Report #80

FINAL WORK PLAN

REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

UNITED NUCLEAR CHURCH ROCK, NEW MEXICO

EPA WA 67.6L15.0

March 9, 1983/4

SLSUPER/18

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CH2M HILL
engineers
planners
economists
scientists

March 13, 1984

W66215.00

Mr. Larry D. Wright/RSPO
USEPA Region VI
1201 Elm Street
Dallas, Texas 75270

Dear Mr. Wright:

Subject: Final Work Plan United Nuclear Site (67.6L15.0)

Enclosed are eight copies of the final Work Plan for the United Nuclear site at Church Rock, New Mexico as requested by Steve Phillips. The total estimated budget for the RI/FS is, $721,626, and the estimated time of completion is 70 weeks. The estimated budget for the RI portion of this project is, $563,000, including $6,000 for community relations.

I very much appreciate Steve Phillip's and your comments and assistance in preparing this Work Plan. I am looking forward to implementing this Work Plan in an expeditious manner.

Sincerely,

Terrence D. Chatwin
Site Project Manager

Enclosures

cc: Nancy Willis, USEPA, Washington, D.C.
Russ Bartley, USEPA, Region 6
Dorothy Tyler, USEPA, Headquarters
Wayne Sellman, CH2M HILL, AWPM-ADM/WDC
Bob D'Agostaro, AZPM-REM/WDC
Bob Davis, CH2M HILL, RPTL/DEN
Mike Harris RPTL/GLO
Bob Schilling RPTL/SEA
Bill Wallace, CH2M HILL, QAM/SEA
Jeff Randall, CH2M HILL, QA/PDX

SLSUPER/16

Salt Lake City Office
187 Wright Brothers Drive, P.O. Box 22045, Salt Lake City, Utah 84122 801/539-0070

SECTION 1
EXECUTIVE SUMMARY

This work plan was prepared and submitted as a requirement of the REM/FIT Zone II contract for remedial planning of uncontrolled hazardous waste sites. Primary objectives of the Remedial Investigation and Feasibility Study (RI/FS) described in this work plan are:

- Delineate the extent and nature of the contaminated groundwater in the Upper Gallup formation north and east of the United Nuclear Corporation (UNC) tailings ponds.

- Delineate the extent and nature of the contaminated groundwater in the alluvium southwest of the UNC tailings ponds.

- Provide data required for the identification, screening, evaluation, and design of a remedial program for the UNC site.

- Using the above data, determine the most cost-effective remedial action for the UNC site.

- Develop a conceptual design of the preferred remedial alternative.

It is anticipated that the documents producted from this effort could be used to support litigation.

This work plan establishes a scope of services to be performed with an associated budget of $721,626 and a performance schedule of 70 weeks.

The UNC site near Church Rock, New Mexico, is currently on the National Priority List. In 1979, a tailings dam broke, releasing 93 million gallons of tailings solution to the Rio Puerco River. The dam has been repaired. After the tailings dam broke, UNC dug two pits to store tailings solution. They also continued to use the existing north pond for evaporation of the solution. These three ponds were reported to be responsible for groundwater contamination in the Upper Gallup formation and alluvium. Private wells are drilled into the Upper Gallup and alluvial aquifers and there is a potential for contamination of these wells.

Currently, CH2M HILL has received work assignments for a Remedial Action Master Plan, and the work described in this work plan.

SECTION 2
INTRODUCTION

This work plan was prepared to define the scope of activities, budget, and schedule anticipated to accomplish work assignments within Remedial Investigation and Feasibility Study (RI/FS) for the United Nuclear Uranium Mill Tailings Site near Church Rock, New Mexico. The work plan includes an overall project schedule and budget as well as detailed estimates of the number of manhours, cost and length of time required to complete each task. Requirements of the work assignments and CH2M HILL's Zone II REM/FIT Management Plan have been incorporated into this work plan along with the results of site-specific discussions with New Mexico Environmental Improvement Division (NMEID) and U.S. EPA personnel.

OBJECTIVE

Primary objectives of the remedial investigation (RI) are to determine the nature and extent of the groundwater contamination in the Upper Gallup and alluvial aquifers, to provide data required to develop and evaluate remedial alternatives. The feasibility study (FS) will utilize the data to identify the most cost effective remedial alternative to be implemented at the United Nuclear site and will develop a conceptual design of the preferred remedial alternative.

BACKGROUND

The Churchrock Uranium Mill Tailings site is located in northwestern New Mexico about 15 miles northeast of Gallup, New Mexico, (as shown in Figure 2-1). The site covers Section 2, Township 16 North, Range 16 West, in McKinley County, New Mexico. The uranium mill and tailings ponds are owned and operated by United Nuclear Corporation (UNC). The mill and tailings ponds are located in Pipeline Canyon, which trends 6 miles in a northeast to a southwest direction. The canyon floor, ranging in elevation from 6,840 to 7,100 feet, is surrounded by mesas that stand over 7,400 feet. The surrounding country is sparsely vegetated and is used as grazing range. The land along the Pipeline Canyon stream is vegetated with grasses typically found in this region.

The United Nuclear mill used an acid leaching process to extract uranium from the ore. The resulting acid solutions and tailings are being stored in the tailings ponds. The tailings solution has been characterized by low pH and high

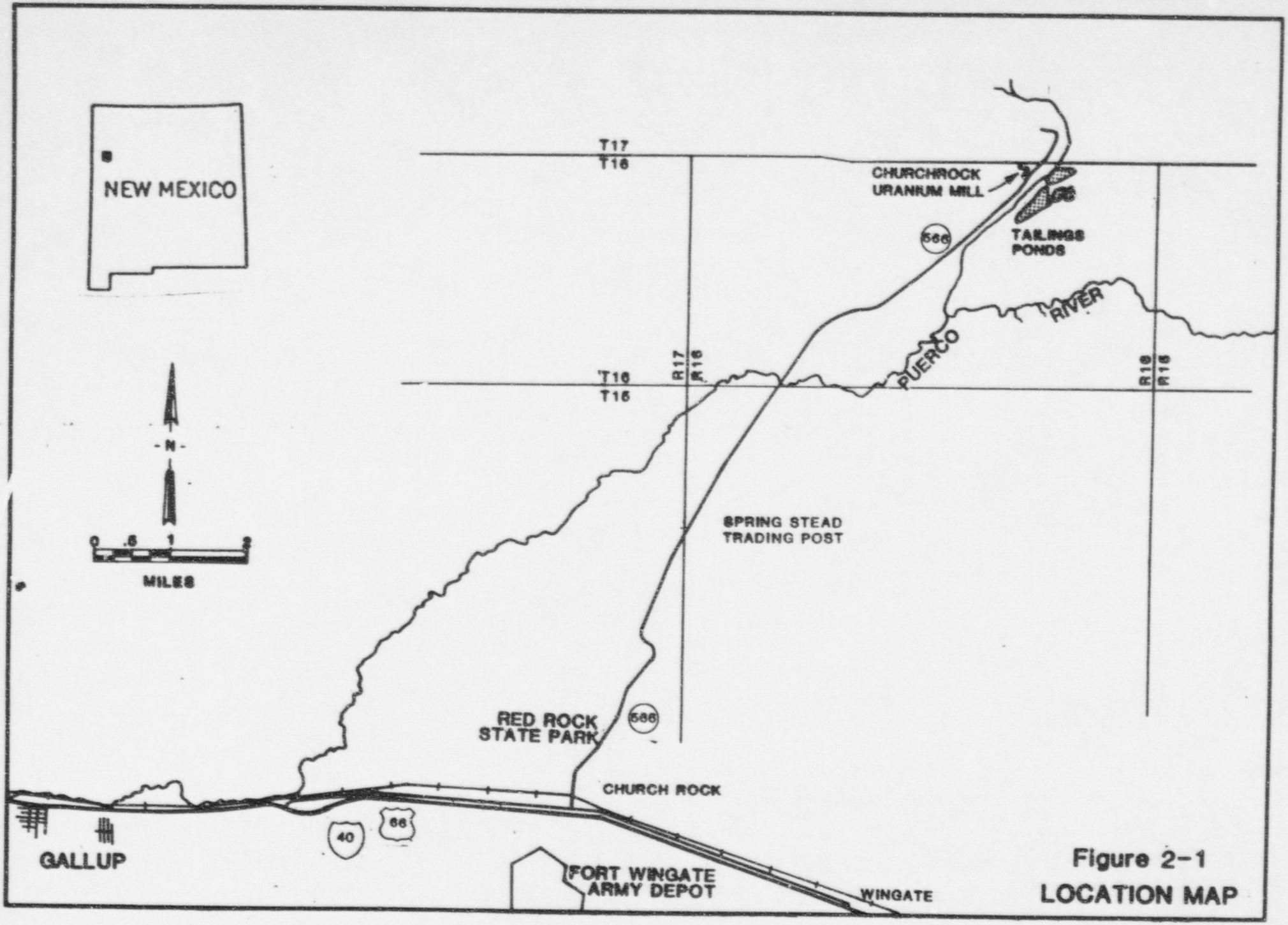


Figure 2-1
LOCATION MAP

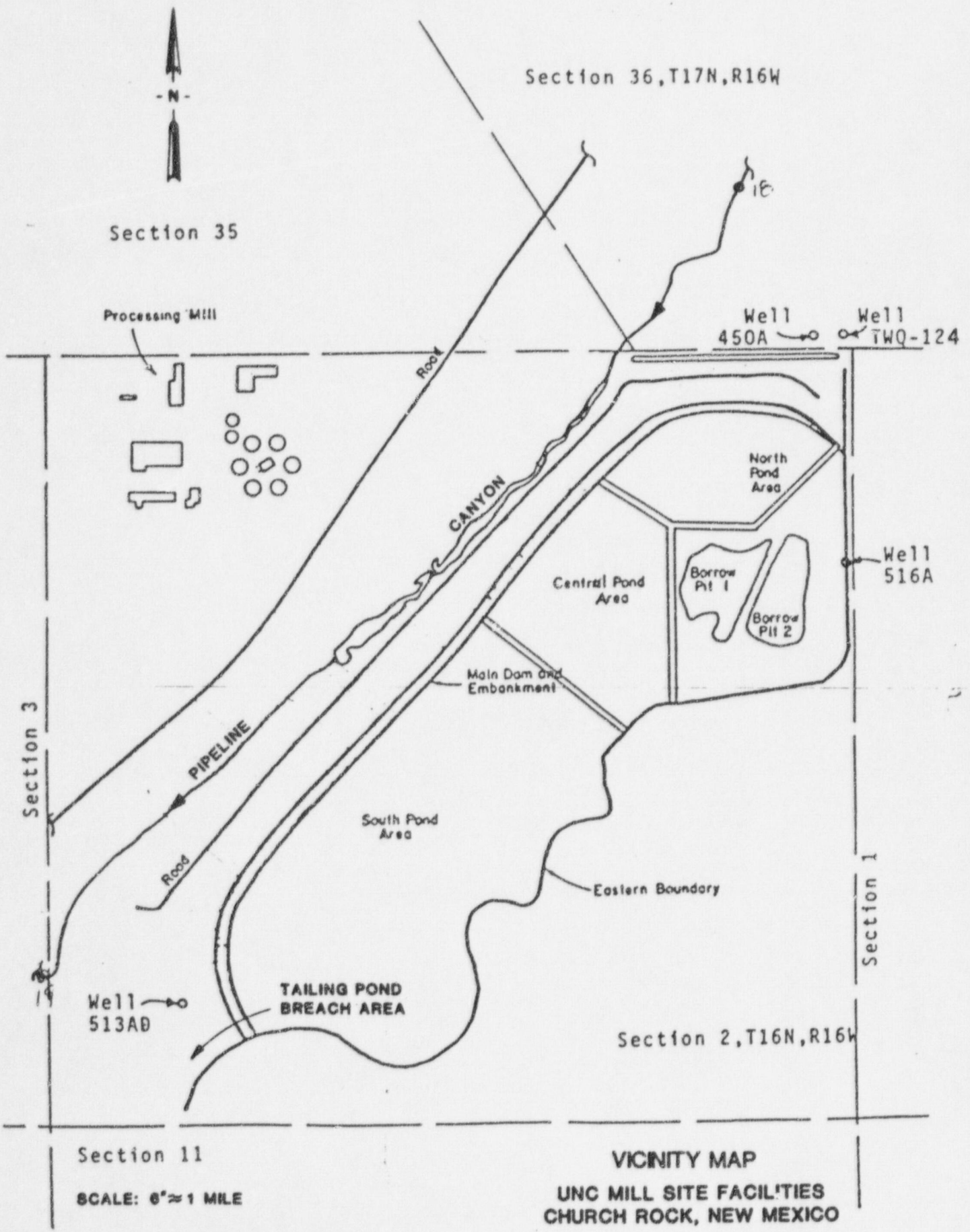
levels of radionuclides, heavy metals and other dissolved constituents such as radium, uranium, thorium, arsenic, cadmium, chromium, copper, lead, nitrate, manganese, and nickel. Recently the tailings solution has been neutralized by UNC.

Monitoring wells located beyond UNC's mill site boundary, (as shown in Figure 2-2) have identified contamination in the Upper Gallup sandstone aquifers northeast of the tailings ponds. The Upper Gallup east of the tailings pond is also reported as contaminated. Monitoring wells near the southwest corner of the site show contamination of the alluvial aquifer down gradient from the facility property. The source of contamination in the sandstone and alluvial aquifers is believed to be leakage mainly from the tailing ponds. Table 2-1 lists groundwater contamination found in the vicinity of the Churchrock tailings ponds.

There are about 10 private wells located within a 3-mile radius of the Churchrock tailing ponds that draw water from the alluvium and the Gallup sandstones.

APPROACH

Considerable work has been done by previous investigators on the groundwater contamination in the vicinity of the Churchrock Uranium mill tailings. However, the extent of the contamination is not fully defined, and additional compilation and analysis is required on existing data to present it in a more useable form. The Remedial Investigation study is designed to define the extent of contamination in Zones 3 and 1 of the Upper Gallup Formation north and east of the tailings ponds and in the alluvium southwest of the tailings ponds. In addition, hydrogeologic, geologic, hydrologic, and environmental features of the tailings pond site and its immediate vicinity will be characterized.



VICINITY MAP

UNC MILL SITE FACILITIES
CHURCH ROCK, NEW MEXICO

REFERENCE: ECOLOGY ENVIRONMENT, INC.
MEMORANDUM OF MAY 4, 1983

Figure 2-2

Table 2-1

Comparison of Churchrock Groundwater
Analysis with Drinking Water Standards

Substance	Standard	Highest Level[3] (Well #)			
Ra 226 + 228	5 pCi/l[1]	12.6	pCi/l	(TWQ 124)	[10/28/80 EID]
U	-	8.15	pCi/l	(TWQ 124)	[4/23/81 UNC]
As	0.05 mg/l[1]	3.65	mg/l	(TWQ 124)	[4/23/81 UNC]
Cr	0.05 mg/l[1]	1.0	mg/l	(TWQ 124)	[4/23/81 UNC]
Se	0.01 mg/l[1]	0.35	mg/l	(450A)	[4/28/81 UNC]
Cd	0.01 mg/l[1]	0.17	mg/l	(TWQ 124)	[4/23/81 UNC]
Pb	0.05 mg/l[1]	0.53	mg/l	(450A)	[4/28/81 UNC]
N as NO_3	10.0 mg/l[2]	342	mg/l	(513)	[1/28/82 UNC]
SO_4	600 mg/l[2]	19,124	mg/l	(TWQ 124)	[4/23/81 UNC]

(1) EPA Primary Drinking Water Standards 40 CFR 141
(2) New Mexico Water Quality Control Commission Regulations
(3) As taken by UNC and NMEID on the dates listed

The proposed feasibility study will develop and evaluate alternative remedial measure and identify the most cost effective action for the site. Alternatives to be considered will include:

- o In situ treatment of groundwater
- o Neutralize tailings solution
- o Pump, treat, and discharge groundwater
- o Barrier well injection
- o Install physical barriers to contain groundwater migration
- o Reduce recharge to the aquifers
- o Line tailings ponds
- o Move tailings to an environmentally more acceptable site
- o Combination of above
- o No action

The evaluation of alternatives will be based upon criteria developed by EPA and NMEID.

