

Union Carbide Corporation
Health, Safety & Environmental Affairs
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Memo

To: N W Gaines - Danbury P2
From: M D Buckingham - UCAP
CC: R Natarajan - UCAP
A Cheely - C&P Engineering Sth Chas
S Bose - UCIL
Date: 6 April 1992
Re: Site Rehabilitation

BUSINESS CONFIDENTIAL

Further to our discussion with David Langseth of ADL, and Al Cheely from the Technical Centre, South Charleston on Friday 03 April 1992, the following draft rehabilitation strategy has been prepared for comment and review. This document should be read in conjunction with N W Gaines' memo of 28 August 1992, and should help in the better focus of our various activities associated with this project.

1. Background

UCIL has leasehold occupancy of the two sites at Bhopal, the larger 65 acre site containing the initial formulation plant and chemical manufacturing operations, while the second 34 acre site consists of three solar evaporation ponds. Both sites remain essentially as they were in December 1984, though all working inventories have now been removed from the main plant and recent monsoons have been used to concentrate calcium chloride contamination from Ponds 2 and 3, in Pond 1, which also has trace contamination of organics especially naphthols. The lease of the sites is conditional on continued chemical manufacture by UCIL, and these leases will be relinquished by UCIL as soon as feasible. Demolition of all process plant and cleanup of any soil contamination to risk evaluated standards is required as a precondition for this.

UCIL has appointed Arthur D Little (ADL) as their consultant for this work, and have negotiated with the Government of India (GOI) and Madhya Pradesh State Government

(MP) agencies, for the appointment of NEERI to conduct detail site evaluation and validate completion of the remediation process.

2. Objectives

- a. Rehabilitate both of the main 65 acre plant site and 34 acre pond site to environmental standards established by NEERI/ADL, and acceptable to GOI and MP State authorities. These standards will be based on risk related criteria related to projected future use patterns. The lease on both locations is intended to be surrendered to MP State authorities as soon as feasible.
- b. Maximise the retention of buildings and infra-structure (roads, storm water drains and electrical utilities) on the main site for residual value retention, and optimise the demolition and rehabilitation activities.
- c. Develop with MP State authorities land use control zoning, or equivalent device, that ensures main site continues as industrial site, designated disposal pits remain isolated, and pond area is retained as either industrial (preferred) or agricultural use, but not residential.
- d. Maintain credibility with NEERI, GOI and MP State agencies, local and international interest groups,

3. Suggested Specific Programs

- a. Complete UCIL initial screening appraisal of main site soil contamination level, confirm ground water well installation standards including the survey of all existing well locations and depth of the respective water levels in each of the wells.
- b. UCIL to appoint NEERI to initiate their assessment of both the major site and ponds and develop in conjunction with ADL, a remediation strategy for both locations. Timing dependent on expectation of continuity of work program by NEERI - not expected before 3Q92.
- c. Identify options for the establishment of ppb GC-MS analytical capability that meets US-EPA QA criteria within India for site evaluation, remediation validation and long term monitoring of the remediated site. Alternatives appear to be either by retrofit of existing UCIL lab equipment or purchase of new equipment. Equipment might be located at main site or UCIL Research Laboratory.
- d. Ponds;

- continue program to collect high salt liquors in Pond 1 (to minimise potentially contaminated soil) through 1992 monsoon.
- reconfirm level of salt contamination in liner cover soil for Ponds 2 and 3 after the 1992 monsoon and review reclamation options
- develop removal and Incineration disposal procedures for pond 4mil PE liners.
- develop with NEERI /ADL remediation program for Ponds addressing both the interaction with the main site timetable and specific issues of;
 - soil analysis under liner, especially in any identified high risk areas,
 - final land profile to minimise surface water drainage from rehabilitated ponds.
 - initial crop sowings and validation procedures prior to return of land to MP authorities.
- establish with NEERI/ADL procedures for contractor implementation of this program that address both physical constraints of the pond site and IH issues.
- UCIL, using contractors and in accord with NEERI /ADL direction will implement remediation - unlikely before late 1992 or 1993.

e. Main Site;

- development by UCIL of detailed assessment of extent of process plant contamination - noted all storage tanks have been cleaned but naphthol plant could require significant work - and any other key issues such as asbestos removal requirements for insulation or asbestos-cement sheeting on naphthol building.
- Implementation by UCIL of their Incineration disposal plans for residual tars and burnt naphthol - total approx 100t.
- development by UCIL of legal terms of transfer of ownership of any residual plant now held on site to limit equipment usage.
- Identification by UCIL of options for cleaning contaminated equipment, support facilities needed and means for disposal of washings.
- UCIL to establish continuing constraints by CBI, if any, on the demolition of the MIC plant.
- reconvene, through MP authorities, the 'specialist committee' (SC) and establish definitive program for decontamination and implement through contractors under direction of UCIL personnel to satisfaction of SC - estimated at 2 months approx.
- appoint demolition contractor and implement removal of designated plant to grade level - estimated at approx 6 months but ability of UCIL to supervise demolition may limit rate of plant removal.

- remove all underground process lines and process sewers, and confirm adjacent soil is not contaminated at levels beyond acceptable risk related limits.
- In parallel with above program and in conjunction with the soil analysis from the pond area, using the Initial UCIL soil evaluation, NEERI/ADL to validate extent of soil contamination, ground water issues if any, and establish remediation program addressing exposure risk assessment, collection of any contaminated soil, disposal in a secure pit on the main site - along with residues from the pond area, revalidation of cleanliness of remediated areas, and definition of any ongoing ground water monitoring program. Included in this program establish whether existing slabs of buildings or structures to be demolished have contamination in or under them and identify need to break and remove - preference to retain these slabs for future buildings. Note some slabs may need to be demolished to provide for the secured land fill unit.
- appoint contractors to implement this program - including the construction of the designated disposal pit, under the direction of UCIL personnel., to the satisfaction of NEERI/ADL.
- validate cleanliness, to satisfaction of NEERI/ADL, of formulation building area by wall wipe tests - implement remediation program if necessary.

f. Establish US training program for UCIL Site Manager C K Hayram mid 1992.

4. As an end point UCIL will aim to have;

- secured all contaminated soil, process plant washings and pond soil residues within the main site subject to on going surveillance,
- provided an industrial park opportunity for future employment opportunity in the area,
- returned the pond area to agricultural use after confirmation that crops are not adversely affected nor chemical plant uptake exists.

Your comments and advice will be appreciated.