SOIL SURVEY
AND
SAMPLING

PLAINTIFF'S EXHIBIT

UC-4374

DE 004868

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UNION CARBIDE CORPORATION
CENTRAL RESEARCH AND ENGINEERING TECHNOLOGY
HEALTH, SAFETY & ENVIRONMENTAL TECHNOLOGY
SOUTH CHARLESTON, WEST VIRGINIA

M E M O R A N D U M

TO: B. R. Adler, Danbury E3
Belia Cortez, Brownsville
J. B. Evans, Danbury K4
R. W. Lasher, Danbury K4
M. A. Tapp - Clear Lake City

FROM: S. G. Gilbert

DATE: July 8, 1988

CC: A. C. Booth
A. H. Cheely
P. R. Kavasmaneck

RE: Proposal - Brownsville, Texas Plant Site Survey for Soil and Ground Water Conditions

We are pleased to submit this proposal for environmental technology services, per your request. The services include a survey for soil and ground water conditions at the site of the Solvents and Coatings Materials (S & CM) Division plant in Brownsville, Texas. J. B. Evans is respectfully requested to authorize or comment on this proposal by July 18, 1988.

The survey provides S & CM with an indication of the subsurface contamination at the production, distribution, maintenance, and certain waste management areas at the plant. The survey will:

- indicate with reasonable certainty if contamination exists at each of the specific sites in the plant.
- where contaminants are found, determine the concentration of selected contaminants in the soil samples.
- provide an initial assessment of the potential risks posed by each site by comparing the collected information against health and environmental effects and standards for the detected compounds.
- recommend future work necessary for a thorough assessment of health and environmental risks posed by uncontrolled development of the site.

DE 004869

For a thorough assessment of future health risks posed by uncontrolled development of the site, additional information such as:

- maximum contaminant concentration
- depth and areal extent of contamination
- identification of all compounds posing health hazards

would be needed. For a thorough assessment of potential risks to the environment (principally ground and surface water), the following information would probably be needed in addition to that identified as health risk factors:

- ground water quality
- in-situ biodegradation rates for the contaminants of concern
- determination of direction and rate of ground water flow

None of this additional work is included in the above cost and schedule, but it could be a second phase of work, if necessary. We would expect to work closely with S & CM representatives when developing the scope of the second phase.

Details of the survey are to be developed and documented in a detailed work plan to be submitted to S & CM for discussion and approval in advance of major expenditures. In the development of the work plan, it may become evident that some aspects of the survey could be made more effective or efficient than as described in this proposal. We intend to capitalize on these opportunities, with the changes highlighted for your review and acceptance. Examples of possible opportunities include the determination that less sensitive analytical tests are required, and the use of in-house laboratory resources.

Major elements of the work include:
- preparation of detailed work plan
- preparation of work safety and health plan
- on-site soil and ground water sampling
- soil and ground water analysis
- data interpretation
- preparation of report

Based upon the attached scope of work, we estimate the cost for the initial site assessment to be in the range of $240,000 to $410,000, depending upon the level of detail in the survey, and the investigation requirements, as determined on a site-by-site basis. The elapsed time estimated to be 22 weeks from release to perform the work to delivery of the final report is estimated to be 22 weeks.

We understand that this program is a significant expenditure, and have taken measures to control cost. For example, the analytical costs have been substantially reduced by the use of reliable but non-protocol methods. The number of soil samples have been held to a minimum consistent with the overall study objectives.

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ACL Doc 18949 · Page 3 of 15 **asbestosclaims.law/library/18949/3**

Further trimming of this study by reducing the number of sites evaluated or by using less effective analytical techniques would be inefficient. The results of a trimmed study would be much more difficult to defend on a technical basis. The fixed costs of the study (sample collection, safety program, administration, etc.) would not be substantially reduced by the trimmed survey. An abbreviated first phase will result in a second phase which is less well planned, more time-consuming, and more costly. We believe we have struck a good balance between cost and quality, consistent with S & CM objectives.

Note that our plan includes the disposal by S & CM Division of all wastes generated as a result of this survey.