ASSUMPTIONS

This statement of work is based upon the following assumptions. These assumptions have been discussed with EPA's Remedial Site Project Officer.

- o The RI/FS is expected to be used for support in litigation.
- o The community relations plan and its implementation will be handled by EPA with assistance from CH2M HILL.
- o Onsite and offsite access will be the responsibility of EPA.
- o Limited cooperation of UNC personnel is assumed. Required UNC data and liaison are to be provided by EPA.

- The Ecology and Environment, Inc. FIT team will be utilized to perform site-related assignments where possible.

- EPA approval of other subcontractors will be expedited where possible.

- All subcontractors will be available without delay.

- All laboratory analyses will be done by EPA contract laboratories or New Mexico State Laboratories.

- Laboratory turnaround will not exceed 6 weeks.

- No drilling below the Upper Gallup Formation will be required.

- Drilling will be performed under Level D Health and Safety Protection (if air bourne radiation is measured above 10 μR/hr above background Level C protection will be required.)

SECTION 3
SCOPE OF SERVICES

The following activities tasks comprise the Churchrock Uranium Mill Tailings Remedial Investigation/Feasibility Study:

Activity 1--Project Management

Remedial Investigation (RI)

Activity 2--Investigation Support
Activity 3--Field Investigation
Activity 4--Remedial Investigation Report

Feasibility Study (FS)

Activity 5--Evaluation of Remedial Action Alternatives
Activity 6--Feasibility Study Report
Activity 7--Conceptual Design

Activity descriptions are presented below. The schedule is shown in Figure 3-1. The costs are summarized in Table 3-1 and are presented as to labor category in the attached detailed cost tables and OF 60.

ACTIVITY 1--PROJECT MANAGEMENT

Task 1.1--Work Plan (Draft and Final)

The purpose of the work plan is to establish the scope, cost, and schedule for the work assignment. The work plan will include a description of the technical approach, schedule, and budgets. The final work plan will be submitted to EPA within 5 days of receipt of written comments. Time has been scheduled to review and update the work plan at the commencement of the feasibility study. Additional revision of the scope, schedule, and/or budgets may be required during the course of the investigation due to unanticipated conditions or monitoring results.

Task 1.2--Project Management

This task will be performed throughout the course of the RI/FS.

The site project manager will be responsible for budget and schedule control and technical and financial reporting. Activities to be performed in this task include:

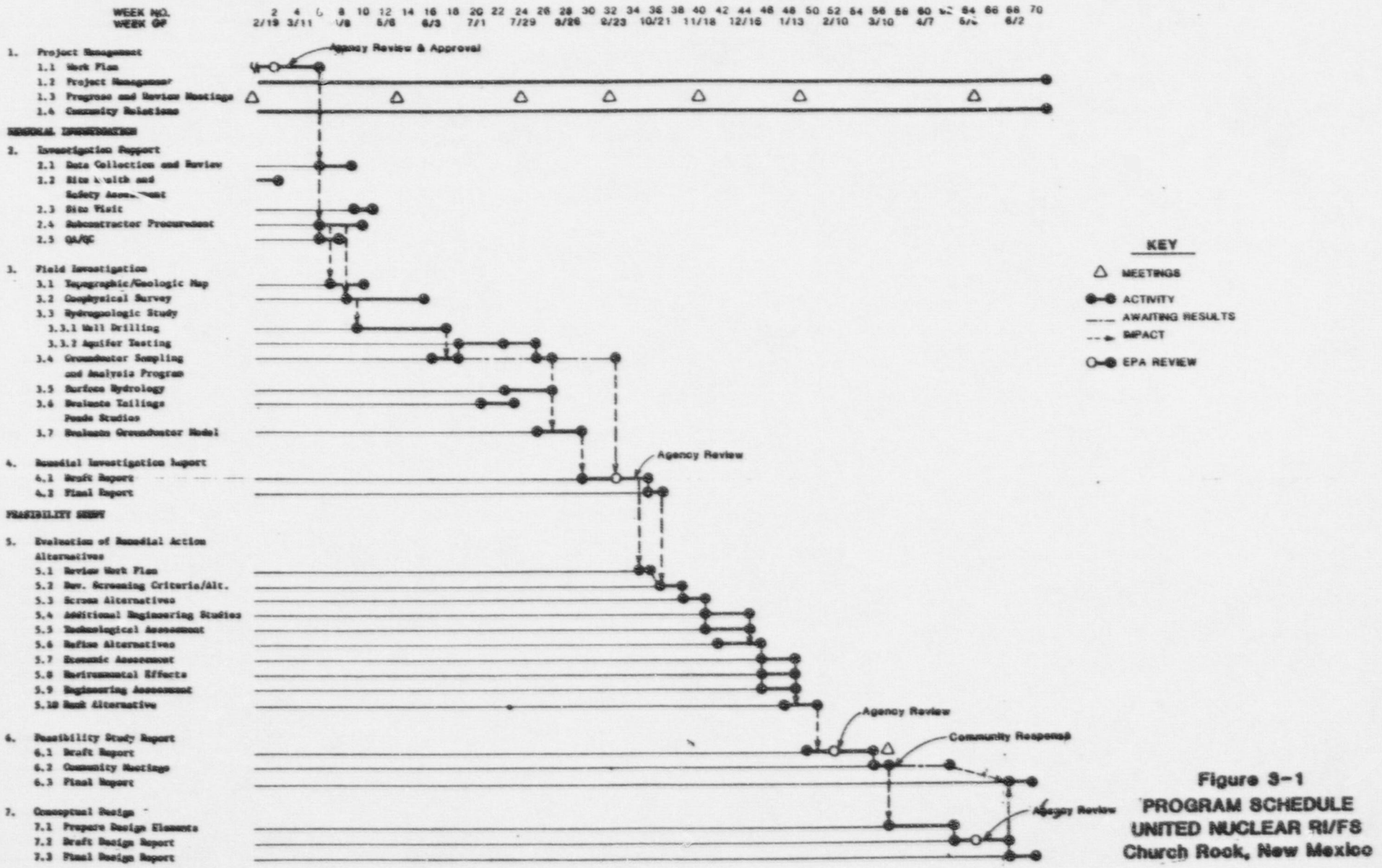


Figure 3-1
PROGRAM SCHEDULE
UNITED NUCLEAR RI/FS
Church Rock, New Mexico

TABLE 3-1
PROJECT COST SUMMARY TABLE
UNITED NUCLEAR RI/FS
CHURCH ROCK, NEW MEXICO

W66215/EPA 67.6[illegible]15.0

Task	Man Hours	Total Labor Cost($)	Total Expenses($)	Total Subcontractor($)	Total Cost($)
1. Project Management	889	51,495	5,896	-	57,391
2. Investigation Support	581	29,313	5,279	5,892(E&E) 3,833	44,317
3. Field Investigation	2359	99,383	18,997	19,199(E&E) 312,764	450,343
4. Remedial Investigation Report	459	24,604	4,400	-	29,004
5. Evaluation of Alternatives	944	54,772	1,650	-	56,422
6. Feasibility Study Report	511	29,924	4,510	-	34,434
7. Conceptual Design	821	44,325	5,390	_____	49,715
	6,564	$333,816	$46,122	$341,688	$721,626

- Selecting, coordinating, and scheduling staff for the work assignment
- Managing the assigned work
- Controlling budgets and schedules
- Assisting in achieving small business, economically disadvantaged business, and labor surplus area subcontracting goals
- Monitoring subcontractors
- Maintaining project quality assurance/quality control (QA/QC), document control, and health and safety programs
- Preparing monthly technical and financial reports, activity completion reports, award fee performance event reports, and task completion memorandums. The contents and format of these reports will be consistent with EPA requirements.
- Project close out, including the work assignment completion report

Task 1.3--Progress and Review Meetings

The site project manager and necessary technical staff will attend progress and review meetings with the EPA and other Federal, state, and local authorities. The sequence of these meetings is shown in the schedule (Figure 3-1). In general, the following meetings will be required:

- Work Plan: Kickoff meeting to define overall project objectives and approach and a review meeting to discuss revisions to the draft work plan
- Field Investigations: Three review/progress meetings at the completion of major field tasks and after submission of the draft remedial investigations report
- Feasibility Study: Three review/progress meetings at the completion of major feasibility planning tasks and after submission of the draft feasibility study report

- Project Close Out: Meeting to arrange the completion of the project

Where possible conference telephone calls will be used to expedite the program schedule and to reduce meeting costs. The actual dates and the need for these meetings will be reviewed and updated as the project progresses.

Task 1.4--Community Relations

It is assumed that the U.S. EPA will take the lead community relations role at the United Nuclear-Churchrock site. The community relations duties of the RI/FS team will be limited to providing advice or assistance to the U.S. EPA when asked. It is anticipated that such assistance will consist of preparing public meeting materials, project updates, and technical summaries; preparing and publishing public notices; and providing a responsiveness summary. Details on each of these activities are provided below:

- Prepare Public Meeting Material - Slide shows and presentation materials will be prepared for the RI/FS.

- Prepare Project Updates - Project updates will be prepared for distribution to individuals and organizations on the project mailing list. These updates will be one-page self mailers that report on past and upcoming site activities and announce public meetings and the availability of project products. The updates will be prepared at approximately the following points in the RI/FS schedule: at project startup to describe the RI/FS activities and the overall project schedule; at the completions of the RI; and at the completion of the FS. The specific content and timing of each project update will be coordinated with EPA.

- Prepare Technical Summaries - Brief (3-4 page) technical summaries will be prepared for both the RI and the FS report. They will be distributed to the project mailing list and placed in the local ~~respiratory~~ repository.

- Prepare and Publish Public Notices - Public notices and small display ads will be prepared and published to announce the public meetings.

- Prepare Responsiveness Summary - During preparation of the final FS, the project team will incorporate comments received from the public during the public comment period. The project team will assist EPA in preparation of the Responsiveness Summary. No activities will be started without specific authorization from EPA.

ACTIVITY 2--INVESTIGATION SUPPORT

TASK 2.1--Data Collection and Review

A description of the current site situation will be prepared. Information on the site background, the nature and extent of the problem, and previous activities from earlier remedial actions will be collected and reviewed. Water level data will be developed into water level contour maps for the alluvium, and Upper Gallup (Zone 3 and Zone 1). Geological cross-sections will be drawn in areas of contamination. Water quality contour maps will be drawn in contaminated areas from existing water quality data for the following constituents:

TDS	Cd
pH	Th
NO_3-N	Pb

A site-specific statement of purpose for the proposed remedial response will be developed based on prior results and consultation with the EPA and NMEID.

New information generated by this investigation will be appended to the monthly technical progress reports.

Task 2.2--Site Health and Safety Assessment

The objective of the site health and safety assessment is to identify any onsite areas where exposure to potentially hazardous substances in the water, air, or soil may be a problem. Such information will be used in protecting local residents and onsite investigators and workers with adequate warnings and safeguards. The plan will include information to alert onsite personnel to physical hazards likely to be encountered on the site. A Site Health and Safety Plan will be prepared and updated as needed to reflect unanticipated changes in the hazards or operating conditions encountered at the project site. The plan will be consistent with the work to be performed and will comply with:

- EPA Occupational Health and Safety Manual
- Section III(c) (6) of CERCLA
- EPA Order 1440.1--Respiratory Protection
- EPA Order 1440.3--Health and Safety Requirements for Employees Engaged in Field Activities
- EPA Interim Standard Operating Safety Procedures and other EPA guidance
- New Mexico state codes
- Site conditions

Task 2.3--Site Visit

An initial site visit will be conducted by project team members to gather first-hand information on site features, access routes, potential site boundaries, potential treatment system sites, and site safety requirements. Team members will also meet with appropriate local agencies including the Navajo Tribe and the U.S. Bureau of Indian Affairs to establish contacts for later work.

Task 2.4--Subcontractor Procurement

The objective of this task is to prepare and submit contractor procurement documents and secure services of subcontractor(s) to conduct onsite remedial investigation activities. This task includes the following items:

- Prepare subcontractor procurement documents (specifications and bidding forms)
- Identify subcontractors and send out documents for bids
- Receive bids and select subcontractors
- Submit selection to EPA for approval
- Issue subcontract(s)

Work to be subcontracted includes:

- o Hydrogeologic studies (including drilling, sampling, hydraulic testing and groundwater water quality analysis
- o Surveying and mapping, as necessary
- o Geophysical surveys for determining geologic conditions and contaminant plume boundaries in the groundwater

Task 2.5--Quality Assurance Project Plan (QAPP)

The objective of this task is to develop a QAPP plan for the sampling, analysis, and data acquisition of the remedial investigation tasks. The plan will satisfy EPA protocols and will adhere to the requirements of EPA's Contract Laboratory Program. Strict chain-of-custody procedures will be followed.

Included in this subtask budget is time to perform quality assurance reviews for the proposed project technical memorandums and reports.

ACTIVITY 3--FIELD INVESTIGATION

Task 3.1--Topographic/Geologic Mapping

The purpose of this task is to provide an accurate base map of the site topographic and surface geologic conditions. UNC has aerial photographs, topographic and geologic maps of the site. It is assumed for budgeting purposes that these items can be made available and are adequate. Existing maps will be used where possible and updated in the field at specific locations where data gaps exist. However, if the maps are inadequate or unavailable additional aerial photography and mapping would be required.

Land ownership and control will also be determined and indicated on the base map.

Task 3.2--Geophysical Survey

A geophysical survey will be performed at the site prior to installation of additional wells. Purpose of the survey is to determine through resistivity (R) techniques the contaminant plume outlines, structural features (monoclinal lineaments), and bedrock formation attitudes/continuity, to help

$75 ($50) Dr. Abel?

- p. 3-6 Is some of this duplication of what Rick has already done?

- Will UNC be represented @ Louie's meeting?

- Is CH_2M Hill's research evasive?

- What does ~~is~~ RI/FS work plan have to do with Navajoa?

- Note Bechtel proposes alternative of Westwater injection well vs. Juan (4/19/84) proposed deepening E. Navajo well to west water.

- Rick wants to put EID wells on Navajo land

in locating new monitoring wells and to define migration flow patterns. Survey lines will primarily be run perpendicular to the projected groundwater plume flow direction. Results of the survey will be correlated with existing test hole data. Approximately 30 lines covering approximately 23,000 lineal feet are proposed and shown in Figure 3-2. The final location of the lines will be selected in the field to avoid interference by any surface or buried utility lines, fences, debris or pipe lines. A technical memorandum discussing the results of the geophysical survey will be prepared as the completion of this task.

The electrical resistivity dipole-dipole array is recommended as the most promising survey technique for the site. Numerical model interpretation of these data, should delineate low resistivity contaminated zones in surrounding higher resistivity effluents and alluvial materials. These responses are expected to be similar to the type of response obtained at other sites where successfully used.

Task 3.3--Hydrogeologic Study

The objective of this task is to further evaluate and confirm the hydrogeologic conditions of the site area. The existing data base will be supplemented by new information provided by the additional studies proposed in this work plan. Specific items to be determined include:

- Attitude and continuity of the bedrock formations at the site (Dilco Coal Member, Upper Gallup, (Zones 3 and 1) Mancos Shale and Torrivio Members) to assist in determining aquifer and confining bed characteristics.

- Location and characteristics of key monoclinal structural features including definition of local fracture zones.

- Site characteristics that could inhibit contaminant migration and contaminant removal by pumping.

- Provide additional hydraulic data to further delineate the horizontal and vertical extent of groundwater contamination across the site.

