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MANAGEMENT OF THE PIPP PROGRAM FOR THE UMTRA PROJECT GROUNDWATER RESTORATION

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1.0 INTRODUCTION

The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (PL 95-604) grants the Secretary of Energy the authority and responsibility to perform such actions as are necessary to minimize radiation health hazards and other environmental hazards caused by inactive uranium mill sites. The U.S. Department of Energy (DOE) is meeting this responsibility through the Uranium Mill Tailings Remedial Action (UMTRA) Project. The program involves the surface stabilization of 24 uranium mill tailings piles in ten states and the restoration of contaminated groundwater at affected sites.

The current objective of the UMTRA Project is surface remediation, which generally involves stabilizing the uranium mill tailings in place at the processing site, or relocating them to another disposal site for stabilization. Surface remediation is complete at eight of the sites and nearing completion at an additional four. The detailed design or early construction work is in progress at the remainder.

The DOE UMTRA Project's primary objective will change in the nineties from surface remediation to groundwater restoration as a result of the Uranium Mill Tailings Radiation Control Amendments Act of 1988, which authorizes the DOE to perform groundwater restoration activities "without limitation". This change results from the proposed U.S. Environmental Protection Agency (EPA) groundwater protection standards, which originated as follows:

1983: The original standards were published.

1985: The standards were challenged and the U.S. Tenth Circuit Court of Appeals remanded them to the EPA for further consideration.

1987: The EPA issued proposed standards.

Because of specific legal provisions in UMTRCA, the proposed groundwater protection standards are binding on the DOE and must be met, even though they have not been published in final form.

The proposed standards require that if the groundwater quality at an UMTRA Project processing site does not meet criteria established in the standards, groundwater restoration should be undertaken to clean up contaminated groundwater to the concentration limits specified in the standards.

This paper describes a proposed approach to planning site-specific groundwater restoration activities. The essence of the approach is an observational process of beginning with basic and least costly actions, and proceeding to more complex, costly procedures as site response to restoration activities dictates. Because the observational process precludes an a priori establishment of the implemental restoration approach, public information and public participation programs must be tailored to the unique needs and features of the observational process. This paper describes the public information and public participation plans and initiatives that will support an observational approach to UMTRA Project groundwater restoration.

2.0 THE EPA GROUNDWATER PROTECTION STANDARDS

The EPA groundwater protection standards for the UMTRA Project sites and vicinity properties are:

- o Concentration limits of contaminants do not exceed the specified Maximum Concentration Limits (MCLs), or background concentrations.

- o An Alternate Concentration Limit (ACL) may be applied to a listed contaminant if it will not result in a substantial present or potential hazard to human health, and if the U.S. Nuclear Regulatory Commission (NRC) concurs that the limit is As Low As Reasonably Achievable (ALARA).

Supplemental standards may be applied if:

- o The restoration produces clearly excessive environmental harm compared to the benefit.

- o Restoration is technically impracticable from an engineering perspective.

- o The groundwater system meets EPA limited use criteria. A limited use groundwater system is one which is not a usable resource due to widespread ambient contamination, total dissolved solids concentration in excess of 10,000 mg/l, or an aquifer yield of less than 150 gallons per day. Supplemental standards applications must demonstrate no threat to remedial action workers or the public.

The standards further indicate that neither gradient manipulation nor active restoration need be undertaken if:

- o Natural flushing at a site will restore groundwater quality to MCLs or background concentrations within 100 years.
- o Institutional controls can be implemented to prevent access to the decreasingly contaminated aquifer for the required period.

3.0 POSSIBLE GROUNDWATER COMPLIANCE STRATEGIES

The groundwater compliance strategy for a given UMTRA Project site must lead to compliance with the proposed EPA groundwater protection standards in 40 CFR 192, Subparts B and C.

The proposed approach to compliance strategy optimization for the UMTRA Project is a "bottom up" review of compliance options, beginning with the most basic and usually the least costly approach and evaluating increasingly complex, usually more costly options.

Figure 1. illustrates the proposed compliance decision logic process. This process begins with an evaluation of existing data to determine whether data are sufficient to develop a compliance strategy and if additional characterization is needed.