A detailed scope of work is attached. We propose to use NUS Inc., (Houston Office) to conduct the on-site soil and ground water work, and to prepare draft reports. NUS is recommended since they are familiar with the facility and facility personnel. If schedule and manpower limitations permit, the analytical portion of this work may be shifted to UCC laboratories at the South Charleston Technical Center. The final determination of laboratory will be made in the preparation of the detailed work plan. We also propose to use NUS laboratories. We are planning on limited on-site support to be provided by S & CM, primarily for site safety activities.

Please contact me with your questions regarding this proposal at (304) 747-5326. We look forward to performing this interesting assignment for Solvents and Coatings Materials Division.

S. G. Gilbert, Jr., P. E.

SGG0607
07/08/88
Enclosure

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SCOPE OF WORK

Brownsville, Texas Plant Site Survey

for

Soil and Ground Water Conditions

Central Research and Engineering Technology

Environmental Engineering Skill Center

South Charleston West Virginia

July 8, 1988

Survey Objectives

In support of a transfer of the property lease, the Brownsville, Texas manufacturing site will be evaluated for soil contamination. The survey will focus on sites where soil or ground water contamination is suspected; sites where there is no indication of a release will not be surveyed. An initial assessment of the environmental and health risks posed by future uncontrolled use of the site will be provided, based upon the available data. The survey will not determine the areal extent, depth, or complete description of contaminants for each release. Recommendations for further investigation will be provided, if such investigation appears warranted.

Technical Approach

Areas where soil contamination has potentially occurred will be identified from historical information and visual inspection. A minimum number of samples will be taken at each potentially contaminated site to determine if contamination has in fact occurred and is persistent, and to preliminarily characterize the contamination. The collected field data will be compared against available information on compound fate, and environmental and health effects to make an initial assessment for each specific site.

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Environmental Fate and Effects and Health Effects Survey

An initial literature review will be performed to determine the levels of concern for the compounds likely to be present. The review will include the collection of readily available data, including:

- biodegradability
- vapor pressure
- solubility
- density
- established safe levels in water, air, soil (where available)
- environmental effects
- odor threshold
- health affects from exposure

Understanding the levels of sensitivity for specific compounds in advance of the field survey provides the following benefits: First, the information is needed to make intelligent management decisions about the study and its findings. Second, the analytical techniques may be tailored to the specific need, and analytical costs are controlled. Finally, much of the information should be collected anyway at this time for the site investigation safety and health plan.

Selection of Survey Areas

A plant history will be developed from available documents, interviews with past and present employees, aerial photographs, and on-site reconnaisance. Collection of the aerial photographs is under way.

Sample locations within individual sites will be selected to represent the most likely and highest contaminated areas, based upon the available historical information and visual inspection.

Detailed Work Plan

A written plan for performance of the field and laboratory work will be prepared. The plan will assure that there is thorough understanding of work assignments and schedule among the project participants. The plan will be provided to S & CM for comment. Preparation of the plan also includes procurement arrangements, peer review, and scheduling.

Work Safety and Health Plan

A site safety and health plan is needed to assure protection of UCC employees, contract employees, the public, and is required by Central Research and Engineering Technology policy.

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ACL Doc 18949 · Page 6 of 15 asbestosclaims.law/library/18949/6

The plan will include the following sections:

- Responsibility
- Systems Analysis
- Training Requirements
- Personnel Protective Equipment
- Medical Surveillance
- Identification of Safety and Health Hazards on Site
- Site Control Measures
- Decontamination Procedures
- Standard Operating Procedures
- Contingency Plan
- Underground Utility Identification Procedure

A prestartup safety meeting will be conducted at the job site, with contract technical and drilling employees in attendance.

Analytical Methods

A screening test will be used for soil samples collected where the probable contaminants, if any, would be low molecular weight acids and alcohols. The analytical methods are described in the attached proposal prepared by NUS. Use of the Technical Center laboratory resources instead of NUS will be reconsidered when the project schedule and requirements are more firmly established. UCC labs will be used if the needed manpower and equipment are available, and if the change is cost-effective.

In preparation of the detailed work plan, the environmental fate and effects information and health information will be compared to the analytical sensitivities of the analyses. If wide disparities exist, revisions to the analytical methods will be considered. This will assure the required information is acquired at minimum cost.

An appropriate number of trip blanks and sample duplicates will be included in the program for quality assurance/quality control.