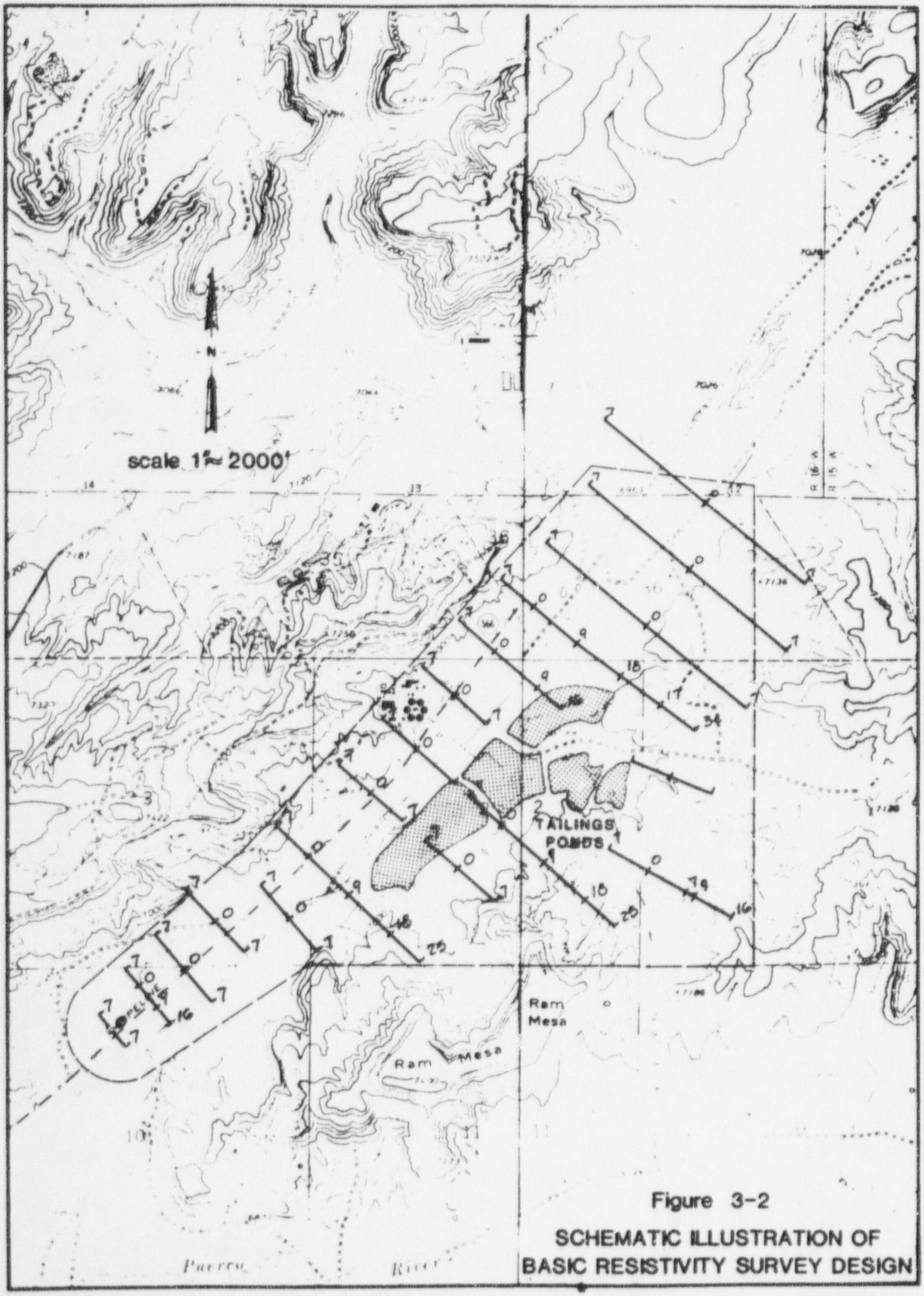


Figure 3-2

SCHEMATIC ILLUSTRATION OF
BASIC RESISTIVITY SURVEY DESIGN

- o Provide aquifer test data needed to determine the potential for any off site contaminant plume migration and contaminant removal by pumping.

- o Establish a groundwater monitoring (sampling and chemical analysis) program to define the existing groundwater contaminant areas and to detect future movement of the plume(s).

Nearly 300 test holes, monitoring wells, test wells or leachate collection wells have been installed at the site during past studies.

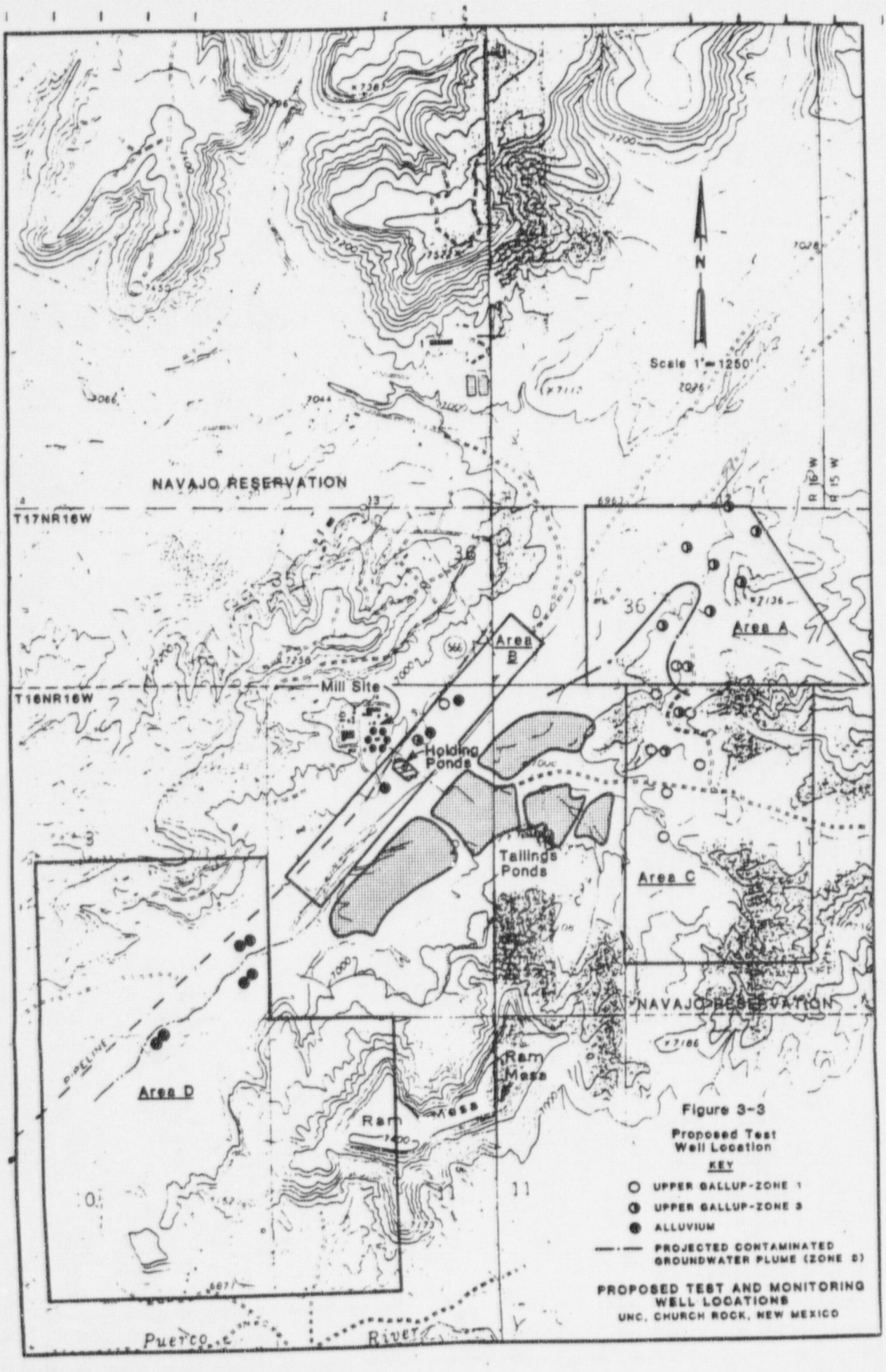
Recommendations for the proposed number, location, depth and type of new wells are based on a review of available data, evaluation of site conditions, and discussions with NMEID and EPA. Information from these wells is required to more fully understand subsurface flow conditions and the potential for both on and off site migration of contaminants.

Subtask 3.3.1 - Monitor Well Drilling

A total of 28 additional 10- to 12-inch-diameter wells with 6-inch-diameter screened casing are recommended at the site located as shown on Figure 3-3.

Area A (Section 36)	Nine monitor/test wells, eight in Zone 3 and one in Zone 1 of the Upper Gallup
Area C (Section 1)	Eight monitor/test wells, six in Zone 1 and two in Zone 3 of the Upper Gallup
Area B (Section 2)	Five monitor/test wells, three in the alluvium along Pipeline Canyon and two in the Upper Gallup
Area D (Sections 3 & 10)	Six monitor/test wells in the alluvium in lower Pipeline Canyon

Exact locations of the wells will be selected utilizing results from the recommended surface geophysical studies and data from prior drilling and testing. Technical specifications and contract documents will be prepared for the drilling and well installation and design. The basic monitor/test well design is shown on Figure 3-4.


N
Scale 1" = 1250'
NAVAJO RESERVATION
T17NR16W
T16NR16W
R16W
R15W
Area A
Area B
Area C
Area D
Mill Site
Holding Ponds
Tailings Ponds
Ram Mesa
Ram
NAVAJO RESERVATION
PIPELINE
Puerco River
Figure 3-3
Proposed Test Well Location
KEY
UPPER GALLUP-ZONE 1
UPPER GALLUP-ZONE 3
ALLUVIUM
PROJECTED CONTAMINATED GROUNDWATER PLUME (ZONE 2)
PROPOSED TEST AND MONITORING WELL LOCATIONS
UNC, CHURCH ROCK, NEW MEXICO

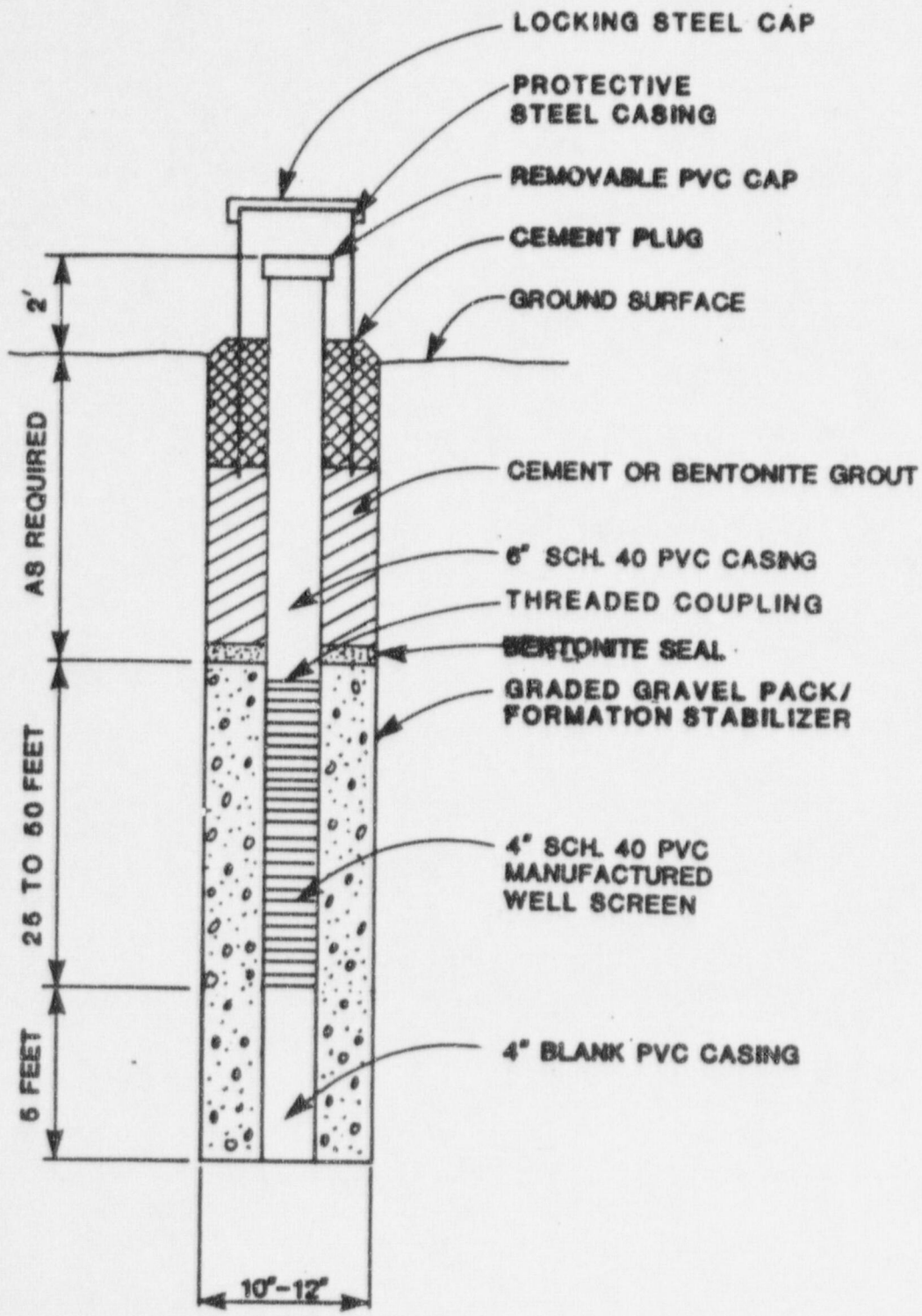


Figure 3-4
TYPICAL MONITORING WELL DESIGN

The wells in Areas A, B, C, and D will be used to extend the study area in order to determine the extent of off site contaminant migration and to evaluate bedrock aquifer conditions.

The following general procedures will be used when installing all test wells at the site.

Well Drilling and Construction

The wells will be drilled under CH2M HILL supervision by a licensed contractor with a rotary drill rig using an approved drilling fluid. All drilling equipment, pipe and materials will be decontaminated between each hole, as necessary.

The total depths of the wells will be identified prior to drilling, from lithologic and geophysical logs of nearby wells and from surface geophysical survey results. In addition, a lithologic log will be made for each new well. To more precisely identify the well target formation, bore hole geophysical logs (self potential (SP), neutron porosity, gamma, and resistivity) will be taken immediately after drilling of each well.

The wells will be drilled a minimum of 5 feet below the target formation allowing pump placement below the target formation and creating the maximum drawdown possible.

During drilling, any variations in speed and circulation loss will be monitored. Variations of these factor could indicate the presence of high flow zones such as fractured areas or high permeability formation. If structural features are encountered during drilling, pre-casing development may have to be performed on the well.

Once the target formation and total depth has been identified, the casing and screen will be installed in the well in accordance with approved specifications as modified by field conditions. A blank section of 6-inch diameter PVC casing, with a cap on the bottom, will be installed from the bottom of the target formation to the bottom of the well to facilitate maximum drawdown of the well and provide a zone for sediment capture. PVC well screen (6-inch diameter) will be placed on top of the blank section and extend to the

top of the target formation thus allowing the screen to fully penetrate the aquifer. A screen aperture size 0.005 to 0.10 inches is proposed which should retain 95-100 percent of the formation stabilizer (well rounded clean fine gravel) and still maintain satisfactory strength. A centering guide will be used when placing the screened section of the well to insure that the screen is placed in the center of the borehole. Formation stabilizer will be installed around the well screen to stabilize the hole from sluffing and to prevent sand within the aquifer from entering the well.

Six inch diameter Schedule 40 PVC blank casing will be installed on top of the screen to a point about 2 feet above the ground surface.

Drilling fluid will be removed from the inside of the well and annulus after allowing the screen and casing to set. This will be accomplished by lowering the drill stem into the well, sealing the top of the well and pumping clear water through the drill stem into the well. The clear water will force the drilling fluid in the well to move out through the screen and up through the annulus. Circulation will be stopped and final well construction completed once the discharge water becomes clear.

A formation stabilizer (gravel pack) will be installed in the annulus around the well casing and screen from the bottom of the well to the top of the aquifer. A bentonite seal will then be placed on top of the stabilizer around the blank asing annulus using bentonite pellets. A betonite/cement grout will then be placed in the annulus by the use of a grout "tremie" pipe and surface pump. A grout pipe and surface pump are used to ensure that a dilution of the grout to water ratio does not occur as the grout is placed in the annulus. After the cement/grout has hardened a protective concrete plug will then be installed around the casing annulus at the surface and extending a minimum of two feet down the well. A steel pipe with a protective locking cap will be installed in the cement plug around the PVC piping.

For alluvial wells, soil samples will be collected at 5-foot intervals or at major changes of strata. Samples will be collected using a split spoon sampler or other appropriate sampling techniques. These samples will be used to define physical properties of the alluvium. Drilling will extend a minimum of 5 feet into bedrock.