Using this process, if the groundwater quality does not exceed MCLs or background concentration, or supplemental standards are applicable, no further action is required. Where MCLs or background concentrations are exceeded, a risk assessment may be performed to support supplemental standards or an ACL application.

4.0 POSSIBLE REMEDIAL ACTIONS

The following are the main engineering remedial action options that may be adopted to meet selected compliance strategies:

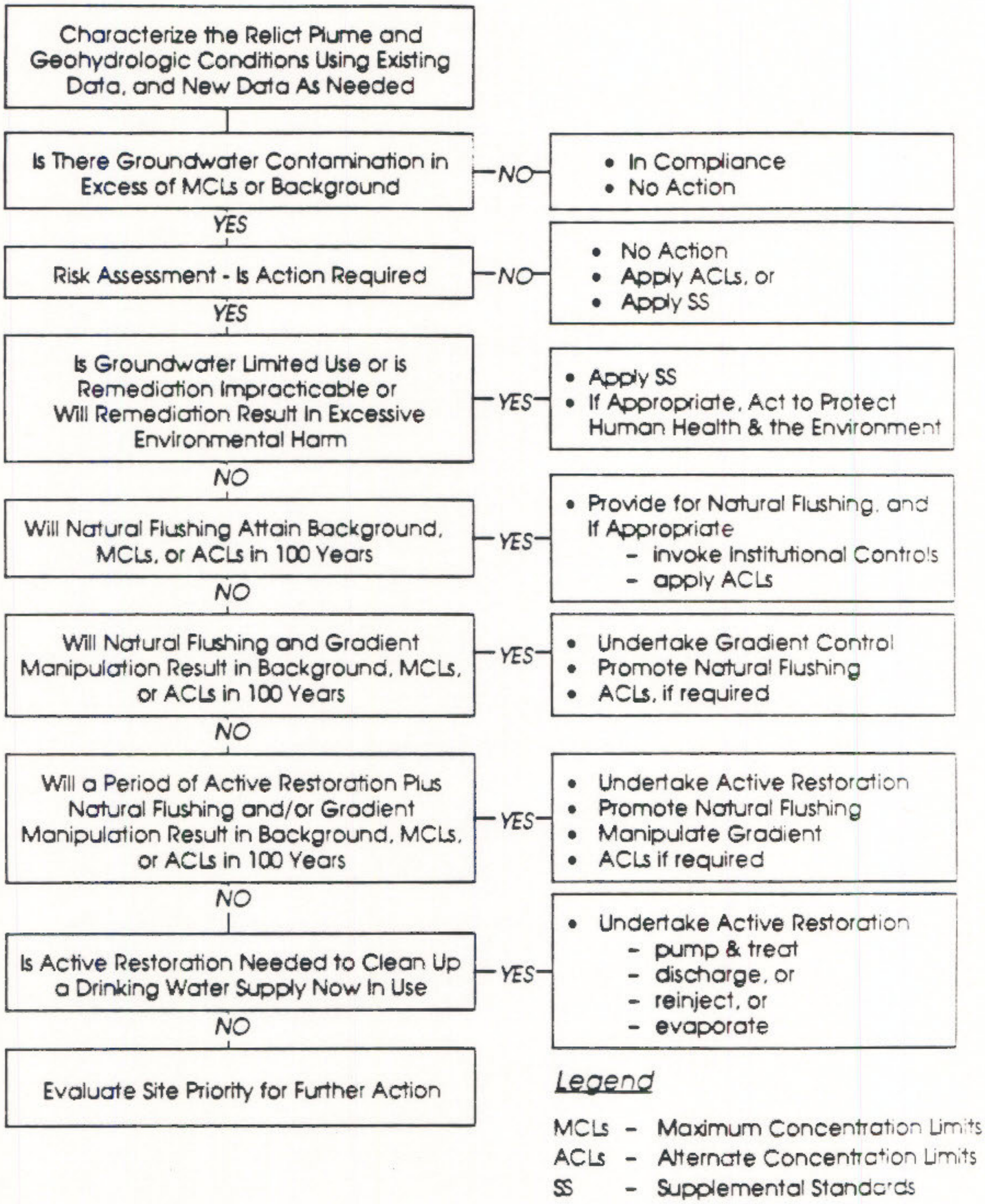


FIGURE 1. COMPLIANCE DECISION LOGIC

- o Passive (natural) flushing.

