



Environmental Restoration: Part 4 - Phase 1 Field Investigations

An Online Continuing Education Course for Engineers

Course Number: EN-3027

Credit: 3 Hours / 3 PDH / 3 CPD

Environmental Restoration: Part 4 - Phase 1 Field Investigations

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General Overview

This course, Part 4, is the fourth in a series of six sequential courses, Parts 1 through 6, that present the history and steps taken to remediate the environmental hazards created by the land disposal of Chemical and radioactive wastes on the campus of a research institute. The practice of shallow land burial of hazardous wastes was widely used throughout the US between the 1960s and the 1980s. However, since the late 1980s both federal and state legislations were promulgated requiring the environmental regulatory agencies throughout the US to investigate operating, decommissioned and abandoned landfills of all types having in mind the ultimate goal of mitigating the impacts these waste disposal sites have on the natural environment.

I decided to write this series of courses, six in all, from the perspective of a Manager who leads a team charged with the implementation of an environmental Remedial Investigation (RI), Feasibility Study (FS) and Engineered Remediation (ER) of a hazardous waste disposal site. This perspective is especially interesting to develop because a manager is usually associated with a project from its inception and he or she has a unique overview and comprehensive understanding of the scope of work that needs to be implemented. Students, who are interested in environmental issues, will be able to follow and gain an in-depth understanding, not only of the technical and contractual aspects of the project. Even more, they will be able to appreciate the countless difficulties posed by the competing goals and desires of the various parties involved in implementing an environmental investigation of a hazardous waste disposal site. Students will learn to analyze - and then reconcile – the different goals and objectives of the owners, regulators, environmental consulting firms, the interested public and the news media. Finally, the significant impacts of these interactions on scope, budget and schedule are presented and discussed as the process of completing the project unfolds.

This series of courses draws from numerous environmental investigations that I managed across the US. As such, the scenarios that are presented are similar to those a professional environmental engineering practitioner faces in real life. The case that is developed here is used as an example and a vehicle to present and discuss concepts and project implementation strategies that I gained through my long and varied experience working in the engineering consulting business. This information is not usually found or taught in traditional or standard academic courses dealing with environmental issues or investigations. In their entity this series of courses can be considered an implementation guide for conducting environmental investigations at hazardous waste disposal sites. Students will gain unique and useful insights into the data, analyses, interpretations, recommendations and conclusions that were made and that they could then easily adapt to the situations they are likely to encounter themselves in managing their own projects.

More specifically, the environmental problems are those encountered at a decommissioned hazardous and low-level radioactive waste disposal site owned by a research institute. The presentations are sequenced in the order in which investigations would be conducted by an environmental consulting firm contracted to perform and supervise the work that would be done in order to assess the magnitude of the problem and develop appropriate mitigation strategies for the rehabilitation of the site.

Starting with the use of the site for the disposal of chemical and radioactive wastes over a period of twenty years and following the eventual decommissioning and passive custodial maintenance of the site, the presentation unfolds by addressing the following topics in sequential order:

- Initial concerns raised by the regulatory agencies,
- Request for Proposals issued by the research institute,
- Bidding process and the selection of an environmental consulting firm,
- Contract negotiation,
- Compilation and review of existing data,
- Development of work plans and preparation of sampling and testing procedures,
- Implementation of geologic and hydrologic investigations at the site,
- Evaluation of the data collected and assessment of impact on public health,
- Development and evaluation of engineering options for remediation,
- Recommendation of a preferred engineered remedial option,
- Implementation of the corrective action plan, and
- Post remediation monitoring to assess the outcome.

The introduction of each course in the series summarizes briefly the key points covered by the preceding courses in the sequence. This was done to help the students remember all that has unfolded prior to getting involved in a new topic. In addition, each course in this series was structured as a stand-alone presentation of the topics listed in the “**Course Overview**” section found at the beginning of each course. This was done to accommodate the students that have a particular interest in one aspect of the work only.

The titles of the courses in this series are:

- Part 1 – History Leading to Contract Award
- Part 2 – Existing Information and Regulatory Concerns
- Part 3 – Project Plans and Procedures
- Part 4 – Phase 1 Field Investigations
- Part 5 – Phase 2 Field Investigations
- Part 6 – Risk Assessment and Engineered Remediation

Part 4 Course Overview

This course, **Part 4: Phase 1 Field Investigations**, briefly reviews the key points of the previous courses in the sequence (Parts 1 through 3), and presents the results of a new round of groundwater and soil sampling and analysis using the approach and testing procedures presented in Part 3 of this course

series. This information is then compared to the earlier sampling and testing results obtained by the State Regulatory Agencies to allow evaluation of the validity of the earlier tests. Also presented as part of this initial characterization are:

- The geologic setting of the site
- The hydrologic setting of the site
- The properties of the site soils
- Preliminary estimates of infiltration
- An estimate of the down gradient groundwater travel time, and
- An initial evaluation of environmental impacts.