Well Development and Stabilization

Several techniques may have to be used in the development of the test wells. Based on techniques employed by drillers on previous work in the vicinity, it is estimated that air lifting from 1.0 to 4.0 hours with an air compressor and eductor pipe may be required followed by bailing and surging for approximately another hour. If the combination of these techniques are not totally satisfactory then the well should be air jetted over the entire screen length with an appropriate variable velocity jetting tool. After air jetting, the well should be bailed/surged again for approximately 30 minutes or until clear.

After developing the wells, they should be allowed to stabilize for a minimum of 10 days. Periodic water level measurements should be taken during this time to assure static water levels have been reached.

All drilling fluid and cuttings will be contained and disposed of in an appropriate manner.

Using the proposed well locations shown in Figure 3-3 and geological cross-sections supplied by NMEID, the drill hole footage was estimated for the drilling program for both the alluvium and bedrock. The bedrock drilling and casing costs were estimated at $50/per foot for the projected 3400 feet of bedrock wells. The alluvium drilling and casing costs were estimated at $35/per foot for the projected 950 feet of alluvial wells. Additional costs were included for well screens, mobilization, per diem, expenses, drilling supervision and sampling.

A technical memorandum describing well designs, and installations will be prepared after well installations. Included will be all driller's logs, formation sample field analyses, available water quality analyses, peizometric surfaces, ground surface elevations, and geologic cross-sections. Included in the memorandum will be maps indicating the water level in the Upper Gallup (Zone 3 and 1) Formations as indicated from existing data as well as data developed from the RI.

Subtask 3.3.2 - Aquifer Testing

Three long-term aquifer tests are recommended and will be run continuously until sufficient data have been obtained to adequately define the drawdown relationships and the trans-

missivity and storitivity coefficients of both alluvial and bedrock systems. Duration of the tests will vary according to aquifer conditions but are planned for 30 days to establish the recharge and barrier conditions.

Slug injection and/or falling head permeability tests in selected monitoring wells where aquifers are only partially saturated may also be required. These tests would establish additional aquifer characteristics as to hydraulic conductivity where pumping tests are not possible.

It is planned to use automatic water level recorders on the pumping well and select monitor wells to measure water level fluctuation and drawdown during pumping and recovery. Technical representatives will be present to begin testing and recovery and to periodically check the system during pumping.

At the conclusion of the aquifer testing program, a technical memorandum will be written and submitted to EPA for review. This memorandum will include measured aquifer characteristics and descriptions of recharge and barrier conditions.

Task 3.4--Groundwater Sampling and Analysis Program

Following installation, development, and stabilization of the monitoring and test wells, a groundwater sampling and analysis program of all new and some existing wells will be conducted. The objective of the program will be to verify and update the results obtained in previous studies, and to expand the area covered by past studies. These data will be used to further evaluate water quality conditions and to plan further remedial investigation activities or to select alternative remedial actions.

One groundwater sample suite will be collected from each selected new and existing well. Three suites of samples will be taken throughout the RI period. The elevation of the groundwater surface in each well will be recorded at the time of sample collection.

Samples will be analyzed for the appropriate parameters as listed in Table 3-2. The test results will assist in determining the level of existing contamination and the nature of remedial action necessary. For cost estimating purposes, it has been assumed that approximately 120 groundwater samples will be taken during the RI/FS.

Table 3-2

Groundwater Sample Analysis

Na	Al	Ag
K	Cr	As
Ca	Ba	Se
Mg	Co	Hg
HCO_3	Fe	Cd
SO_4	Ni	Pb
Cl	Mn	U
NH_3-N	Temp.	Ra-226
NO_3-N	Cond.	Ra-228
TDS	pH	Th-230

Note: 1) This list of parameters conforms to analysis performed during previous studies and as required by NMEID.

2) The list should be refined after evaluation of the first set of analytical results. Likewise, the sampling frequency should be either increased or decreased, according to data results.

All sampling and testing will conform to guidelines in the User's Guide to the U. S. EPA Contract Laboratory Program (CLP), prepared by the Sample Management Office of CLP and published in August 1982.

To ensure that a representative sample is obtained, samples will not be taken until sufficient pumping has been performed to reach stabilized conditions for pH, temperature

and conductivity in the pump discharge or a predetermined amount of purging has been conducted to reach equilibrium. Following the pre-sample well pumping, the pH, temperature, and specific conductance will be determined for the groundwater sample in the field.

At the conclusion of the sampling and analysis program, a technical memorandum will be prepared presenting the test results and evaluating the extent of contamination.

Task 3.5--Surface Hydrology

The objectives of this task are to 1) determine the flow and water quality of the Pipeline Canyon stream, 2) estimate the recharge to the Upper Gallup aquifer by the Pipeline Canyon stream and the tailings ponds, and 3) determine the present tailings pond solution and sediment composition. Existing data will be reviewed to develop a historical basis for comparison with data obtained during the RI activity.

Historically, the Pipeline Canyon stream has been ephemeral, but the continuous discharge of uranium mine water into the stream has altered its flow. Consequently, the discharge rates and water quality of the mine waters give a good estimate of the Pipeline Canyon stream except during storms.

If an accurate measurement of stream recharge to the groundwater is to be determined, an estimate of groundwater flow in the Pipeline Canyon alluvium and measurement of the stream flow must be made. The groundwater flow estimates can be made with piezometric measurements in alluvial wells, alluvial cross-sections and groundwater velocity measurement. The stream bed and alluvium recharged by the stream are located over recharge areas of both Zone 3 and Zone 1 of the Upper Gallup in the vicinity of the tailings ponds.

Therefore, parshall flumes or weirs with continuous flow recorders will be installed to measure flow and estimate the recharge to each zone. To determine the location of these flow measurements, a bedrock profile will be constructed along the stream from existing data.

In addition, geological cross sections perpendicular to the stream will be constructed to define the attitude and location of the bedrock recharge zones under the tailings ponds. Locations of these cross sections will be determined from existing drill logs and bore hole geophysical logs, and surface geophysical studies.

Surface measurement methods can be used to estimate the seepage rate of the tailings ponds. A water balance calculation can be made for each pond using measurements of all inflow and outflow. Net evaporation can be measured using a U. S. Weather Bureau pan situated at the ponds with tailings liquid as the evaporative fluid. Precipitation can be measured using a rain gauge. A 24-hour, or longer as required, period is planned for each seepage measurement.

Substantial numbers of water quality samples have been taken from the tailings ponds and the Pipeline Canyon stream; consequently, the present condition of the surface water quality is well defined. During the RI, it is planned that the water quality will be based on the existing UNC/NMEID testing program, supplemented by a few new sample locations. Mill tailings composition will be based on mill data and existing samples.

Task 3.6--Evaluate Tailings Pond Studies

The Churchrock uranium mill tailings dams have been studied in detail particularly, since the break of the south tailings dam in 1979.

This information will be reviewed to assess the potential of stabilizing the uranium tailings on the existing site. The stabilization would need to address the questions that have been raised by NMEID pertaining to the effectiveness of the existing site to contain the radioactive and potentially toxic elements in the tailings solids and solution. Aspects to be addressed include impacts from floods (especially since the ponds appear to be located within the 100 year flood plain boundary), seismic events, contamination of groundwater and surface waters, wind blown dust, etc.

Task 3.7--Evaluate Groundwater Model

If a groundwater model is developed by UNC consultants, it would be evaluated with regards to site specific geologic and hydrogeologic factors. Using this model, the movement of the contaminated plumes in the Upper Gallup and alluvial aquifers would be evaluated. Methods of minimizing the contamination movement would also be analyzed. If no model is developed this task will be eliminated.

ACTIVITY 4--REMEDIAL INVESTIGATION REPORT

Task 4.1--Draft Report

Within 7 months of approval of the work plan, a draft remedial investigation report will be submitted to EPA. This report will compile material obtained from the geophysical, geohydrologic and surface hydrologic studies and other sources.

Task 4.2--Final Report

Within 2 weeks after receipt of EPA's comments on the draft remedial investigation report, a final report will be prepared and submitted to the EPA.

ACTIVITY 5--EVALUATION OF REMEDIAL ACTION ALTERNATIVES

The objective of this activity will be to define and evaluate alternative remedial actions. On the basis of economic, environmental, and engineering comparisons, an alternative or combination of alternatives will be selected for conceptual design and implementation. The level of detail developed to facilitate these evaluations will only identify comparative or relative differences among alternatives.

Task 5.1--Review Work Plans

The present feasibility study work plan for the United Nuclear site is of a general nature due to the fact that the preferred remedial alternatives have not been selected. Specific data relating to these remedial alternatives need to be developed. As the preferred alternatives are selected and the site specific data are developed during the Remedial

Investigation, it will be possible to revise the United Nuclear Feasibility Study Work Plan and make it more detailed and site specific.

Task 5.2--Develop Remedial Screening Criteria/Alternatives

Potential remedial actions, which reduce the threat caused by the United Nuclear site, will be compiled. This list will be developed through brainstorming techniques where key project members including EPA and NMEID personnel collectively select alternatives and discuss preliminary evaluation criteria.

Under the direction of EPA, screening criteria will be prepared to assess the remedial action alternatives. The factors addressed in developing the screening criteria include:

- Economic. The capital, operational and maintenance costs shall be estimated and a present worth value determined to define significant cost differences.

- Environmental Effects. The adverse impacts of the alternatives, the adequacy of source control, and the acceptable mitigation of danger to public health and welfare and the environment shall be identified.

- Engineering. The alternative must be technically feasible in light of site location and conditions, must be applicable to the project needs, and must be a reliable method of solving the problem.

These preliminary remedial actions form the basis for subsequent feasibility study activities. During the evaluation as more information becomes available the project team may include other remedial action alternatives. The no-action alternative is included in the evaluation as a baseline to compare alternatives and may be a viable alternative, if the benefits of the remedy achieved outweighs the cost.

Task 5.3--Screen Alternatives

The initial remedial action alternatives will be screened to reduce the number of alternatives to about five to seven. Site-specific screening criteria developed in the prior task will be used to assess economic environmental and engineering factors. The initial alternative screening is based primarily on engineering judgement; consequently the reasons for decisions will be fully documented in a technical memorandum. The memorandum will summarize the screening criteria, the initial remedial action alternatives, the screening results and justifications.

The EPA will review and concur with this memorandum prior to initiating detailed alternative evaluations.
In preparing this work plan, the assumption has been made that the screening process would reduce the number of alternatives to not more than seven for further evaluation.

Task 5.4--Additional Engineering Studies

After screening remedial action alternatives, remedial investigation data will be evaluated. Additional engineering studies may be undertaken if necessary to evaluate the cost, the constructability, applicability, or reliability of any alternative. Such studies may include additional sampling and analysis of groundwater or surface water with emphasis on selected parameter; confirming local availability of construction materials (clay, gravel, etc.) and conducting additional hydrogeological studies. Prior to initiating any additional engineering studies, EPA must concur.

Task 5.5--Technology Assessment

Since treatment and/or disposal of tailings, soils, groundwater, or surface water are potential remedial actions at this site, a technical assessment of treatment options will be conducted.

A report will be prepared documenting the results of a literature search and technology assessment and presenting the conclusions regarding the applicability of various technologies. One or more technologies may be identified for further evaluation. Prior to initiating any additional studies, EPA must concur.

Task 5.6--Refine Alternatives

Based on all the available data, the remaining alternative remedial actions will be refined and more fully developed. A detailed written description of each alternative, basic component diagrams for each alternative to be considered, major equipment needs and utility requirements, conceptual site layout drawings, and preliminary implementation schedule will be made. A report will be prepared to be included in the draft feasibility study.

Task 5.7--Economic Assessment

Construction, operation and maintenance costs will be estimated for each remedial action alternative. The comparative cost impacts of health and safety requirements will be included in the cost estimates. The cost estimates prepared for this task will be comparative level estimates that reflect cost differences between alternatives, but may not necessarily represent the actual cost of the alternatives.

A technical memorandum will be prepared presenting the results of the cost estimates. This memorandum will be included as a section in the draft feasibility study.

Task 5.8--Environmental Effects

The remedial action alternatives will be evaluated based on the environmental screening criteria developed. The comparative assessment will determine:

- The adverse environmental impacts of the alternatives including potential risks to the public during construction and operation;
- The effectiveness of adverse impact mitigation measures;
- The adequacy of source control measures;
- The effectiveness of offsite control measures in mitigating the danger or threat of danger to the public or the environment;
- Endangerment Assessment of the "no action" alternative.

A technical memorandum will be prepared presenting the results of this assessment. This memorandum will be included as a section in the draft feasibility study.

Task 5.9--Engineering Assessment

The engineering aspects of the alternatives will be assessed on the basis of acceptable engineering practices. The specific factors to be evaluated include:

- Reliability
- Established technology
- Suitability to control the problem
- Risks to construction and operational personnel's health and safety
- Constructability and operability in light of site conditions
- Maintainability and sensitivity to offsite upset
- Offsite transportation and disposal capacity requirements
- Time needed for capital implementation

A technical memorandum will be prepared summarizing the results. This memorandum will be included as a section in the draft feasibility study.

Task 5.10--Rank Alternatives

During this task, the assessments prepared in the prior three tasks will be quantified and the results will be compiled. The overall rankings will reflect the sum of all three categories. This ranking will be based on professional judgement and will reflect EPA and NMEID inputs. A technical memorandum will be prepared summarizing the comparative rankings and documenting the ranking procedure.

ACTIVITY 6--FEASIBILITY REPORT

Task 6.1--Preparation of Draft Report

A draft report on all data developed during Activity 5 will be prepared. It will document the alternative remedial actions and their assessment process. This report will be submitted to EPA and NMEID for review. The report will recommend one alternative or a combination of alternatives for consideration in conceptual design.

Task 6.2--Community/Public Meetings

A community/public meeting shall be held following a review of the draft report by EPA and NMEID personnel. The purpose of this meeting will be to inform concerned citizens of the findings of the RI/FS activities and to obtain their comments and reactions. CH2M HILL will be present to answer technical questions. A four to six week period will be allowed for written public comment. These comments and their responses will be included in the Final Feasibility Study Report.

Task 6.3--Preparation of Final Feasibility Study Report

Following the receipt of agency and public review comments and EPA approval of the recommended remedial action(s), a final report will be prepared and submitted to EPA. The final report will include a chapter detailing the final conceptual design as described in Tasks 7.1, 7.2, and 7.3.

ACTIVITY 7--CONCEPTUAL DESIGN

Following receipt of agency approval of the recommended remedial action(s), the conceptual design will commence. The conceptual design activity will be the mechanism by which the selected remedial alternative(s) are designed for implementation. The following scope of work addresses the conceptual design requirements, provides additional data that may be needed to prepare a design consistent with the objectives of the proposed remedial actions, and is intended to be sufficient to allow preparation of a budget level cost estimate.

The work required to complete the conceptual design depends on the complexity of the solution. For example, a well field and treatment facility conceptual design will require more effort than a slurry containment wall. Budgets presented in this work plan include a 2-man-month allowance to complete the conceptual design of one alternative. This allowance will be reviewed and updated, if necessary, as additional data become available.

Task 7.1--Preparation of Conceptual Design Elements

The following conceptual design elements will be developed as required for the remedial actions selected:

- A conceptual plan view drawing of the overall site, showing general locations for project actions and facilities.
- Conceptual layouts (plan and cross sectional views where required) for the individual facilities, other items to be installed, or actions to be implemented
- Conceptual design criteria and rationale
- Process flow sheets, including chemical consumption estimates and a description of the process
- Operational description of process units or other facilities
- Estimate of quantities of material to be excavated and moved
- Description of well design and completion procedures
- Utility requirements and rationale
- Evaluation of potential construction problems, associated risks, and the proposed solutions
- Right-of-way requirements

- Description of technical requirements for environmental mitigation measures
- Additional engineering data required to proceed with design
- Construction permit requirements
- Temporary hazardous material storage and disposal requirements and rationale
- Offsite disposal procedures, including transportation and vehicle constraints, and final disposal and treatment facility options
- Closure and long-term monitoring requirements and rationale
- Performance standards to define what levels of cleanup will be required to complete the remedial action
- Data and document control requirements
- Prepare an order of magnitude cost estimate (+50%-30%)
- Prepare a project schedule

Task 7.2--Preparation of Draft Report

A draft report summarizing conceptual design data and information shall be prepared and submitted to EPA and NMEID for review.