- o Passive flushing enhanced with gradient manipulation, including, if appropriate:
  - In situ geochemical process enhancement.
  - Slurry walls.
  - Trenches and/or extraction and injection wells.

- o Extraction of contaminated groundwater with:
  - Evaporation.
  - Treatment and discharge.
  - Treatment and reinject.

5.0 THE OBSERVATIONAL METHOD

In order to ensure that a cost-optimized remedial action protects human health and the environment and is concurred with by the NRC, the various states, Indian tribes and the public, the use of the Observational Method is proposed by the authors as a suitable programmatic approach. Ralph B. Peck (Peck, 1969) formalized the Observational Method as applied to geotechnical applications. The steps Peck outlined have been modified to apply to groundwater restoration and have been adopted by the EPA for use at Superfund sites (EPA, 1989). Table 1. lists the essential features of the Observational Method. Figure 2. shows diagrammatically the logic of the Observational Method.

The Observational Method incorporates a performance monitoring program to track the effectiveness of remedial action over time. In the event that the monitoring shows a deviation from the expected performance level, a predetermined contingency action would be initiated to return the remediation effort to acceptable parameters.

During the development of the initial remedial action plan, the most likely deviation scenarios would be postulated. Contingency plans would be developed to deal with these deviations. In the event performance monitoring detects a deviation, it will most likely be one which has been postulated and for which a contingency plan is available.

By combining "bottom up" compliance strategy selection with the Observational Method, a cost-effective remediation option is linked with an effective contingency plan that will result

TABLE 1. THE OBSERVATIONAL METHOD

a. Characterization Sufficient to Establish at least the General Nature, Pattern and Properties of the Groundwater System

b. Assessment of the Most Probable Conditions and the Most Unfavorable Conceivable Deviations from these Conditions

c. Establishment of a Remedial Action/Design Based on a Working Hypothesis of Behavior Anticipated under the Most Probable Conditions

d. Selection of Characteristics to be Observed as Remedial Action Proceeds and Calculations of their Anticipated Values on the Basis of Working Hypothesis