Selected soil samples (approximately 1 in 10 samples) will be analyzed for volatile and semivolatile organics, and heavy metals. This will determine if constituents have been missed by the analytical techniques used on most of the samples. If critical constituents are detected at levels which are of concern in these selected samples, they may be added to the analytical protocols used in subsequent work. Also, areas where contaminants not detected by the indicators but from site history may be present will be targeted. For example, the garage and construction stores areas should be analyzed for a more complete suite of compounds. The laboratory chemist will be provided with a list of compounds potentially handled in past site industial activities for use in the review of the analytical data.

On-Site Soil and Ground Water Sampling

The program intent is to determine with reasonable certainty if the proposed sampling sites have contamination remaining from past industrial activity. The principal method of evaluation of each site will be by sampling and analyzing soil samples. For a solid waste landfill area, the presence or absence of ground water contamination is to be determined.

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ACL Doc 18949 · Page 7 of 15 asbestosclaims.law/library/18949/7

Analysis of selected near-surface soil samples is a sensitive and specific indicator of site contamination. The soil samples will be taken at locations where leakage or dumping of materials is most likely to have occurred. Ground water samples will be utilized to determine area-wide effects of solid waste landfills.

Preliminary surveys indicate soil contamination may have occurred at the sites shown in Tables 1, 2, and 3. Table 1 lists the sites proposed for soil contamination investigation. Table 2 lists the sites proposed for ground water contamination investigation. Sites included in Table 3 are being addressed separately and are not included in this work plan. The sites in these tables are subject to revision as additional historical information is collected and assimilated.

A summary of the sites to be surveyed for soil contamination, with ranges of soil samples per site, is provided in Table 4. Ranges of soil samples are provided to indicate the magnitude of sampling required for each group of sites. The number of samples will be made more specific for each site as the overall study objectives become more sharply focused, and detailed histories, visual inspections, underground utility locations, and other factors are collected and considered. The detailed work plan will be more specific about the number and location of samples per site; final determination of sample locations will be by the on-site hydrogeologist supervising the soil sampling.

For the sites proposed for ground water monitoring, five wells are included in this preliminary plan for the combined area of all the sites. For this large area, monitor wells at each corner, plus a location in the middle of the site is proposed. This is a reasonable minimum number of sample locations for evaluating if ground water contamination has occurred. Additional wells may be required in the future to fully define ground water conditions, if contamination is indicated.

For the iron oxide catalyst piles, several representative samples of waste material will be excavated and analyzed for volatile and semivolatile organics, and heavy metals to determine if there is potential for ground water contamination from the waste. The samples will be collected from deep within the piles to minimize the effects of weathering.

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ACL Doc 18949 · Page 8 of 15
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TABLE 1

SITES TO BE EVALUATED FOR POSSIBLE SOIL CONTAMINATION

Zone	Description	Size	Evidence of Release
26	Waste Acid Lines and Energy Systems Boilers	Medium	Known and suspected spills
26	Fuel Unloading	Small	Likely spills
46	Garage	Small	Suspected oil and fuel spills
16	Construction Stores	Small	Construction Fuel storage and suspected Fuel spills
48	Sandblasting/Painting	Medium	Spent sandblasting sand containing heavy metals, and paint solvents
68	Fire Training Pit	Large	Known fuels and wastes burned on the ground
76	Drum Cleaning	Small	Visible signs of release
44-45	Amoco Pond	Very Large	No vegetation, past use for wastewater disposal
24	#6 Oil Storage Tanks	Very Large	Oil service, large quantities of material, no direct evidence of a release
12-13	Chemical Storage Tanks	Very Large	Recorded spills, visible releases, likely spill area
42	Stores Drum Storage	Small	Drummed materials stored outside
52,53,62,72,73,82	Process Area	Very Large	Visible spill evidence, known spills, known operating practices
58,68	Refinery Site for Carthage Hydrocol (Gas Oxidation)	Very Large	Typical operating practices of the 1950's
82	Amoco Ground Burner	Small	Suspected spills
92	UCC Ground Burner	Small	Suspected spills
76	Old oil skimmer pits	Small	Suspected spills
	45	Water Separator Small	Wastewater unit
82,92	North Wastewater Pond	Very Large	Wastewater unit