Task 7.3--Preparation of Final Conceptual Design

The draft report shall be finalized based upon EPA and NMEID review comments. This material will then be included as a chapter in the Final Feasibility Report.

PROJECT DELIVERABLES

	Anticipated Issue Date
Draft Work Plan	10/31/83
Final Work Plan	3/09/84
Site Health & Safety Plan	3/09/84
Quality Assurance Project Plan	4/11/84
Geophysical Study Technical Memorandum	6/04/84
Well Drilling Technical Memorandum	6/18/84
Aquifer Testing Technical Memorandum	8/18/84
Groundwater Quality Technical Memoradum	8/30/84
Draft Remedial Investigation Report	9/28/84
Final Remedial Investigation Report	10/31/84
Remedial Alternatives Screening Technical Memorandum	11/23/84
Environmental Assessment Technical Memorandum	1/18/85
Engineering Assessment Technical Memorandum	1/21/85
Economic Assessment Technical Memorandum	1/24/85
Remedial Alternatives Ranking Technical Memorandum	2/01/85
Draft Feasibility Study Report	2/15/85
Final Feasibility Study Report	6/14/85
Draft Conceptual Design Report	5/10/85
Final Conceptual Design Report (part of Final Feasibility Study Report)	6/14/85

APPENDICES

CONTRACT PRICING PROPOSAL

(RESEARCH AND DEVELOPMENT)

Office of Management and Budget Approval No. 29-R0184

This form is for use when *(i)* submission of cost or pricing data (see FPR 1-3.807-3) is required and *(ii)* substitution for the Optional Form 59 is authorized by the contracting officer.

PAGE NO | NO OF PAGES

NAME OF OFFEROR: CH2M HILL Southeast, Inc.

HOME OFFICE ADDRESS: 1941 Roland Clarke Place, Reston, Virginia 22091

SUPPLIES AND/OR SERVICES TO BE FURNISHED: WA 67.6L15.0 Remedial Investigation/Feasibility stud United Nuclear Site Church Rock, NM

DIVISION(S) AND LOCATION(S) WHERE WORK IS TO BE PERFORMED: Salt Lake City, Utah & Church Rock NM

TOTAL AMOUNT OF PROPOSAL: $721,626

GOV'T SOLICITATION NO: 68-01-6692

DETAIL DESCRIPTION OF COST ELEMENTS

1. DIRECT MATERIAL *(Itemize on Exhibit A)*			EST COST ($)	TOTAL EST COST	REFERENCE
a. PURCHASED PARTS					
b. SUBCONTRACTED ITEMS					
c. OTHER—(1) RAW MATERIAL					
(2) YOUR STANDARD COMMERCIAL ITEMS					
(3) INTERDIVISIONAL TRANSFERS (At other than cost)					
TOTAL DIRECT MATERIAL					
2. MATERIAL OVERHEAD (Rate % X $ base =)					
3. DIRECT LABOR (Specify)	ESTIMATED HOURS	RATE/HOUR	EST COST ($)		
P4	2562		64,541		
See Exh A- P3	423		7,611		
P2	1959		28,984		
P1	84		1,094		
T2	72		842		
T1	844		7,476		
0 TOTAL DIRECT LABOR	620		5,280	115,828	
4. LABOR OVERHEAD *(Specify Department or Cost Center)*	O.H. RATE	X BASE =	EST COST ($)		
	.41	115,828	47,489		
TOTAL LABOR OVERHEAD				47,489	
5. SPECIAL TESTING *(Including field work at Government installations)*			EST COST ($)		
TOTAL SPECIAL TESTING					
6. SPECIAL EQUIPMENT *(If direct charge) (Itemize on Exhibit A)*				6,750	
7. TRAVEL *(If direct charge) (Give details on attached Schedule)*			EST COST ($)		
a. TRANSPORTATION			9,000		
b. PER DIEM OR SUBSISTENCE			7,560		
TOTAL TRAVEL				16,560	
8. CONSULTANTS *(Identify—purpose—rate)*			EST COST ($)		
Ecology and Environment - Health & Safety			5,720		
ECOLOGY AND ENVIRONMENT - FIT			18,640		
Other Consultants (See exhibit A)			301,520		
TOTAL CONSULTANTS				325,880	
9. OTHER DIRECT COSTS *(Itemize on Exhibit A)*				18,620	
10. TOTAL DIRECT COST AND OVERHEAD				140,152	
11. GENERAL AND ADMINISTRATIVE EXPENSE (Rate 121% of cost element No. 3)					
12. ROYALTIES					
13. TOTAL ESTIMATED COST					
14. FEE OR PROFIT See Exhibit A				50,347	
15. TOTAL ESTIMATED COST AND FEE OR PROFIT				721,626	

OPTIONAL FORM 60
October 1971
General Services Administration
FPR 1-16.806
9060-101

This proposal is submitted for use in connection with and in response to (Identify RFP, etc.)

N. Wayne Sellman
Contract Administrator

and reflects our best estimates as of this date, in accordance with the Instructions to Offerors and the Footnotes which follow

TYPED NAME AND TITLE	SIGNATURE
CH2M HILL	

NAME OF FIRM	DATE OF SUBMISSION

EXHIBIT A—SUPPORTING SCHEDULE *(Specify. If more space is needed, use reverse)*

COST EL NO.	ITEM DESCRIPTION (See footnote 5)							EST COST ($)
	1984			1985				
3		HRS	RATE	COST	HRS	Rate	Cost	TOTAL
	P4	1486	24.65	36,630	1076	25.94	27,911	64,541
	P3	290	17.70	5,133	133	18.63	2,478	7,611
	P2	1564	14.64	22,897	395	15.41	6,087	28,984
	P1	84	13.02	1,094		13.70		1,094
	T2	72	11.69	842				842
	T1	641	8.75	5,609	203	9.20	1,868	7,476
	D	412	8.37	3,448	208	8.81	1,832	5,280 115,828
8	Aerial Photograph/Maps						1,000	
	Geophysical Study						33,000	
	Drilling						226,375	
	Borehole Logging						15,200	
	Survey Wells						2,000	
	Aquifer Testing-Pumping						20,295	
	Health Physicist						3,650	301,520
6	Piers and Water Level Monitors						6,750	6,750
9	Photocoping, Mail, Phone, Computer Time, Word Processing time, etc.							18,620
14	(Items 3+4+7+11+9)x10% = 345,399 x 0.10= 34,540							
	Ecology & Environment (Item) x 3% 24,360 x 0.03= 731							
	All other Item 8 x 5% x 0.05 = 15,076							50,347

I. HAS ANY EXECUTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR RECORDS IN CONNECTION WITH ANY OTHER GOVERNMENT PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?

☒ YES ☐ NO *(If yes, identify below.)*

NAME AND ADDRESS OF REVIEWING OFFICE AND INDIVIDUAL	TELEPHONE NUMBER/EXTENSION

II. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?

☐ YES ☒ NO *(If yes, identify on reverse or separate page)*

III. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT?

☒ YES ☐ NO *(If yes, identify.)* ☐ ADVANCE PAYMENTS ☐ PROGRESS PAYMENTS OR ☐ GUARANTEED LOANS

IV. DO YOU NOW HOLD ANY CONTRACT *(Or, do you have any independently financed (IR&D) projects)* FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?

☐ YES ☒ NO *(If yes, identify.)*

V. DOES THIS COST SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?

☒ YES ☐ NO *(If no, explain on reverse or separate page)*

See Reverse for Instructions and Footnotes

OPTIONAL FORM 60 (10-71)

GPO : 1972 O - 460-269

BUDGET FOR ACTIVITY, PROJECT MANAGEMENT

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 1-1	1-2	1-3	1-4	Total Direct Labor
P4	111/2736	291/7290	170/4264	20/502	592/14,799
P3	-	-	-	-	-
P2	-	-	-	82/1222	82/1222
P1	-	-	-	-	-
T2	-	-	-	-	-
T1	-	-	-	20/179	20/179
0	50/419	72/613	24/204	13/112	159/1348
					889/17,868
Labor Overhead (41%)					7,326
G & A Expense (121%)					21,620
Profit (10%)					4,681
Total Labor Cost					51,495

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation	$3,500	$350	$3,850
Subsistence	490	49	539
Other Direct Costs	1,370	137	1,507
Subcontractors			-
			$ 5,896

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 1 $57,391

*Time Period For Labor Rates:
1-1 1984
1-2 (2/3) 1984 (1/3) 1985
1-3 (2/3) 1984 (1/3) 1985
1-4 (2/3) 1984 (1/3) 1985

SUPER3/10

BUDGET FOR ACTIVITY, INVESTIGATION SUPPORT

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 2-1	2-2	2-3	2-4	2-5	Total Direct Labor
P4	0/1479	14/345	28/690	20/493	51/1257	173/4264
P3	-	-	-	64/1133	102/1805	166/2938
P2	90/1318	-	16/234	-	-	106/1552
P1	60/781	-	-	-	-	60/781
T2	-	-	-	-	-	-
T1	-	-	-	-	-	-
0	40/335	4/33	-	16/134	16/134	76/636
						581/10,171
	Labor Overhead (41%)					4,170
	G & A Expense (121%)					12,307
	Profit (10%)					2,665
	Total Labor Cost					29,313

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation	$1,500	150	$ 1,650
Subsistence	440	44	494
Other Direct Costs	2,850	285	3,135
Subcontractors (H & P)	3,650	188	3.833
(E & E)	5,720	172	5,892
			$15,004

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 2

$44,317

*Time Period For Labor Rates:
2-1 1984
2-2 1984
2-3 1984
2-4 1984
2-5 1984

SUPER3/10

BUDGET FOR ACTIVITY, FIELD INVESTIGATION

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 3-1	3-2	3-3	3-4	Total Direct Labor
P4	21/515	42/1035	72/1775	56/1380	
P3	-	-	-	-	
P2	-	16/234	508/7437	418/6120	
P1	-	-	-	-	
T2	-	-	-	-	
T1	-	38/333	3/70	434/140	
0	-	24/201	16/134	16/134	

Labor Overhead (41%)
G & A Expense (121%)
Profit (10%)

Total Labor Cost

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation	$ 3,000	$ 300	$ 3,300
Subsistence	5,280	528	5,808
Other Direct Costs	500	50	550
Subcontractors (Koogle,Poule)	1,000	50	1,050
(Geophysical)	33,000	1,650	34,650
(Logging)	15,200	760	15,960
(Drilling)	226,375	11,319	237,694
(Pumping)	20,295	1,015	21,310
(Surveying)	2,000	100	2,100
		SUB TOTAL	$322,422

*Time Period For Labor Rates:

3-1	1984
3-2	1984
3-3.1	1984
3-3.2	1984

SUPER3/10

BUDGET FOR ACTIVITY, FIELD INVESTIGATION (Con.)

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 3-4	3-5	3-6	3-7	Total Direct Labor
P4	45/1134	38/1380	54/1331	7/173	336/8282
P3	-	40/1062	-	56/991	96/1699
P2	241/3628	104/1522	-	-	1287/18,841
P1	-	24/312	-	-	24/312
T2	-	-	-	-	-
T1	8/70	8/70	8/70	8/70	512/4480
0	8/67	8/67	16/134	16/134	104/870
					2359/34,484
	Labor Overhead (41%)				14,114
	G & A Expense (121%)				41,654
	Profit (10%)				9,019
	Total Labor Cost				$ 99,383

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation	$ 500	$ 50	$ 550
Subsistence	1,240	124	1,364
Other Direct Costs	6,750	675	7,425
Subcontractors (E&E FIT)	18,640	559	19,199
(Subtotal first sheet)			322,422
			$350,960

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 3

$450,343

*Time Period For Labor Rates:

3-4	1984
3-5	1984
3-6	1984
3-7	1984

SUPER3/10

BUDGET FOR ACTIVITY, REMEDIAL INVESTIGATION REPORT

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 4-1	4-2			Total Direct Labor
P4	229/5645	42/1035			271/6680
P3	-	-			-
P2	40/586	-			40/586
P1	-	-			-
T2	-	-			-
T1	60,525	24/210			84/735
0	40/335	24/201			64/536
					459/8537
	Labor Overhead (41%)				3500
	G & A Expense (121%)				10,330
	Profit (10%)				2237
	Total Labor Cost				24,604

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation			
Subsistence			
Other Direct Costs	4,000	400	$4,400
Subcontractors			
			$4,400

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 1 $29,004

*Time Period For Labor Rates:
4-1 1984
4-2 1984

SUPER3/10

BUDGET FOR ACTIVITY, EVALUATION OF REMEDIAL ACTION ALTERNATIVES

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 5-1	5-2	5-3	5-4	Total Direct Labor
P4	24/592	68/1676	46/1134	25/616	
P3			12/212	8/142	
P2		16/234	8/117		
P1					
T2					
T1					
0	3/25	4/33	8/67	2/17	
	Labor Overhead (41%)				
	G & A Expense (121%)				
	Profit (10%)				
	Total Labor Cost				

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation			
Subsistence			
Other Direct Costs	100,200,100/$400	40	$440
Subcontractors			
			$440

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 1

*Time Period For Labor Rates:

5-1	1984
5-2	1984
5-3	1984
5-4	1984

SUPER3/10

BUDGET FOR ACTIVITY, EVALUATION OF REMEDIAL ACTION ALTERNATIVES (CON)

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 5-5	5-6	5-7		Total Direct Labor
P4	30/740	81/1997	69/1790		
P3	8/142		16/298		
P2		52/761	40/616		
P1					
T2		72/842			
T1	8/70				
0	8/67	20/167	6/53		

Labor Overhead (41%)
G & A Expense (121%)
Profit (10%)

Total Labor Cost

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation			
Subsistence			
Other Direct Costs	200,200,100/ $500	50	$550
Subcontractors			

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 1

*Time Period For Labor Rates:

5-5	1984
5-6	1984
5-7	1984

SUPER3/10

BUDGET FOR ACTIVITY, EVALUATION OF REMEDIAL ACTION ALTERNATIVES (CON)

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 5-8	5-9	5-10		Total Direct Labor
P4	78/2023	48/1245	46/1193		515/13,006
P3	52/969				96/ 1,763
P2		38/586	24/370		178/2684
P1					
T2					72/842
T1					8/70
0	8/70	8/70	8/70		75/640
					944/19,005
	Labor Overhead (41%)				7,792
	G & A Expense (121%)				22,996
	Profit (10%)				4,979
		Total Labor Cost			

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation			
Subsistence			
Other Direct Costs	200,200,200/ $600	60	$ 660
Subcontractors			550
			440
			1,650

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 1 $56,422

*Time Period For Labor Rates:

5-8	1985
5-9	1985
5-10	1985

SUPER3/10

BUDGET FOR ACTIVITY, FEASIBILITY STUDY REPORT

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 6-1	6-2	6-3		Total Direct Labor
P4	178/4617	39/1012	84/2179		301/7808
P3	40/745				40/745
P2	48/740				48/740
P1					
T2					
T1	24/221		16/147		40/368
0	30/264	28/247	24/211		82/722
					511/10,383
	Labor Overhead (41%)				4,257
	G & A Expense (121%)				12,563
	Profit (10%)				2,720
		Total Labor Cost			$29,924

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation	$500	50	550
Subsistence	100	10	110
Other Direct Costs	2000,1500/3,500	350	3,850
Subcontractors			
			$4,510

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 1 $34,434

*Time Period For Labor Rates:
6-1 1985
6-2 1985
6-3 1985

SUPER3/10

BUDGET FOR ACTIVITY, CONCEPTUAL DESIGN

Remedial Investigation/Feasibility Study
United Nuclear
Churchrock, New Mexico

W66215.00 EPA WA67.6L15.0

1. LABOR COST

EPA LABOR Category	Task (hrs/$) 7-1	7-2	7-3		Total Direct Labor
P4	190/4928	112/2905	72/1868		374/9701
P3	25/466				24/466
P2	154/2373	40/616	24/370		218/3359
P1					
T2					
T1	80/736	40/368	24/221		144/1325
0	12/106	24/211	24/211		60/529
					821/15,380
	Labor Overhead (41%)				6,306
	G & A Expense (121%)				18,610
	Profit (10%)				4,030
		Total Labor Cost			$44,325

2. EXPENSES

Item	Estimated Cost	Profit	Total Expense Expenses
Transportation			
Subsistence			
Other Direct Costs	1400,1000,2500/	$4,900 490	$ 5,390
Subcontractors			
			$ 5,390

3. LABOR COST PLUS EXPENSES FOR ACTIVITY 1

$49,715

*Time Period For Labor Rates:

7-1	1985
7-2	1985
7-3	1985

SUPER3/10

UNAPPROVED PLAN PENDING SELECTION OF TEAM AND SUBCONTRACTOR(SEE ATTACHED MEMO)

ECOLOGY AND ENVIRONMENT, INC.
R.E.M. FIELD INVESTIGATION TEAM
SITE SAFETY PLAN

A. GENERAL INFORMATION

UNC Mining & Milling — CH_2M HILL No: W66115.00
WSTS No:

LOCATION: Church Rock, New Mexico
PLAN PREPARED BY: D. L. Dahlstrom — DATE: 8/16/83(amended 2/16/84)
APPROVED BY: UNAPPROVED — DATE:
OBJECTIVE(S): To drill ten to twenty monitoring wells both on and off site and to take samples from same to confirm the extent of subsurface contamination.
PROPOSED DATE OF INVESTIGATION:
BACKGROUND REVIEW: Complete: ___ Preliminary: x
DOCUMENTATION/SUMMARY: OVERALL HAZARD: Serious: ___ Moderate: ___
Low: x Unknown: ___

B. SITE/WASTE CHARACTERISTICS

WASTE TYPE(S): Liquid x Solid x Sludge ___ Gas ___
CHARACTERISTIC(S): Corrosive ___ Ignitable ___ Radioactive x
Volatile ___ Toxic x Reactive ___ Unknown x Other (Name) ___

FACILITY DESCRIPTION: United Nuclear Corporation is an active uranium mining and milling facility covering an extensive area near Church Rock, New Mexico.