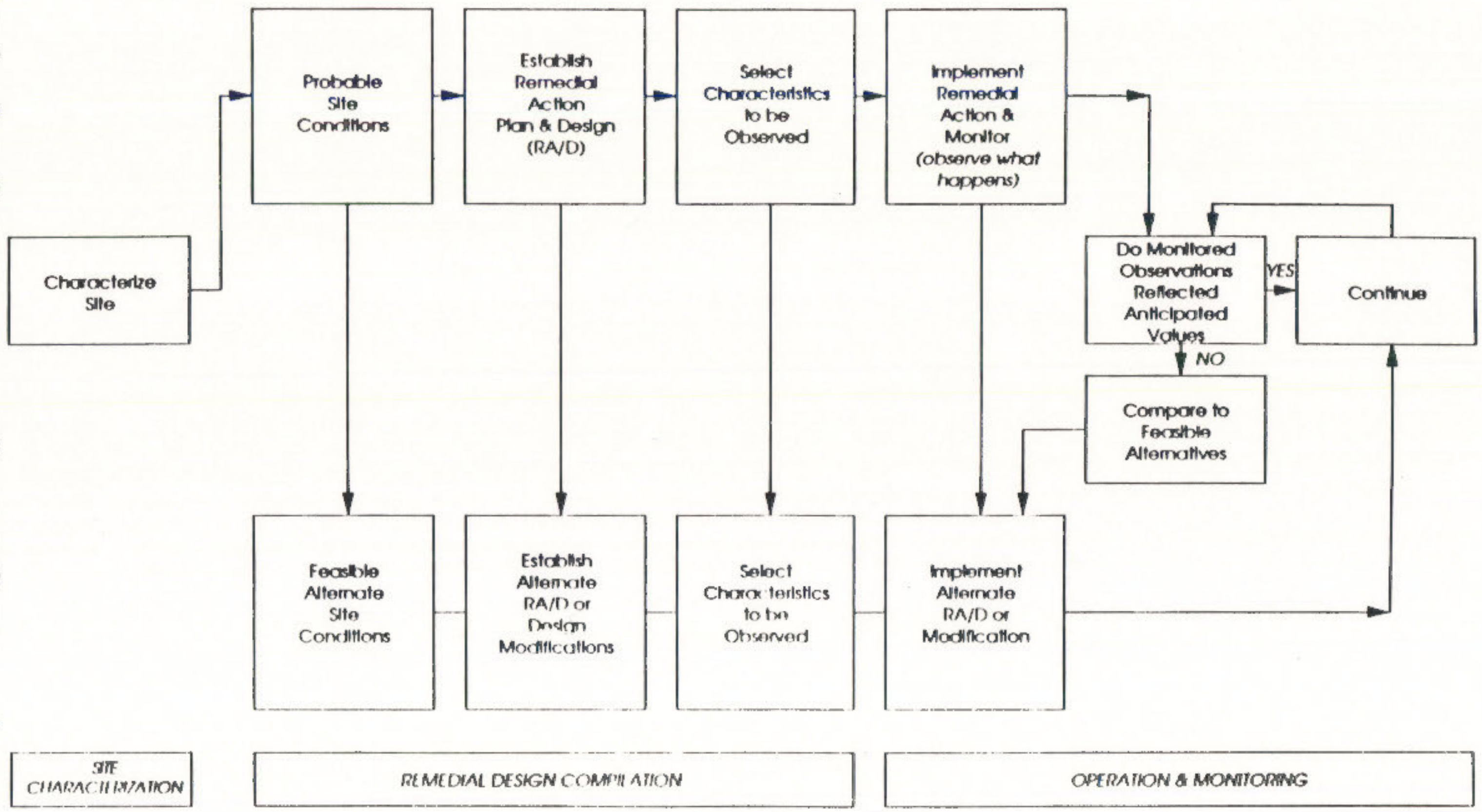
e. Calculation of Values of the Same Characteristics Under the Most Unfavorable Conditions Compatible with the Available Data

f. Selection in Advance of a Course of Action or Modification of Design for Every Forseeable Significant Deviation of the Observational Findings from Those Predicted on the Basis of the Working Hypothesis

g. Measurement and Evaluation of Actual Conditions

h. Modification of Action to Suit Actual Conditions

FIGURE 2. THE OBSERVATIONAL METHOD GENERAL APPROACH



SOURCE: EPA 1989

Legend: RA/D – Remedial Action Plan & Design in full regulatory compliance and protection of the environment without the burden of excess conservatism.

6.0 SITE-SPECIFIC APPLICATION

Compilation of a groundwater restoration remedial action plan and the associated designs is an integrated procedure, leading from completion of the feasibility study to implementation of the final remedial design. This section describes possible (and proposed) general approaches using the Observational Method to the proposed phases of the design and remedial action plan.

The following discussion is formulated in anticipation of the process that may be applicable to a general tailings site. Figure 3. shows a proposed possible general approach for compiling a site Observation Method scheme or work plan for UMTRA Project groundwater restoration.

Following completion of the feasibility study, additional field work may be conducted and incorporated into the planning. A preliminary (30 percent) design of the most feasible remedial alternative will be prepared. In accordance with the Observational Method approach, the preliminary design will be formulated for the most probable site conditions. Initial site characterization would provide the data to determine these site conditions. These will constitute the working hypothesis conditions and guide the selected remedial design.

At the same time, the range of deviations from probable site conditions will be identified. Characteristics to be observed as groundwater restoration proceeds will be selected. Courses of action or design modifications for foreseeable significant deviations from those predicted for the working hypothesis will be formulated. For example, if the feasibility study indicates a strong probability that natural flushing may not be as effective as believed and that gradient control may ultimately be required to achieve MCLs, then the draft remedial action plan and the description of the Observational Method scheme implementation may describe a gradient control plan as an alternative.