The results of this Phase of work allowed the development of a preliminary groundwater contour map and clearly indicated the presence of a plume of contamination moving downhill from the burial site. The report issued at the end of this phase of work was reviewed by several State Regulatory Agencies and a number of questions and concerns were raised. The questions and the Consultant's responses, on behalf of the Institute, are included in the course as well as the press coverage received once the report was made public.

Introduction

Starting in the 1960s a research institute (“Institute”) operated a small (0.65 acre) hazardous chemical and radioactive waste burial facility on its campus for about 20 years. All waste buried at the site resulted from the use of radioactive isotopes and chemicals in research experiments. Waste brought to the disposal site was in both solid and liquid form, and the liquids were in various types and sizes of containers. The waste was placed into narrow trenches dug into the soil at the burial site. The trenches were about 8 to 12 feet deep. Once waste reached about 4 feet from the surface, local dirt was used to fill the trench to grade.

When the site was decommissioned and no longer used, it was fenced, posted and locked. Minimal ground maintenance was done until the State Radiation Protection Agency (State RPA) notified the Institute that they were to keep the fence clear of vegetation and the area within the fence mowed and free of trees. The following photo shows the waste disposal area after the site was decommissioned and the ground maintenance started:



Figure 1: Decommissioned waste disposal site at the Institute

Following decommissioning of the site, yearly testing of soil, surface water and vegetation by the State Radiation Protection Agency (State RPA) showed no evidence of significant radioactive contamination outside the burial area. In the late 1980s, the State RPA recommended that the Institute install a series of monitoring wells to allow sampling and testing of the groundwater. In response, and under the guidance of the State Groundwater Protection Agency (State GPA), the Institute installed five monitoring wells around the waste disposal site. The location of the five wells is shown on the following figure.

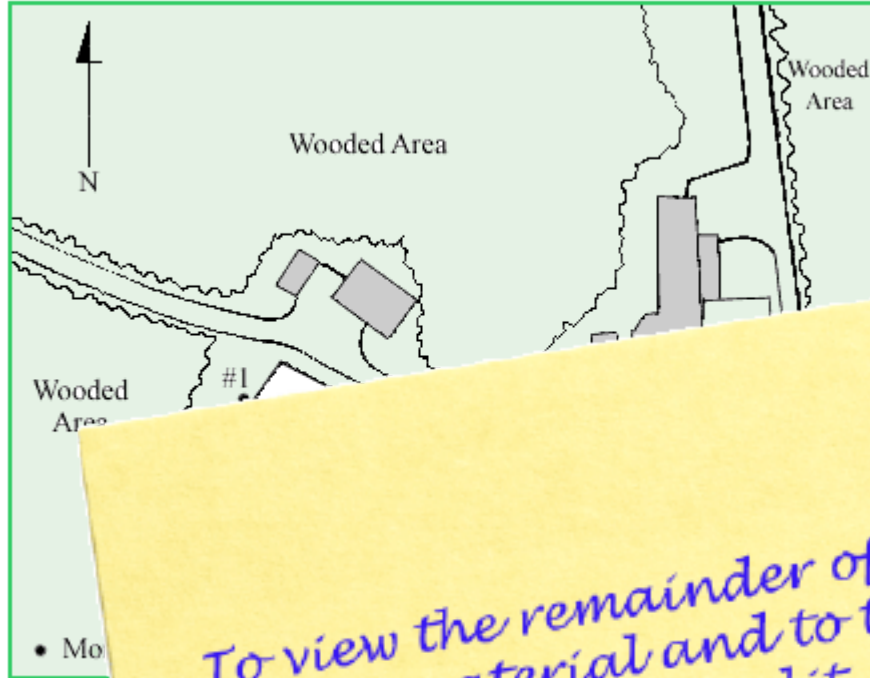


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Because the waste disposal site contained hazardous chemicals and radioactive isotopes, no additional field investigations could be started until a project-specific Health and Safety Plan was developed. A project-specific Quality Assurance Plan was also created, and the technical requirements were developed as part of the Sampling and Testing Plan. A set of Project Procedures was written to guide the field sampling and analysis programs that incorporated the requirements of each of the project