Principal Disposal Method (type and location): Surface impoundment on-site.

Unusual Features (dike integrity, power lines, terrain, etc.)
In 1979, UNC experienced a breach in the dike of one of its surface impoundments. Since that time, all dikes have been reinforced.
Status: (active, inactive, unknown) Active
History: (Worker or non-worker injury; complaints from public; previous agency action): This facility experienced a tailings dam break in 1979 which involved the discharge of 93 million gallons of contaminated liquid into a nearby river bed. The spill was cleaned up under the supervision of EPA. The dam has been rebuilt, but seepage of tailings liquid through the bottom of the impoundment pond continues to contaminate groundwater under and around the site. The Region 6 FIT performed sampling of wells both on and off site in November, 1982.

C. HAZARD EVALUATION

Monitoring during previous on-site activities has indicated low level respiratory and cutaneous hazards (e.g. the pH of the liquids in the retaining ponds is about 1 - very corrosive to the skin). Background radiation levels are in the 0.07 mR/hr range. Radiation hazards predominate from radon-222, radium-226 and thorium-230 radionuclides within the tailings materials. Types of radiation represented include alpha, beta, and gamma thereby representing both as inhalation/ingestion and dermal hazard. These hazards can be minimized by respiratory protection, dermal protection, and dust suppression measures. Levels of radiation above 10 MR/hr require immediate evacuation of the site. (see attachment A for more detailed description of potential hazards)

D. SITE SAFETY WORK PLAN

PERIMETER ESTABLISHMENT: Map/Sketch Attached No Site Secured: Yes
Perimeter Identified? Yes Zone(s) of Contamination Identified? No

PERSONAL PROTECTION
Level of Protection: A ___ B ___ C X D off site (Drilling, wells, sampling & decon.)
Modifications: Chemically resistant coveralls with outer tyvek CS or Tyvek S/1422A suits, steel toed and shanked neoprene boots, disposable booties, latex gloves under neoprene work gloves, air purifying respirators with high efficiency filter cartridges, Hard hats to be worn around drill rigs.
Surveillance Equipment and Materials:
Radiation mini-alerts, TLD badges, Thyac 471

ATTACHMENT A

C. Hazard Evaluation

I. Chemical Classification of Wastes

A. Inorganic Pollutants: Sodium carbonate, sodium bicarbonate, magnesium, molybdenum, copper, barium, chromium, selenium, lead, arsenic, vanadium, iron, cobalt, nickel, strong base anionic resins, salt, sulfuric acid, ammonium nitrate, various other chlorides, nitrates, and sulfates.

B. Organic Pollutants: inconsequential.

C. Radioactive Pollutants: Uranium is present in small quantities as U-234, U-235, U-238

- Thorium-234, Thorium-230
- Polonium-218, Polonium-214, Polonium-210
- Bismuth-214, Bismuth-210
- Radium-226
- Radon-222
- Lead-214, Lead-210
- Protactinium-234

Uranium-238 is the first member of a long series of radioactive isotopes which decay to stable lead-206. The series contains eight alpha emitters and six beta emitters. Uranium-238 decays by alpha emission to thorium-234 with a half life of 4.5 billion years; the thorium-234 decays by beta emission to protactinium-234 with a half life of 24.1 days; the protactinium-234 decays by beta emission to uranium-234 with a half life of 1.1 minutes; uranium-234 decays by alpha emission to thorium-230 with a half life of 250,000 years with decay continuing until stable lead-206 is found (see attached decay chart). Most ores occur with the members of the radioactive family in equilibrium, the state that prevails when the ratios between the amounts of successive members of family remain constant. Natural leaching by groundwater of some members of the family may disturb the equilibrium of these materials.

Uranium-238 has an alpha activity of 152 microcuries per pound. If the series is in equilibrium, each of the daughters will have the same activity. The eight alpha emitting daughters will have an activity of 1216 microcuries per pound of uranium and the six beta emitting daughters will have an activity of 912 microcuries per pound, resulting in a total alpha and beta activity of 2,128 microcuries per pound of uranium. Note that since only uranium is recovered from the ore, the other radioactive members of the family are discharged as waste. The activity of the recovered alpha-emitting uranium isotopes is 304 microcuries per pound, resulting in the discharge as mill waste of the other 12 alpha and beta emitting isotopes

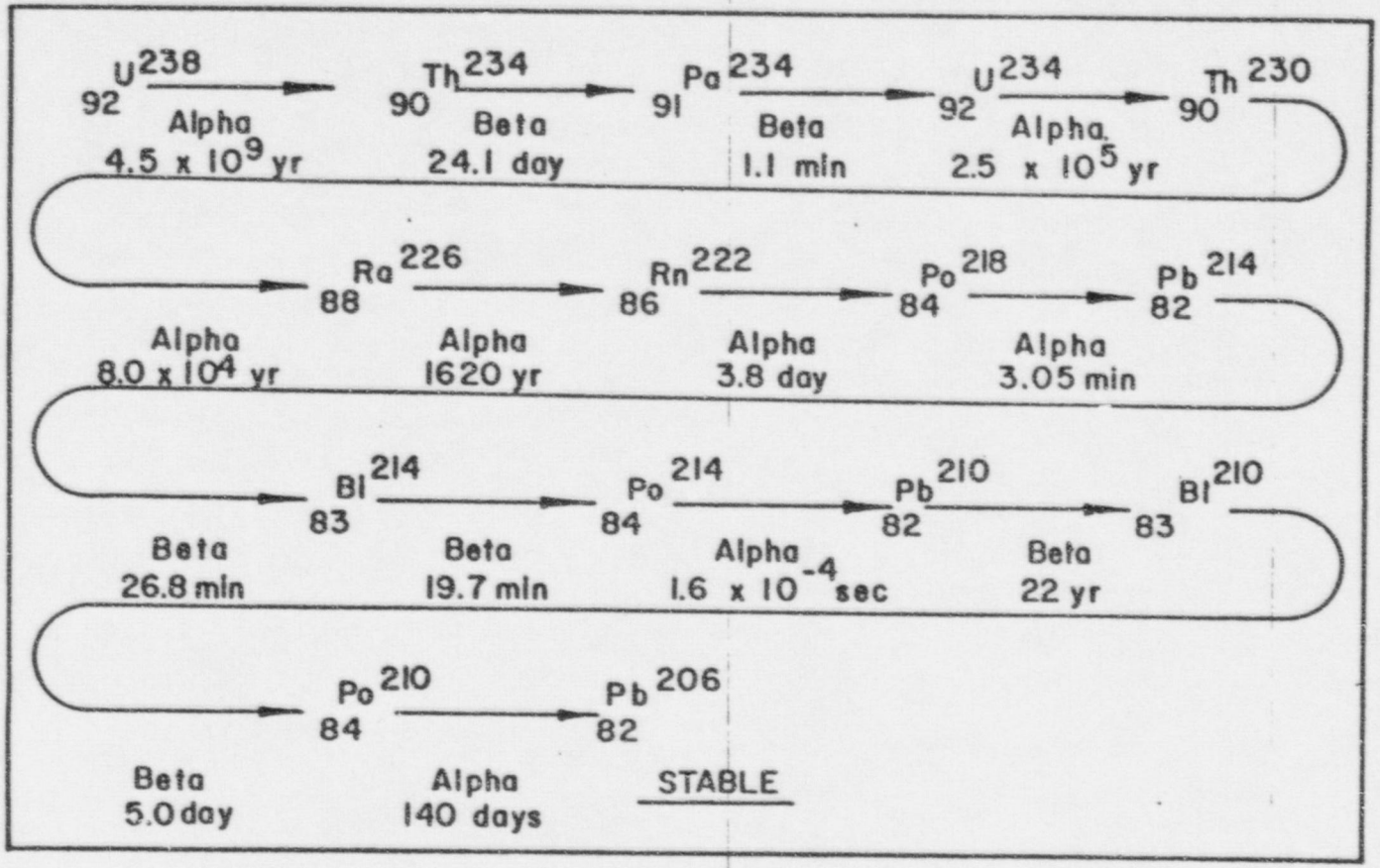


Figure 10. URANIUM-RADIUM FAMILY (minor branches not shown)

C. Hazard Evaluation cont.

with an activity of 1,824 microcuries per pound; hence, 85 percent of the total activity is contained in the mill waste. It has also been determined by review of the alkaline leach process used by United Nuclear Corp. that 98.0 to 98.5 percent of the radium-226 (considered to be the most hazardous of all waste products) associated with the raw uranium ore is discharged into the tailings pond in the sand and slimes. This factor represents approximately 16.0 grams of radium being discharged to the tailings ponds per day. It should also be noted that the daughters of radon-222 are solids which attach themselves quickly to any solid surface, such as dust particles. In this manner the radionuclides may remain suspended for prolonged periods.

Radioisotope concentrations in water vary in the degree of hazard and have been given a maximum permissible concentration in water (MPCw). The following table lists each of the members of the uranium - radium family in order of increasing maximum permissible concentration in water.

Radium-226 has the lowest maximum permissible concentration indicating that it is considered to be the most hazardous of all the waste products. It is a bone-seeking alpha emitter having a half life of 1620 years. Radium does not precipitate from solution as readily as the other isotopes and is rapidly leached from suspended waste material, thereby contributing to the dissolved activity of water.

The MPCw for uranium is 13,300 picocuries per liter and is equivalent to 40 mg of uranium per liter. Chemical toxicity of uranium, rather than radioactive hazard, is the determining factor for the high MPCw permitted. From a chemical toxicity standpoint, uranium is probably one of the most toxic chemicals, but it is absorbed into the body with difficulty, thus minimizing the degree of hazard. However, if a water soluable fraction of uranium is absorbed into the body, renal damage may ensue. Typical uranium concentrations in the mill tailings are routinely less than the MPCw since extractive methods employed in the milling process are quite efficient.

Lead-210 and polonium-210 have sufficiently long half lives and a low MPCw to warrant consideration as potential pollutants. The two isotopes are related in that polonium-210 concentrations in wastes are dependent on the lead-210 present. When lead-210 is absent, polonium-210 present will decay almost completely in a year. Little is known of the fate of the two nuclides through the milling process. Lead-210, however, is the most hazardous of the two radionuclides with a MPCw of 33 picocuries per liter.

C. Hazard Evaluation cont.

Of the two thorium isotopes, thorium-230 is of the greatest concern in mill wastes since it is a bone-seeking alpha emitter with an extremely long half life. The MPCw for thorium-230 is 667 picocuries per liter. Thorium compounds are insoluable at neutral or higher pH levels and are discharged primarily in the solid waste material in the alkaline leach milling process as used by United Nuclear.

Bismuth-210, Polonium-218, Polonium-214, Protactinium-234, Bismuth-214, Lead-214, and Radon-222 have not been considered significant hazards due to their short half lives.

Previous environmental surveys of several uranium mill tailings piles have been conducted at various uranium mill sites. The conclusions from the studies were that:

1. The radiation levels on the tailings were of such levels as to preclude the release of the tailings area for public use;

2. Wind erosion had spread tailings materials to distances of 1000 feet from the tailings area to the extent that radiation levels exceeded recommended standards;

3. Radium-226 and thorium-230 concentrations in air exceeded recommended concentrations downwind from the pile if left uncovered and unstabilized;

4. Radon-222 gas in the area was not a hazard unless enclosed structures were to be built on the material; and

5. Well water and stream samples did not show pollution from the tailings area.

It has further been noted in the literature that as a general rule, when radium-226 concentrations are found to be below the standard limit (drinking water: 3.3 pCi/l or 7.3 pCi/day), all other radionuclide concentrations will be below their standard limit. Grass alpha and grass beta activity should, however, be continually assessed so as to insure that radionuclide concentrations are low.

Table 24. URANIUM-RADIUM FAMILY, MPC_w VALUES[a]

Nuclide	MPC_w pc/liter	Critical organ	Half-life	Emission
Ra^{226}	3.3	Bone	1,620 yr	Alpha
Pb^{210}	33.0	Kidney	22 yr	Beta
Po^{210}	233.0	Spleen	140 days	Alpha
Th^{230}	667.0	Bone	8×10^4 yr	Alpha
Th^{234}	6,667.0	GI tract	24.1 days	Beta
U^{234}	10,000.0	GI tract	2.5×10^5 yr	Alpha
U^{238}	13,300.0	GI tract	4.5×10^9 yr	Alpha
Bi^{210}	13,300.0	GI tract	5 days	Beta
Pa^{234}	b	---	1.1 min	Beta
Po^{218}	b	---	3.05 min	Alpha
Po^{214}	b	---	1.6×10^{-4} sec	Alpha
Bi^{214}	b	---	19.7 min	Beta
Pb^{214}	b	---	26.8 min	Beta
Rn^{222}	(gas)	Lung	3.8 min	Alpha

[a] MPC_w value is the Maximum Permissible Concentration in water for an average member of the general population (1/30th HB69 value for continuous occupational exposure).

[b] No value given for these short-lived materials.

DECONTAMINATION PROCEDURES: Boots, booties, gloves are to be thoroughly washed in detergent solution and rinsed in water. Disposable clothing is to be properly bagged, labelled, and left onsite. Decontamination of drilling and sampling equipment is to be properly performed onsite. If solvent washes are employed, respirators with GMC-H cartridges are to be worn.

Special Equipment, Facilities, or Procedures All personnel will take a shower immediately following on-site work and are to be scanned for gross alpha and beta contaminations.

SITE ENTRY PROCEDURES: Site is to be entered from upwind direction. Personnel are to stay upwind of all activities (sampling and drilling) when possible. All drilling and sampling points will first be surveyed for background radiation levels using the Thyas 471 and then continuously during all drilling and sampling operations. Radiation levels approximately 10 mR/hr above background will require immediate evacuation of the site. Dust suppression practices are to be observed during drilling.

Team Member	Responsibility
Terry Chatwin - CH2M Hill	Project Manager

E&E HEALTH AND SAFETY GROUP (BUFFALO)
TO BE NOTIFIED OF ALL ADDITIONAL PERSONS
TO BE ON SITE FOR PLAN APPROVAL

All employees should have received site investigation training and have current medical surveillance examinations.