This alternative solution may be to use hydraulic control methods to direct the flow of affected groundwater towards a large river and to accelerate natural flushing. The viability of such an approach may be investigated by pilot studies to assess the hydraulic effects of gradient control techniques such as the use of injection wells, or infiltration trenches with well injection or gravity feed from the river, and to confirm the rate of decline of contaminant concentrations.

If more aggressive hydraulic controls are (potentially) ultimately needed, up to and including pump and treat, these too would be described in the draft Remedial Action Plan and Observational Method scheme.

As field data accumulate from the implementation of the site Observational Method scheme, compilation of the final groundwater restoration remedial action plan and preparation of the final design will proceed.

7.0 PUBLIC INFORMATION/PUBLIC PARTICIPATION PROGRAM

The Public Information/Public Participation (PIPP) program is essential to the success of a groundwater restoration program using the Observational Method. It is important that the public be educated in the logic of the Observational Method so that it is perceived as a process to obtain the best solution at the least cost. If the Observational Method is not understood, it could be perceived that the restoration program is disorganized or technologically inept. Such a perception could lead to public opposition to the final groundwater restoration plan and potentially costly delays in its implementation.

A cornerstone of public acceptance of any technical program impacting a community is early and ongoing exchange of information between project officials and those who would be affected. By communicating Project objectives and methods to the public early in the process, potentially contentious issues can be identified and resolved before a decision-making point is reached. Routine contact with key members of the community and periodic public informational meetings can serve to maintain this dialogue. While a conscientious public involvement program cannot eliminate the potential for public opposition, experience at UMTRA Project sites where surface remedial action has been completed or is in progress has shown that the likelihood of public acceptance of the remedial action plan is greater when channels of communication are open.

Because of its deliberative nature, the Observational Method lends itself well to early interaction between Project officials and the affected public. A model PIPP program applicable to a general tailings site would include an assessment during the feasibility study phase of the project to identify community perceptions and attitudes about the project. Assessment instruments could include informal surveys conducted with community leaders, a preliminary public information meeting to introduce the Observational Method concepts and technologies and to secure feedback from the public, and a review of past media coverage of relevant issues. Based on this assessment, a community relations plan would be developed.

As the project progresses, several techniques for informing and involving the public could be considered. These include:

- o Designating a lead community relations contact, preferably stationed in the community and readily available to the public, to present periodic briefings to community leaders and to respond to inquiries from the public.

- o Formulating Citizen's Advisory Committees to serve as a focal point for communications with the community.

- o Preparing written public information materials including news releases, fact sheets, and brochures regarding project status, site conditions, and proposed project activities.

- o Developing site-specific mailing lists for distribution of written public information materials.

- o Establishing local information repositories at public libraries to stock public information materials.

- o Maintaining community access lines for persons with questions or concerns about the project.

- o Conducting site tours for community leaders, news media representatives, and members of interest groups.

- o Coordinating special events such as groundbreaking and closing ceremonies to signify key Project milestones.

- o Producing informative and entertaining videotapes to explain project status and objectives.

- Conducting public information meetings at key points during the project to inform interested citizens and obtain public input before decisions are finalized

Applicability of these techniques at a specific site would be determined through the community assessment and planning process.

Through an effective PIPP program, project decision makers can become aware of the impact of the proposed groundwater restoration plan on others. For example, if gradient control is being contemplated, a source of water for injection wells might be an aquifer that is also used for irrigation. A concern might be that injection well drawdown could adversely affect irrigation. Through the PIPP program, this concern could be expressed to Project officials before a final decision is rendered. Steps could then be taken to mitigate impacts to the satisfaction of local water users.

Public reaction to other remedial concepts could also be observed through the PIPP program. This would enable identification of approaches that were completely unacceptable to the community, and would allow the project to benefit from the suggestion of new alternatives.

8.0 CONCLUSION

The successful use of the Observational Method in groundwater restoration is highly dependent on a well planned PIPP program. The structure of the Observational Approach must incorporate a PIPP program to ensure two-way communication between the restoration team and the public to allow for public input during the decision-making process. Failure to do this could result in higher costs and/or time delays. These types of problems could jeopardize the restoration program and lead to unacceptable public health risks.