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TABLE 2

SITES TO BE EVALUATED FOR POSSIBLE GROUND WATER CONTAMINATION

Zone	Description	Size	Evidence of Release
78	Scrap Pile*	Large	Suspected releases from visible cans, drums, etc.
78	Trash Pile*	Large	Suspected releases from visible cans, drums, etc.
96,98	Garbage*	Large	Suspected releases from visible cans, drums, etc.
86,98	Perlite*	Large	Known disposal of insulation
86	Concrete Rubble*	Large	Visible concrete, suspect chemical dumping
98	Insulating Asbestos*	Large	Notations on drawing
82,92,45,88	Catalyst	Very Large	Iron Oxide catalysts were either buried or deposited at these locations

(* indicates to be investigated as one large site)

DE 004877

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TABLE 3

SITES NOT INCLUDED IN SURVEY

Zone	Description	Size	Reason Not Included
38	Linde Unit	Medium	Future status not determined
56,66	Salvage Yard	Large	Site reportedly contained only clean materials
86,96	Catalyst Ball Mill Residue	Large	Addressed as SWMU unit
76	Incinerator	Medium	Addressed as RCRA unit
46	Fuel Tanks at Garage	Small	Has been removed with no apparent release
65	Tank 3326	Medium	Addressed as RCRA unit
26	#2 Fuel Oil Tank	Medium	Site reportedly used only once with no release during this use
12	Building 127 Bulk Stores	Small	No evidence of release
32	Tank 3210	Small	Addressed as RCRA unit
42	Tank 4267	Small	Addressed as RCRA unit
52	Tank 5207	Small	Addressed as RCRA unit
52	Tank 5216	Small	Addressed as RCRA unit
53	Tank 5211	Medium	Addressed as RCRA unit
	RX-1 Caustic Tank	Small	Addressed as RCRA unit
	RX-2 Caustic Tank	Small	Addressed as RCRA unit
86	Mixed Acid/Residue Oil	?	Addressed with Catalyst Ball Mill Residue
46	Unleaded Gasoline Tank	Small	Tank and release have been removed
-	100 Acre Wastewater Evaporation Ponds	Very Large	(4) Addressed separately
	Q-107 Recovery Sump	Small	Addressed as UST
	Q-110 Recovery Oil Separator Sump	Small	Addressed as UST
	Q-114 Final Oil Separator Sump	Small	Addressed as UST
	Q-133 Pumphouse Oil Separator Sump	Small	Addressed as UST

DE 004878

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TABLE 4

SUMMARY - SITE GROUPS AND ESTIMATED SOIL SAMPLES
(SOIL SAMPLING SITES)

Group (by size)	Sites/ Group	Sample Locations/ site (range)	Soil Samples/ site (range)	Total (range)
Small	9	1-3	2-6	18-54
Medium	2	3-5	6-10	12-20
Large	1	4-10	8-20	8-20
Very Large	6	5-15	10-30	60-180
Grand Totals	18			98-274

TABLE 5

WIDE-RANGE ESTIMATE - DEEP BORINGS AND SOIL SAMPLES

Group (by size)	Sites/ Group	Avg Deep Borings/ site	Avg Soil Samples/ site	Total Samples
Small	9	1	2	18
Medium	2	2	4	8
Large	1	3	6	6
Very Large	6	4	8	48
Grand Totals	18			80*

(* Wide range estimate of +/- 40% quality results in range of 48 to 112 soil samples for analysis from deep boring program)

For the soil borings, locations where soil contamination is most probable will be determined from historical information and visual inspection. The field geologist may determine on the site that additional samples are warranted. At each of these locations, two initial soil samples will be collected at selected depths. The first sample will be collected near the surface (approximately 6 inches deep) and the second sample will be collected at 2 feet. Soil sampling at these shallow depths allows the use of hand tools for sampling.

Use of hand tools for shallow soil sampling reduces cost, and the soil samples may be collected more quickly. It is unlikely that significant contamination will be missed by taking only shallow soil samples, given the sensitivity of the analytical tests employed. Each soil sample will be visually examined, pH measured, and head space of sample container checked with a portable gas analyzer at the time of sampling.