WORK LIMITATIONS (Time of day, etc.): Daylight hours.

INVESTIGATION-DERIVED MATERIAL DISPOSAL: To be disposed of on-site.

* EMERGENCY NUMBERS ARE TO BE CHECKED PRIOR TO ANY SITE ACTIVITY

* E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance Gallup 505/722-7296
Hospital Emergency Room Gallup McKinnly General 863-6832
Poison Control Center 1-800-432-6866
Police Gallup 505/722-2231
Fire Department East Gallup 505/722-4929
Airport Gallup 505/722-4896
Explosives Unit see Fire Dept.
EPA Contact

SITE RESOURCES

Water Supply
Telephone yes
Radio no
Other

EMERGENCY CONTACTS

1.	Dr. Raymond Harbison (University of Arkansas)	(501) 661-5766 or 661-5767 (501) 370-8263 (24 hour)
2.	Safety Coordinator/D. Dahlstrom	(716) 632-4491 (Office) (716) 741-2384 (Home)
3.	RPT Leader	
4.	RPT Office	(801) 539-0070
5.	Ecology and Environment, Inc. NPMO . . .	(703) 522-6065
6.	Regional Health Maintenance Program Contact	
7.		
8.		
9.		
10.		

EMERGENCY ROUTES ARE TO BE DRIVEN PRIOR TO ANY SITE ACTIVITY

F. EMERGENCY ROUTES
(Give road or other directions; attach map)

HOSPITAL: CH2M Hill on-site personnel to obtain directions to hospital. (1901 Red Rock Drive)

OTHER: This site safety plan has been developed based upon the most recent and available information as provided by CH2M Hill and FIT Region 6 personnel (information from November, 1982). It is recognized that site conditions may have changed considerably from the previous investigations. Therefore, it is imperative that personnel protective measures be thoroughly assessed by the project team leader prior to and during on-site activities. This safety plan was designed to cover drilling and well sampling only. Any other activities on this site will invalidate this safety plan and will require further approval by D. Dahlstrom prior to initiation.

MEMORANDUM

TO: File CH785-2

FROM: D. L. Dahlstrom

DATE: August 22, 1983

AUG 29 1983
CH2M HILL
SALT LAKE CITY, UTAH

SUBJECT: Addendum to Site Safety Plan

cc: [redacted], M. A. Chillingworth, L. Adams

- Terry Chatwin and I discussed the content of the safety plan developed for drilling and sampling operations on the United Nuclear Site in Church Rock, New Mexico.

- We agreed that an action level of 0.14 mR/hr to 0.20 mR/hr (assuming that the typical background radiation levels found on-site is 0.07 mR/hr as has been reported earlier by Region 6 - FIT) be established as requiring the donning of respiratory equipment. This level represents the ± 10-15% error expected from the radiation detection equipment to be used continuously on-site for monitoring purposes during drilling and sampling operations.

- Respirators should be worn when conditions become dust due to the potential presence of alpha and beta emitting radionuclides in the immediate work area.

- Dust is not viewed as a significant problem in that wet drilling methods are to be used in drilling the wells.

- Terry and I agreed that all drilling equipment (bits, augers, etc.) will be cleaned to background levels between the drilling of each monitoring well and prior to leaving the site.

- Terry informed me that UNC uses an acid leach method versus an alkaline leach method in processing uranium ore and that the pH of the waste lagoon is now neutral. The groundwater pH, however, is in the range of 3 to 5.

- Terry mentioned that neither the proposed CH2M Hill team nor the drillers have received either the required training or physical exam.

- I attempted to call M. A. Chillingworth concerning the discrepancy in physical exams and training but she was not in.

- Terry did mention that he will need to borrow one of E & E's thyac 471's for on-site monitoring.

DLD/clf

TO: Terry Chatwin
CH2M Hill, Salt Lake City

FROM: Steven J. Sherman SJS

DATE: 16 February 1984

RE: UNC Mining and Milling, Church Rock
W66115.0

A copy of the 8/16/83 SSP for this site is attached for reference. The terms and conditions of the plan will still apply to your work this spring with the following exception/revisions following our phone conversation and my discussions with D. Dahlstrom:

- The plan is UNAPPROVED until such time as we are notified of the drilling subcontractor (and their training/medical approval), and all members chosen for CH2M Hill's field team.

- A health phycisist or similar from Rodgers will be required on site with the field team. In this way we will be assured of having necessary monitoring equipment and know-how on site and will not have to stop work should an action level be reached by our people. This individual will be able to document radiological conditions at the site, as well as interpret these numbers.

- The 10mR/hr evacuation action level still stands.

- Verification of all emergency information and route(s) will be necessary prior to the initiation of site work.

- Consideration will be given to rotating field crew to minimize exposures if higher than expected levels are observed during sampling.

Please contact E & E when field crew/subcontractor selection is finalized.

SJS/mba

WORK ASSIGNMENT

received 9/30/83

A. Contractor: CH2M-Hill
1941 Roland Clarke Place
Reston, VA. 22091

B. Contract Number: 68-01-6692 W66215.00

C. SITE/Title: UNITED NUCLEAR CORP (UNC)

D. Assignment Number: 67.6L15.0

E. Statement of Work: Attached

F. Level of Effort (Work hours): 1333

G. Period of Performance: 12 mos

Contracting Officer

Dorothy Tyler PHONE 382-3195
Environmental Protection Agency (PM-214-F)
401 M Street, S.W.
Washington, D.C. 20460

Contracting Officer Approval Dorothy C. Tyler Date 9/23/83

Project Officer

Paul Nadeau PHONE 382-2339
Environmental Protection Agency (WH-548-E)
401 M Street, S.W.
Washington, D.C. 20460

Signature Paul F. Nadeau Date 9/22/83

Deputy Project Officer

Nancy Willis PHONE 382-2339
Environmental Protection Agency (WH-548-E)
401 M Street, S.W.
Washington, D.C. 20460

Signature _____ Date _____

Regional Site Project Officer

PHONE 382-7951

Signature David F. Kluber Date 9/22/83

Steve Romanow Reviewers - Bob Davis
Jeff Randall

STATEMENT OF WORK
REMEDIAL INVESTIGATION
UNITED NUCLEAR CORPORATION

Purpose:

The purpose of this task is to prepare and implement a Remedial Investigation (RI) for the United Nuclear Corporation in Church Rock, New Mexico. The RI should determine the level and extent of onsite and offsite contamination, determine the potential for further offsite migration and endangerment, develop potential remedial measures for site cleanup or containment, and gather all necessary data to support the feasibility study.

Scope:

The RI consists of eight (8) tasks

TASK 1 - DESCRIPTION OF CURRENT SITUATION
TASK 2 - INVESTIGATIVE SUPPORT
TASK 3 - SITE INVESTIGATIONS
TASK 4 - PRELIMINARY REMEDIAL TECHNOLOGIES
TASK 5 - SITE INVESTIGATION ANALYSIS
TASK 6 - DRAFT FINAL REPORT
TASK 7 - COMMUNITY RELATIONS SUPPORT
TASK 8 - ADDITIONAL REQUIREMENTS

A detailed work plan, including technical approach, budget, personnel requirements, and schedule shall be submitted by the Engineer for the proposed remedial investigation.

TASK 1 -- DESCRIPTION OF CURRENT SITUATION

The consultant shall describe the background information pertinent to the site and its problems and outline the purpose and need for remedial investigations at the site. The data gathered during previous investigations should be used including the Remedial Action Master Plan (RAMP). Studies have been conducted by United Nuclear from Corp., the New Mexico Environmental Improvement Division (NMEID), New Mexico State Engineer Office (NMSEO), U.S. Nuclear Regulatory Commission (RRC), U.S. Environmental Protection Agency (EPA), U.S. Indian Health Service (IHS) and Center for Disease Control (both U.S. Public Health Service/Department of Health fand Human Service), and the Navajo Tribe.

The summary will be presented as a reviewable and shall address the following areas: Site background, Nature and Extent of Problem and History of Previous Actions.

TASK 2 -- INVESTIGATIVE SUPPORT

The contract, in consultation with the EPA, shall determine the role of the State of New Mexico and/or local agencies in the investigation and present this support. The local USGS should be contracted as to the availability of hydrogeologists to perform needed work on Indian lands.

A list of proposed subcontractors by type shall be presented. a schedule to obtain these resources will also be given. Other activities are as follows:

- Site visit - Choose an appropriate team and conduct an initial visit to the site in order to verify the information obtained in Task 1 and to define future activities.

- Define the boundaries of the problem area, points of access control and security. Make recommendations for any IRM's needed to accomplish the investigation.

- Prepare a site map, as a sepia or mylar overlay, adequate to disclose the area of investigation, discharge points, wetlands, drainage, buildings, utilities, paved areas, easements, ROW, etc. Such map, or maps, may be prepared from the aerial photo files at EMSL-LV. The contractor will recommend the scale and topographic interval for the map and forward the request to EMSL-LV through EPA, Region 10 staff. The map will show a permanent baseline monument and a reference grid.

- Site office - If such is required, this will be established in coordination with the local agency.

TASK 3 -- SITE INVESTIGATIONS

The contractor shall conduct only those further investigations necessary to characterize the site and its actual or potential hazard to public health and the environment. The data obtained must be adequate to prepare the preliminary remedial technologies in Task 4 and support the detailed evaluation of alternatives during the Feasibility Study (FS).

All sample collection and analysis shall be IAW agency protocols. Strict chain-of-custody procedures will be followed. The point at which any sample is taken will be shown on the site map.

a. Waste Characterization

Develop and conduct a complete sampling and analysis of the [illegible] ponds located on site. A sampling plan will be developed showing the locations, quality, frequency, numbering and constituents for analysis of each sample. Each sample shall be analysed for, at a minimum: all

critical radiological parameters including ^{230}Th, ^{226}Ra and ^{210}Pb, all major cations and anions, appropriate heavy metals as revealed in Task 1, pH and Total Dissolved Solids.

b. Hydrogeological Investigation

Develop and conduct a program to determine the present and potential extent of ground water contamination and to evaluate the suitability of the site for on-site waste containment. [Idenfity specific aquifer to be studied.] Efforts should begin with a survey of previous hydrogeologic studies and other existing data. The survey should address the degree of hazard, the mobility of pollutants considered (from Water Characterization), the soils' attenuation capacity and mechanisms, discharge/recharge area, regional flow direction and quality, and effects of any pumping alternatives described in Task 4. Such information may be available from the USGS, the Soil Conservation Service, and local well drillers. Subsequent to the survey of existing data, a sampling program should be developed to determine the full horizontal and vertical distribution of contaminants both on and off-site and predict the long-term disposition of contaminants. Attenuation should be focused on determining all potential hydrologic connections to nearby water supply wells, including those on Indian Lands immediately to the east of the UNC operation. The proposed sampling plan will include an inventory of all existing wells.

c. Soils and Sediments Investigation

Develop and conduct a program to determine the location and extent of contamination of surface and subsurface soils and sediments and identify specific areas to be studied. This process may overlap with certain aspects of the hydrogeologic study (e.g., characteristics of soil strata are relevant to both the transport of contaminants by ground water and to the location of contaminants in the soil; cores from ground water-monitoring wells may serve as soil samples). A survey of existing data on soils and sediments may be useful.

A detailed stream sediment plan should be developed for the the Rio Puerco River which should include core sampling to the 3-foot depth areas with particularly high concentrations of radionuclides should be delineated.

d. Surface Water Investigation

Develop and conduct an investigation to totally characterize the potential for contaminants leaving the source(s) by surface runoff. A program should be developed and conducted discussing the receptor(s) of runoff, degree of hazard, techniques for sampling, etc. In addition determine the extent of surface water contamination in Pipeline Canyon Arrayo.

e. Air Studies

Develop and conduct a program to determine the extent of atmospheric contamination. The program should address the tendency of substances (identified through Waste Characterization) to enter the atmosphere, local wind patterns, and the degree of hazard. A sampling program should be developed which includes monitoring the entire perimeters of the site.

TASK 4 -- PRELIMINARY REMEDIAL TECHNOLOGIES

The contractor will identify preliminary remedial technologies, providing detail sufficient to ensure that site investigations will develop a data base adequate for the evaluation of alternatives during the Feasibility Study.

A. Pre-Investigation Action. Prior to starting any site investigations, the contractor will assess the site conditions to determine potential categories of source control and off-site remedial actions. Examples of questions to be answered are:

1. Source Control Action

i. What containment techniques appear feasible to prevent further contamination of ground water?

ii. What technologies are available to treat, contain, or destroy the contaminants on the site?

iii. Does on-site treatment appear to be a viable option, and if so, what category of treatment should be investigated (e.g., biological, physical, chemical, thermal)?

iv. Will substances migrate or continue to migrate off site if no action is taken? If only source control measures are taken?

2. Off-Site Action

   i. Does the apparent volume of contaminated ground water, soil, or filter cake make investigation or treatment impracticable?

   ii. What technologies are available to treat the identified contaminants off the site?

   iii. What technologies exist to effectively remove off-site contaminated materials (e.g., sediments, ground water)?

   iv. Will the off-site contamination continue to pose a threat if no action is taken?

   Enforcement personnel will review and screen the preliminary technologies so that the later site investigations can be designed to answer these types of questions and support the Feasibility Study.

B. Post-Investigation Evaluation. Either during or following the investigations the contractor will assess the investigation results and recommend preliminary remedial technologies likely to apply to the site problem. These will be a refinement of those identified in task 4A. They will provide the basis for developing detailed alternatives during the Feasibility Study. The work during the remedial investigation will generally be limited to the following:

   1. Verifying types of remedial technologies appropriate to the site conditions.

   2. Recommending whether or not to remove some or all of the waste for off-site treatment, storage, or disposal.

   3. Determining the compatability of groups of wastes with other wastes and with materials considered as part of potential remedial action (e.g., slurry walls, lagoon liners). Recommending alternatives for treatment, storage, or disposal for each category of compatible waste.

C. The Preliminary Remedial Technologies should be presented in a table, or matrix, with all technologies or actions shown and one sentence qualifiers for the criteria. Criteria should include, but not be limited to, applicability to the problem, reliability, implementability, damage to the environment, initial cost, O&M, etc. This should be a separate deliverable for use in negotiations and planning.

TASK 5 -- SITE INVESTIGATIONS ANALYSIS

The contractor shall prepare a thorough analysis and summary of all site investigations and results. The objective of this task will be to ensure that the data obtained are sufficient in quality and quantity to support the feasibility study.

a. Data Analysis. Analyze all site investigations and develop a summary of the type and extent of contamination at the site. This analysis must include all significant pathways of contamination and an exposure assessment. The exposure assessment should describe and threat public health, welfare, or the environment. The analysis should discuss the degree to which either source control or off-site actions are required to significantly mitigate the threat to public health, welfare, or the environment. If the results of the investigation indicate that no threat or potential threat exists, a recommendation to stop the remedial response should be made.

b. Application to Preliminary Technologies. Analyze the results of the site investigations in relation to the preliminary remedial technologies developed in Task 4. Data supporting, or rejecting, types of remedial technologies, compatability of wastes and construction materials, and other conclusions should be presented.

TASK 6 -- DRAFT FINAL REPORT

The contractor shall prepare eight (8) copies of a draft report to be submitted to the Agency IAW Task 8. The report shall include the results of Tasks 1-5 and should include additional information in an appendix.

TASK 7 -- COMMUNITY RELATIONS SUPPORT

The contractor may be required to furnish the personnel, services, materials, and equipment required to undertake a community relations program. Although this may be a limited program, community relations must be intergrated closely with all remedial response activities. The objectives of this effort are to achieve community understanding of the actions taken and to obtain community input and support prior to selection of the remedial alternative(s).

Community relations support includes but may not be limited to the following:

- Revisions or additions to community relations plan including definition of community relations program needs for each remedial activity.
- Analysis of community attitudes toward proposed actions.

- Preparation and dissemination of news releases, fact sheets, slide shows, exhibits, and other audio-visual materials designed to apprise the community of current or proposed actions.
- Establishment of a community information center.
- Arrangement of briefings, press conference, workshops, and public and other informal meetings.
- Assessment of the successes and failures of the community relations program.
- Preparation of reports and participation in public meetings, project review meetings, and other meetings as necessary to the normal progress of the work.
- Solicitation, selection and approval of subcontractors, if needed.