9.0 ACKNOWLEDGMENTS

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10.0 REFERENCES

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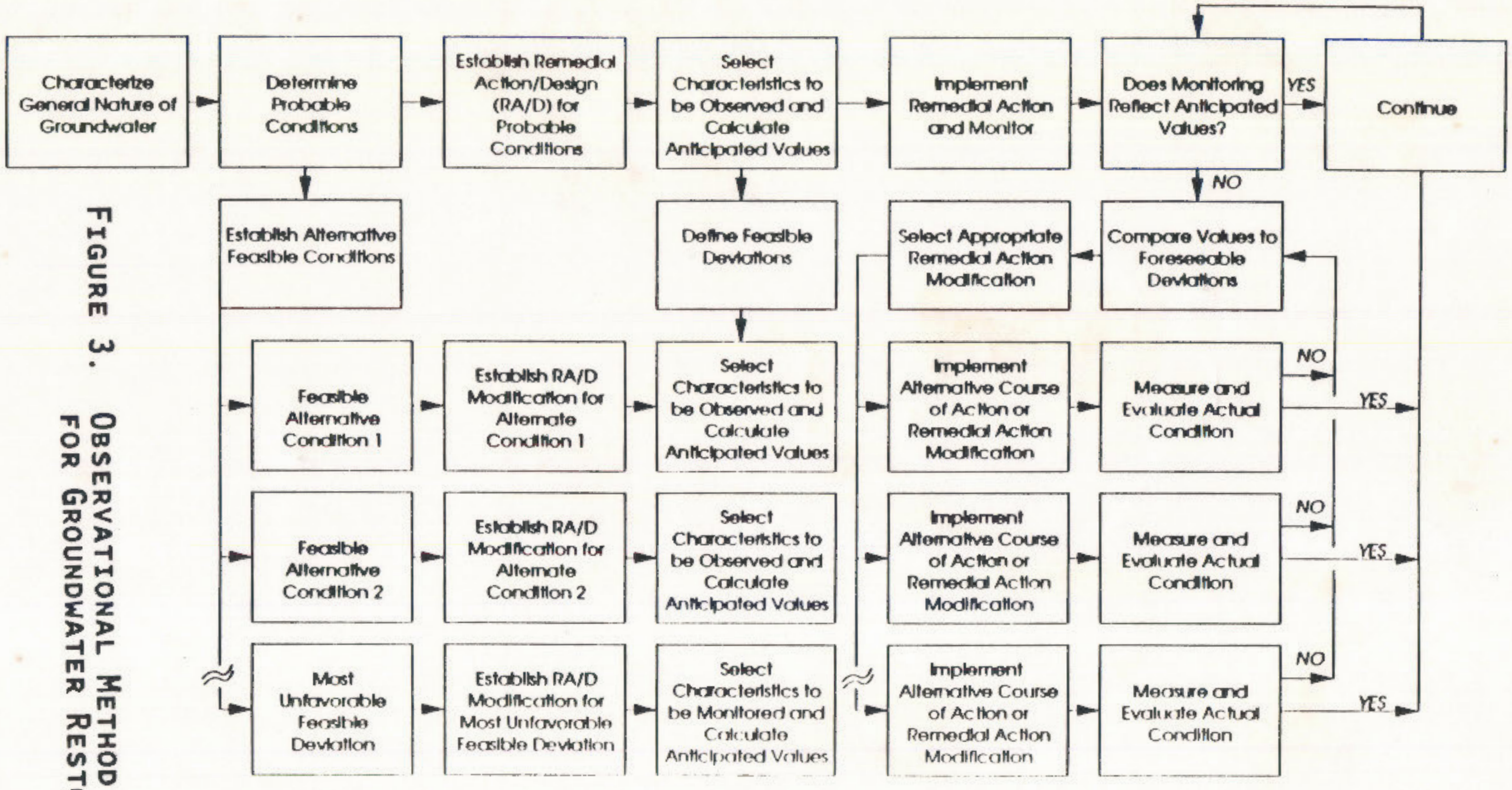

FIGURE 3. OBSERVATIONAL METHOD DETAILS FOR GROUNDWATER RESTORATION