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ACL Doc 18949 · Page 12 of 15
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Where significant, field-detectable levels of contaminants are found in either of the two soil samples, follow-up sampling will be performed with a drilling rig to determine the depth of contamination at that location. Deeper samples provide a more clear picture of the overall contamination at the site. All drilling will be conducted after the surficial samples are taken to allow careful planning and efficiency. The total number of borings is estimated to range between 24 and 56; the total number of soil samples to be analyzed is estimated to range between 48 and 80. Table 5 provides details for these estimated ranges.

It is expected that EPA protocol sample holding times will be met.

For the sites where ground water samples are to be collected, monitor wells will be constructed. Standard well construction techniques for permanent landfill ground water monitoring will be employed. The wells will be completed through the first saturated conductive zone. The elevations of the casing tops will be surveyed to permit measurement of the potentiometric levels with respect to sea level. Ground water samples will be collected by dedicated bailers for each well. Field measurements of water temperature, pH, static water level, and observations of ground water color and odor will be recorded.

A written sampling plan will be followed for this work. Chain of custody procedures for the samples will be followed. The samples will be shipped by express carrier or transported by UCC personnel to the laboratory. The samples will be iced during transport.

It is assumed for budget and scheduling purposes that work may be conducted with standard personnel protective equipment (Level D). If low level contamination of organic solvents and organic acids are encountered in the drilling and sampling program, impermeable coveralls, respirators, and rubber gloves (Level C) would be required and the field portion of the work would require additional time at greater cost. If high levels of contamination are encountered, requiring self-contained breathing air (Level B), the on-site activities at that boring site will be suspended and S & CM management will consulted. The work safety and health plan will include Levels B, C, and D work.

Data Interpretation

The collected soil boring logs, aerial photos, analytical results, and field observations will be evaluated as a whole for determination of the risk of uncontrolled development of the site and potential environmental harm.

The interpretation will be performed by NUS and UCC geologists and environmental engineers. UCC CRET professionals will perform peer review.

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ACL Doc 18949 · Page 13 of 15 asbestosclaims.law/library/18949/13

Preparation of Final Report

Draft and final reports will be issued. The reports will include:

executive summary
data interpretation
figures of site showing locations of samples and soil stratigraphy
recommendations for future work, if any

The raw data will be provided in an Appendix. The final report will be issued as UCC Business Confidential, with a restricted distribution approved in advance by S & CM. Meetings for one day each are planned to review the draft and final reports with S & CM management.

Project Personnel

This project will be managed by S. G. (Jerry) Gilbert. Jerry has 12 years Union Carbide experience in environmental engineering, including site contaminant studies, hydrogeological evaluations, and site surveys. Jerry is a registered engineer, and holds a M.S. in Civil Engineering.

The environmental program leader for the Brownsville Plant is A. C. Booth. Alan will stay apprised of the project activities and provide advice and guidance on an as-needed basis. Alan holds an M.S. degree in Civil Engineering, is a registered engineer in Texas, and has 11 years experience in the UCC environmental engineering skill center.

Other project personnel will be selected from the staff of NUS, Inc. This consultant is in the second year of a two year national contract with Union Carbide for environmental engineering services, and has performed soil contamination studies at the Brownsville Plant.

Project Schedule and Cost

The total elapsed time for the study is estimated to be 21 weeks.

The activities are planned on the following schedule:

Detailed Work Plan and Safety/Health Plan	4 weeks
On-Site Soil and Ground Water Sampling	4
Soil and Ground water Analysis	8
Data Interpretation and Draft Report Preparation	4
Final Report Preparation	2
Total Time	22 weeks

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The total project cost is estimated to range between $240,000 and $410,000, depending upon the number of soil samples required at each site. This estimate includes the following assumptions:

25% contingencies for weather and unanticipated difficulties.
Work in Level D. Contamination at the site could increase costs due to slower work progress.
Soil and ground water analyses completed by the contract laboratory in 8 weeks.
Disposal of wastes generated during the study by S & CM.

Elements of the estimated project cost are:

Work Element	Minimum	Maximum
Site History, Detailed Work Plan, Safety and Health Plan, Environmental Fate and Effects and Health Effects Survey	$30,000	$30,000
Well Construction and Soil Sampling	35,000	57,000
Analytical Services	93,000	210,000
Data Evaluation and Report	32,000	32,000
Contingencies	50,000	81,000
Total	$ 240,000	$ 410,000

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