All community relations support must be consistent with:

- Superfund community relations policy, as stated in the "Guidance for Implementing the Superfund Program".
- Community Relations in Superfund -- A Handbook.

TASK 8 -- ADDITIONAL REQUIREMENTS

a. Reporting Requirements

Monthly reports shall be prepared by the Engineer to describe the technical and financial progress of the project. These reports should discuss the following items:

1. Identification of site and activity.
2. Status of work at the site and progress to date.
3. Percentage of completion.[1]
4. Difficulties encountered during the reporting period.
5. Actions being taken to rectify problems.
6. Activities planned for the next month.

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[1]Indicates data required for input to EPA's Project Tracking System/Project Management Module (PTS/PMM).

7. Changes in personnel.

8. Actual expenditures including fee and direct labor hours expended for this period.[1]

9. Cumulative expenditures (including fee) and cumulative direct labor hours.

10. Projection of expenditures for completing the project, including an explanation of any significant variation from the forecasted target.[1]

11. A graphic representation of proposed versus actual expenditures (plus fee) and comparison of actual vs. target direct labor hours. A projection to completion will be made for both.

The monthly progress report will list target and actual completion dates for each element of activity including project completion and provide an explanation of any deviation from the milestones in the work plan schedule.

b. Chain-of-Custody. Any field sampling collection and analyses conducted shall be documented in accordance with chain-of-custody procedures as provided by EPA.

c. Health and Safety Plan. A health and safety plan will be developed to protect the health and safety of personnel involved in the remedial investigation and third parties. The plan will be consistent with:

- Section 111(c)(6) of CERCLA
- EPA Order 1440.1 -- Respiratory Protection
- EPA Order 1440.3 -- Health and Safety Requirements for Employees Engaged in Field Activities
- EPA Occupational Health and Safety Manual
- Other EPA guidance as provided
- State safety and health statutes
- Site conditions

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[1]Indicates data required for input to EPA's Project Tracking System/Project Management Module (PTS/PMM).

d. Quality Assurance/Quality Control (QA/QC). The Engineer shall prepare and submit as part of the work plan a Quality Assurance Project Plan for the sampling, analysis, and data handling aspects of the remedial investigation. The plan shall be consistent with the requirements of EPA's Contract Laboratory Program. The plan shall address the following points:

1. QA Objectives for Measurement Data, in terms of precision, accuracy, completeness, representativeness, and comparability.

2. Sampling Procedures.

3. Sample Custody.

4. Calibration Procedures, References, and Frequency.

5. Internal QC Checks and Frequency.

6. QA Performance Audits, System Audits, and Frequency.

7. QA Reports to Management.

8. Preventive Maintenance Procedures and Schedule.

9. Specific Procedures to be used to routinely assess data precision, representativeness, comparability, accuracy, and completeness of specific measurement parameters involved. This section will be required for all QA project plans.

10. Corrective Action.

e. All reports of an interpretive nature, not raw data or financial reports are to be sent in five (5) copies to the Region and three (3) copies to EPA Headquarters, to a designated attorney.

f. All copies will be stamped front and back, "Privileged Information, Subject to Litigation, Enforcement Confidential." On the inside each copy will be stamped and numbered, "_____copy of _____ copies, do not reproduce without attorney approval."

g. The final report will only be prepared at the request of the senior case attorney depending on the state of negotiation/litigation at the time.

REMEDIAL INVESTIGATION SCHEDULE

Task No.	Activity	Outputs	Target Completion Date	Estimated Cost	Personnel Work Hours	Actual Completion Date
1	Description of Current Situation	Draft Summary Section	4 wks	$ 3,000		
1-a	Site Background		2 wks			
1-b	Nature and Extent of Problem		1 wk			
1-c	History of Response Actions		1 wk			
2	Investigation Support					
2-a	Contractor Procurement	RFP (or IFB)	5 wks	$ 5,000		
2-b	Site Visit		2 days	$ 1,300		
2-c	Define Boundary		1 wk	$ 2,000		
2-d	Site Map	Map	3 wks	$ 3,600		
2-e	Site Office		1 wk			
3	Site Investigations	Investigations, Draft Report	3 mths.			
3-a	Waste Characterization					
3-b	Hydrogeologic Investigation			$ 31,000		
3-c	Soils and Sediments Investigation			$110,000		
3-d	Surface Water Investigation			$ 1,000		
3-e	Air Investigation					

Task No.	Activity	Outputs	Target Completion Date	Estimated Cost	Personnel Work Hours	Actual Completion Date
4	Preliminary Remedial Technologies	Draft Report Section	3 wks	$ 6,000		
4-a	Pre-Investigation Evaluation					
4-b	Post-Investigation Evaluation					
5	Site Investigations Analysis	Draft Report	3 wks	$ 6,000		
5-a	Data Analysis					
5-b	Application to Preliminary Technologies					
6	Final Report	Draft Final Report		$ 5,000		6 months
7	Community Relations Support			TBA		
8	Additional Requirements	Final Report		$ 5,000		TBA
				$168,000		

FEASIBILITY STUDY
UNITED NUCLEAR CORPORATION

Purpose:

The purpose of this enforcement feasibility study (FS) is to develop and evaluate remedial alternatives which will eliminate or mitigate the source(s) of contamination to a public water supply in a cost efficient manner. The contractor shall furnish the necessary personnel, materials and services required to prepare the remedial action feasibility study, except as noted.

Scope: The FS consists of nine (9) tasks:

TASK 1 -- DESCRIPTION OF PROPOSED RESPONSE
TASK 2 -- DEVELOPMENT OF ALTERNATIVES
TASK 3 -- INITIAL SCREENING OF ALTERNATIVES
TASK 4 -- LABORATORY STUDIES
TASK 5 -- EVALUATION OF THE ALTERNATIVES
TASK 6 -- CONCEPTUAL DESIGN
TASK 7 -- COMMUNITY RELATIONS SUPPORT
TASK 8 -- DRAFT FINAL REPORT
TASK 9 -- ADDITIONAL REQUIREMENTS

The contractor will submit a draft work plan in six (6) copies IAW Task 8 of the RI to the Agency. This plan will include a detailed technical approach, budget, personnel requirements and schedule.

TASK 1 -- DESCRIPTION OF PROPOSED RESPONSE

Information on the site background, the nature and extent of the problem, and previous activities presented in Task 1 of the remedial investigation may be incorporated by reference. Any changes to the original project scope described in the RI should be discussed and justified.

Following this summary of the current situation, a site-specific statement of purpose for the response, based on the results of the remedial investigation, should be presented. The statement of purpose should be organized in terms of components amenable to discrete remedial measures (e.g., a statement of purpose describing the evaluation of alternatives for treatment of contamination ground water).

TASK 2 -- DEVELOPMENT OF ALTERNATIVES

Based on the results of the remedial investigation and consideration of preliminary remedial technologies (Task 4) of the FS, the contractor shall develop a limited number of alternatives for source control and off-site remedial actions, on the basis of objectives established for the response and the scoping decision.

a. Establishment of Remedial Response Objectives

Establish site-specific objectives for the response. These objectives shall be based on public health and environmental concerns, scoping decision, information gathered during the remedial investigation, Section 300.68 of the National Contingency Plan (NCP), excluding paragraph (k), EPA interim guidance, and the requirements of any other applicable Federal statutes. Preliminary cleanup objectives shall be developed in consultation with EPA and the State.

b. Identification of Remedial Alternatives

Develop alternatives to incorporate remedial technologies (from Task 4b), response objectives, and other appropriate considerations into a comprehensive, site-specific approach. Alternatives should include non-cleanup (e.g., alternatives water supply, relocation) and no-action options. The alternatives shall be developed in close consultation with EPA and the State.

TASK 3 -- INITIAL SCREENING OF ALTERNATIVES

The alternatives developed in Task 2 will be screened by the contractor, EPA, and the State to eliminate alternatives that are clearly not feasible or appropriate, prior to undertaking detailed evaluations of the remaining alternatives.

Conderations to be Used in Initial Screening

Three broad considerations must be used as a basis for the initial screening: effects of the alternative, acceptable engineering practices and cost. More specifically, the following factors must be considered:

1. Environmental protection. Only these alternatives that satisfy the response objectives and contribute substantially to the protection of public health, welfare, or the environment shall be considered further. Source control alternatives shall achieve adequate control of source materials. Off-site alternatives shall minimize or mitigate the threat of harm to public health, welfare, or the environment.

2. Implementability and reliability. Alternatives that may prove extremely difficult to implement, will not achieve the remedial objectives in a reasonable time period, or rely on unproven technology will be eliminated.

3. Environmental effects. Alternatives posing significant adverse environmental effects will be excluded.

4. Cost. An alternative whose cost far exceeds that of other alternatives with similar results will usually be eliminated. Total cost will include the cost of implementing the alternative and the cost of operation and maintenance.

TASK 4 -- LABORATORY STUDIES

The Contractor shall conduct any necessary laboratory and bench scale treatability studies required to evaluate the effectiveness of remedial technologies and establish engineering criteria (e.g., leachate treatment; ground-water treatment; compatability of waste/leachate with site barrier walls, cover, and other materials proposed for use in the remedy). It is expected that the scope of this task will depend on the results of Tasks 2 and 3 and therefore will not be complete at the start of Task 8. The Contractor will submit a separate work plan for any proposed laboratory studies for EPA and State approval. This submittal will be made in the timeframe required to maintain steady progress of the overall feasibility study. [Additional studies may also be conducted during the design phase if needed to refine treatability results or develop detailed design criteria.]

TASK 5 -- EVALUATION OF THE ALTERNATIVES

The Contractor shall evaluate the alternative remedies that pass through the initial screening in Task 3 and recommend the most desirable alternative(s) to EPA and the State.

Alternative evaluation shall be preceded by a detailed development of the remaining alternatives.

a. Detailed Development of Remaining Alternatives

The detailed development of the remaining feasible remedial alternatives shall include as a minimum:

1. Description of appropriate treatment and disposal technologies.

2. Special engineering considerations required to implement the alternative (e.g., pilot treatment facility, additional studies needed to proceed with final remedial design).

3. Environmental impacts and proposed methods, and costs, for mitigating any adverse effects.

4. Operation, maintenance, and monitoring requirements of the remedy.

5. Off-site disposal needs and transportation plans.

6. Temporary storage requirements.

7. Safety requirements for remedial implementation (including both on-site and off-site health and safety considerations).

8. A description of how the alternative could be phased into individual operable units. The description should include a discussion of how various operable units of the total remedy could be implemented individually or in groups, resulting in a significant improvement to the environment or savings in costs.

9. A description of how the alternative could be segmented into areas to allow implementation of differing phases of the alternative.

10. A review of any off-site facilities provided by the state to ensure compliance with applicable RCRA requirements, both current and proposed.

b. Environmental Assessment

Perform an Environmental Assessment (EA) for each alternative. The EA shall include, at a minimum, an evaluation of each alternative's environmental effects, an analysis of measures to mitigate adverse effects, physical or legal constraints, and compliance with CERCLA or other regulatory requirements.

Each alternative will be assessed in terms of the extent to which it will mitigate damage to, or protect, public health, welfare, and the environment, in comparison to the other remedial alternatives. The specific considerations to be used in the assessment will be different for source control alternatives and for off-site alternatives, as explained in EPA guidance. Consideration may be given to standards and criteria developed under Federal or State environmental and health statutes.

c. Cost Analysis

Evaluate the cost of each feasible remedial action alternative (and for each phase or segment of the alternative). The cost will be presented as a present worth cost and will include the total cost of implementing the alternative and the annual operating and maintenance cost. Both monetary costs and associated non-monetary costs will be included. A distribution of costs over time will be provided.

d. Evaluation and Recommendation of an Alternative

Alternatives shall be evaluated using technical, environmental, and economic criteria. At a minimum, the following areas will be used to evaluate alternatives:

1. Reliability. Alternatives that minimize or eliminate the potential for release of wastes into the environment will be considered more reliable than other alternatives. For example, recycling of wastes and off-site incineration would be considered more reliable than land disposal. Institutional concerns such as management requirements can also be considered as reliability factors.

2. Implementability. The requirments of implementing the alternatives will be considered, including phasing alternatives into operable units and segmenting alternatives into project areas on the site. The requirements for permits, zoning restrictions, right of ways and public acceptance are also examples of factors to be considered.

3. Operation and Maintenance Requirements. Preference will be given to projects with lower O&M requirements, other factors being equal.

4. Environmental Effects. Alternatives posing the least impact (or greatest improvement) on the environment will be favored.

5. Safety Requirements. On-site and off-site safety requirements during implementation of the alternatives should be considered. Alternatives with lower safety impact and cost will be favored.

6. Cost. The remedial alternatives with the lowest total present worth cost which alleviates the contamination will be favored. Total present worth cost will include capital cost of implementing the alternative and cost of operations and maintenance of the proposed alernative.

Recommend the alternative determined to be the most cost-effective. The recommendation will be justified by stating the relative advantages over other alternatives considered. Evaluative considerations shall be applied uniformly to each alternative. The lowest cost alternative that adequately protects (or mitigates damage to) public health, welfare, or the environment and is technologically feasible and reliable as the cost-effective alternative.

e. Preliminary Report

Prepare a preliminary report presenting the results of Tasks 1 through 5 and the recommended remedial alternative(s). Submit eight (8) copies of the preliminary report to EPA IAW Task 8 of the RI. EPA and the State will review and select a remedial alternative(s).

TASK 6 -- CONCEPTUAL DESIGN

Prepare a conceptual design of the remedial alternative(s) selected by EPA and the State. The conceptual design shall include, but is not limited to, the engineering approach including implementation schedule, special implementation requirements, institutional requirements, phasing and segmenting considerations, preliminary design criteria, preliminary site and facility layouts, budget cost estimate (including operation and maintenance costs), operating and maintenance requirements and duration, and an outline of the safety plan including cost impact on implementation. Any additional information required as the basis for the completion of the final remedial design will also be included. The Engineer may also be required to revise portions of the community relations plan to reflect the results of the conceptual design.

TASK 7 -- COMMUNITY RELATIONS SUPPORT

The Contractor will continue the efforts denoted in Task 7 of the RI and modify the requirements IAW with guidance from EPA and local authorities.

TASK 8 -- FINAL REPORT

Prepare a draft final report for submission to EPA and the State. The report shall include the results of Tasks 1 through 7, and should include any supplemental information in an appendix. Submit eight (8) copies to EPA IAW Task 8 of the RI.

TASK 9 -- ADDITIONAL REQUIREMENTS

The additional requirements shall be the same as those given to Task 8 of the RI. The distribution and classification system, however, may be adjusted to a lesser or greater standard of security based on the state of negotiations or litigation at the time. The contract manager should therefore maintain communication with the Regional and Headquarters technical contacts in order to stay aware of any unique enforcement requirements.

FEASIBILITY STUDY
MODEL WORK PLAN SCHEDULE

Task No.	Activity	Outputs	Target Completion Date	Estimated Cost	Personnel Work Hours	Actual Completion Date
1	Description of Proposed Response		3 wks	$ 3,000		
2	Development of Alernatives		3 wks	$10,000		
2-a	Response Objectives					
2-b	Identification or Remedial Alternatives					
3	Initial Screening of Alternatives	Draft Letter Report	2 wks	$ 5,000		
4	Laboratory Studies [Optional]	Draft Work Assignment	TBA	$10,000		
5	Evaluation of Alternatives	Preliminary Report	3 wks	$10,000		
5-a	Detailed Development of Remaining Alternatives			$20,000		
5-b	Environmental Assessment	Environmental Information Document	2 wks			
5-c	Cost Analysis					
5-d	Evaluation and Recommendation of Effective Alternative(s)					

Task No.	Activity	Outputs	Target Completion Date	Estimated Cost	Personnel Work Hours	Actual Completion Date
5-e	Preliminary Report	Preliminary Report	4 wks	$10,000		
6	Conceptual Design	Draft Report	4 wks	$20,000±		
7	Community Relations Support					
8	Draft Final Report	Draft Final Report	3 wks	$10,000		24 wks
9	Additional Requirements	Final Report	3 wks	$15,000±		TBA
				$113,000±		