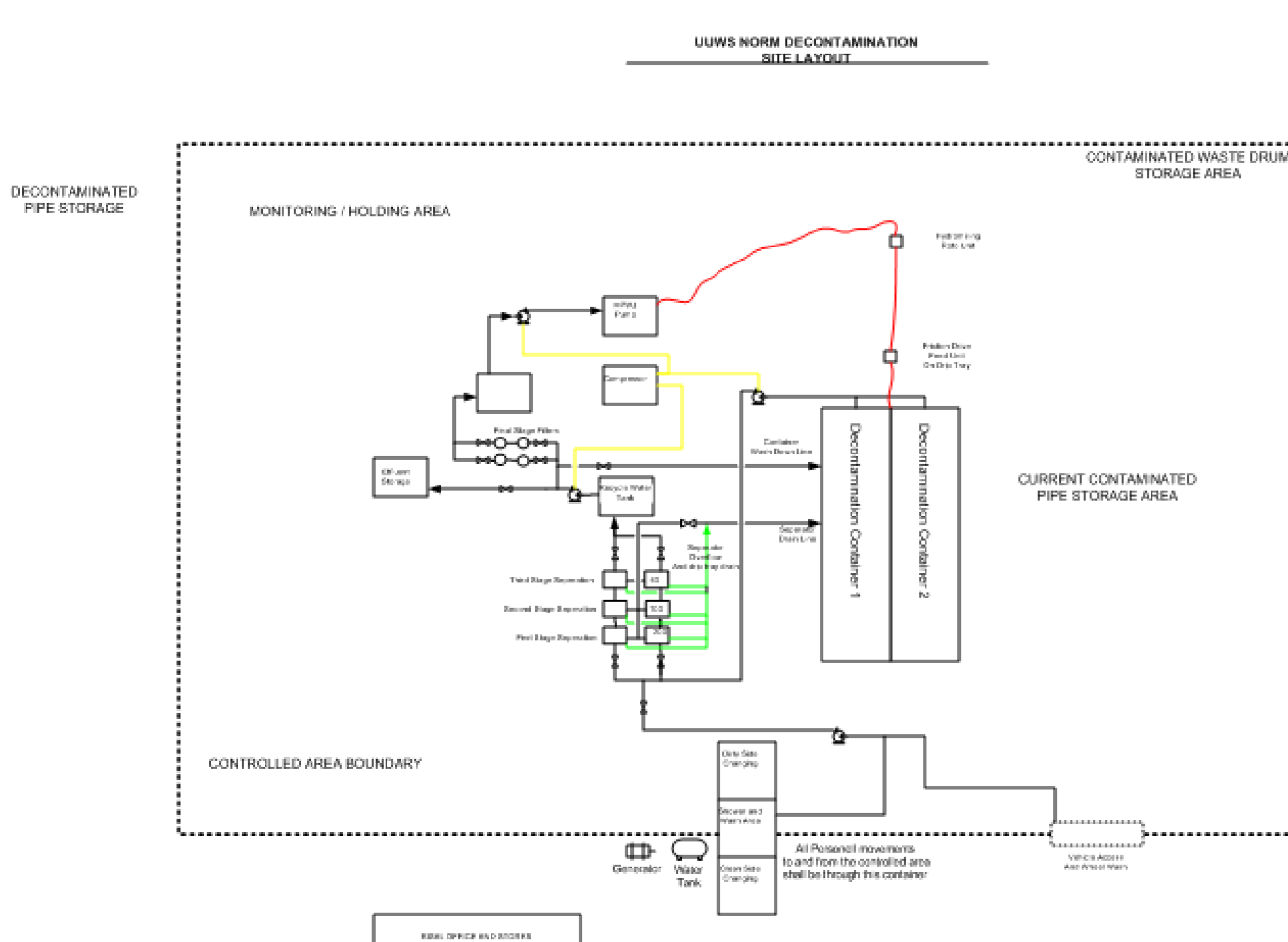


Fig.4. Schematic of decontamination facility

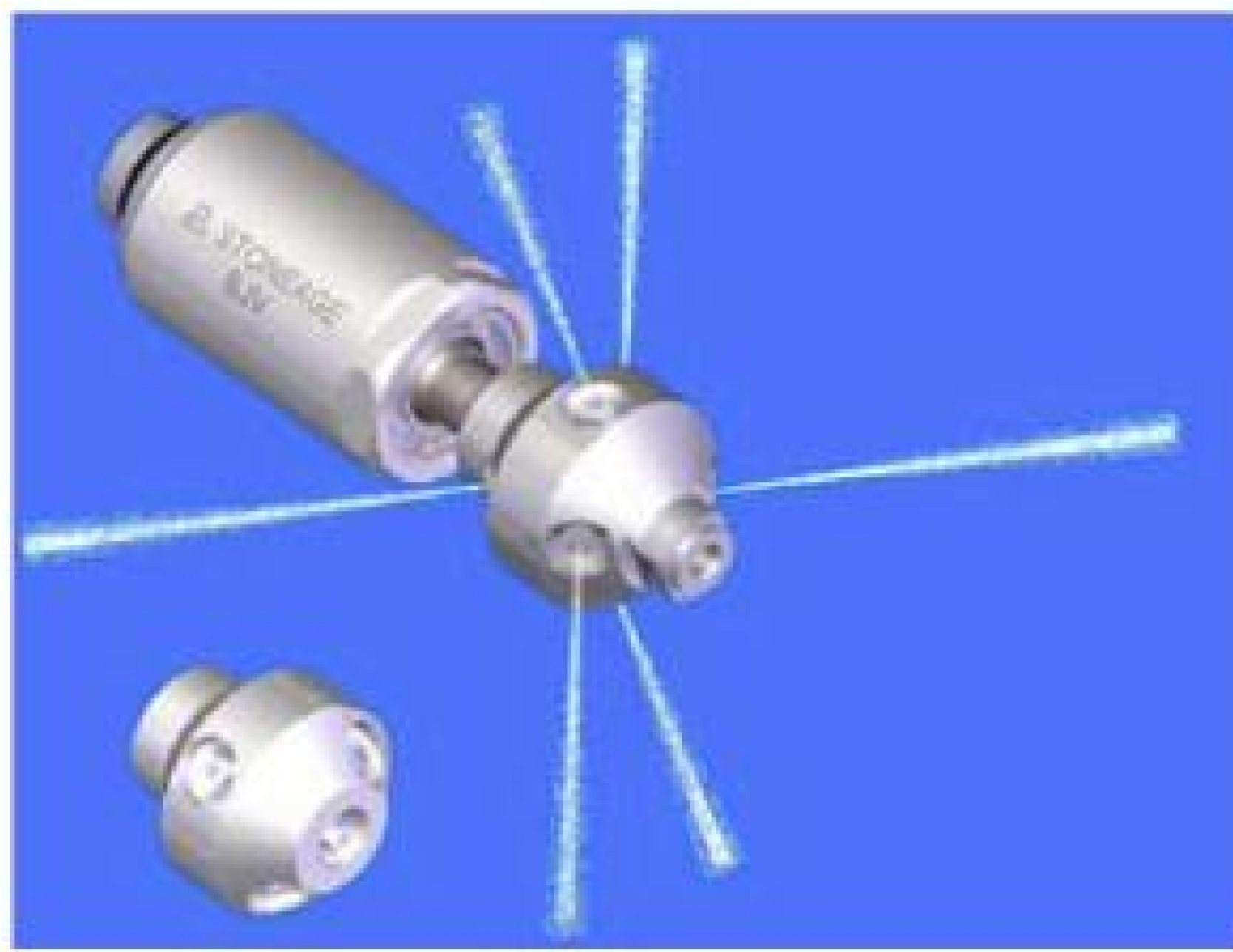


Fig.5. Schematic of High Pressure Water Jetting Head [2]

The acceptance criteria for successful decontamination was:

- All equipment must be visually clear of scale.
- All equipment must be free of detectable radioactive contamination above background level.

## Tubulars



Fig.8. Tubular is placed in containment area



Fig.10. Lance delivering HPWJ is placed through tubular



Fig.11. Process is operated outside containment



Fig.12. External surface cleaning



Fig.13. External Surface after cleaning

## Large Diameter Pipework

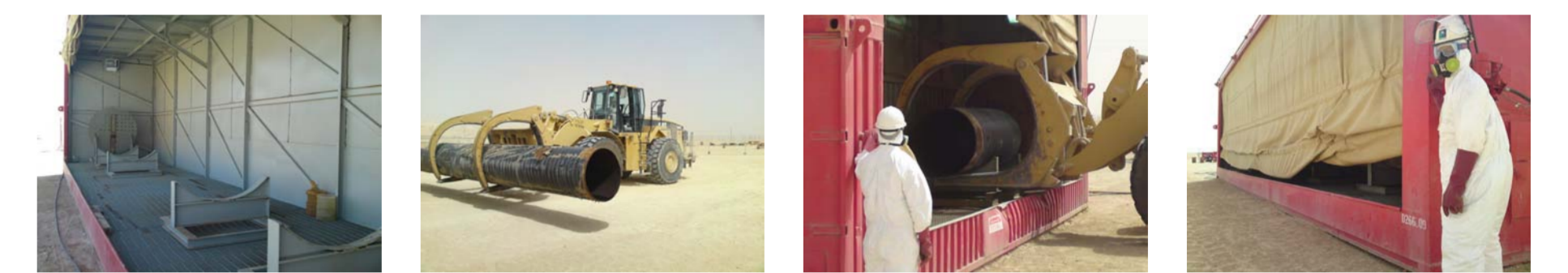


Fig.14. Containment fabricated for large sections of pipework

Large sections of pipework required a different containment structure. Whilst decontamination was achieved by HPWJ, the method employed was Aquamilling® as opposed to jetting. The principles of contamination control and water re-circulation were maintained.

## In situ Decontamination

Some sections of plant required to be decontaminated insitu, the process used the integrity of the plant equipment as containment, and controls were developed for the handling of removed waste and re-circulation of water.



Fig.15. Decontamination of vessel

## Conclusions

1. NORM contaminated equipment & plant can be decontaminated.
2. The process of NORM decontamination is relatively basic, relying on mechanical abrasion of the surface.
3. Controls are required to provide protection to workers and the environment from the hazards associated with NORM.
4. A NORM decontamination operation can be successfully completed without contaminating the environment or delivering enhanced radiation exposure to workers.
5. Planning of resources, including equipment and personnel is important in the successful operation of a decontamination facility.

## References

[1] International Association of Oil & Gas Producers (OGP), Guidelines for the management of Naturally Occurring Radioactive Material (NORM) in the oil & gas industry, Report NO 412, September 2008.

[2] Stoneage Waterjet Tools, BJV-M Nozzle [online] available at <http://www.stoneagetools.com/> accessed 5th May 2009

