Environmental Restoration: Part 3 - Project Plans and Procedures

An Online Continuing Education Course for Engineers

Course Number: EN-3026

Credit: 3 Hours / 3 PDH / 3 CPD

Environmental Restoration: Part 3 –Project Plans and Procedures

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General Overview

This course, Part 3, is the third 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 3 Course Overview

This course, **Part 3: *Project Plans and Procedures,*** briefly reviews the key points of the previous courses in the sequence, and presents the steps required in planning the new round of sampling and testing program for the site. The elements of the Health and Safety Plan (HASP) are presented, including the methodology to determine the hazard category of the site and the personal protective equipment requirement. The Quality Assurance Plan (QAP) is also discussed as it relates to following federal and state sampling protocols and ensuring data quality and proper documentation, including the concepts of chain-of-custody and use of duplicate samples and blanks to verify the quality of the laboratory procedures and results. A set of Project Procedures is then developed based on the technical needs of the site investigation and the requirements of the Health and Safety and Quality Assurance Plans.

The materials presented in this course can be used as a "blueprint" for addressing the elements of the Health and Safety and Quality Assurance Plans, and developing environmental sampling procedures applicable to hazardous waste investigations. The following plans and procedures are presented as part of this course:

- Management Plan
- Scope of Sampling Program
- Preparation of Sample Containers
- Equipment Decontamination
- Laboratory Cleaning Procedures
- Water Level and Well Depth Measurements
- Groundwater Sampling
- Surface Water Sampling
- Soil Sampling

A glossary of terms and acronyms used in this series of courses follows the Conclusion section. Following the glossary, an Appendix is included that contains examples of the following forms that are needed to comply with the Occupational Safety and Health Act (OSHA) requirements:

- Medical Data Sheet,
- Certification of HASP Review,
- Incident/Accident Report,
- Incident Follow-up, and
- OSHA Poster.

Introduction

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

When the site was decommissioned and no longer used for waste disposal, 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, yearly testing of soil, surface water and vegetation of the site by the 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.

chlorinators of ABS plastic), each chosen for application-specific chemical resistance. Use of non-chemical resistant materials with chlorine or sulfur dioxide gases can lead to equipment failure. Moreover, equipment misuse leading to accidental mixing of chlorine and sulfur dioxide gases can lead to an exothermic chemical reaction and equipment failure.

Water can be used to clean most component surfaces. For buildup of impurities or for stains, a dilute hydrochloric (muriatic) acid solution may be necessary (WEF, 1996). Foll...
components ...
are
com...

COS...

Costs
depend...
estimat...
mislead...
variable...
upgrade...
whether...
a compo...
specific ...
thousands...
project.

Table 1 g...
sulfur diox...
Cost consi...
equipment,...
maintenanc...
be used wil...
costs. For...
typically th...
dechlorinati...
However, as ... ...ned, many smaller plants may find that storage, handling, and safety issues offset whatever gains in efficiency can be obtained by using compressed gas.

Effective process control will help prevent chemical overdosing and allow for chemical cost savings. One 40-mgd facility has reported a savings of $7,000 per month—a greater than 1,000 pound per day reduction in SO_2 use (>50%) and a greater than

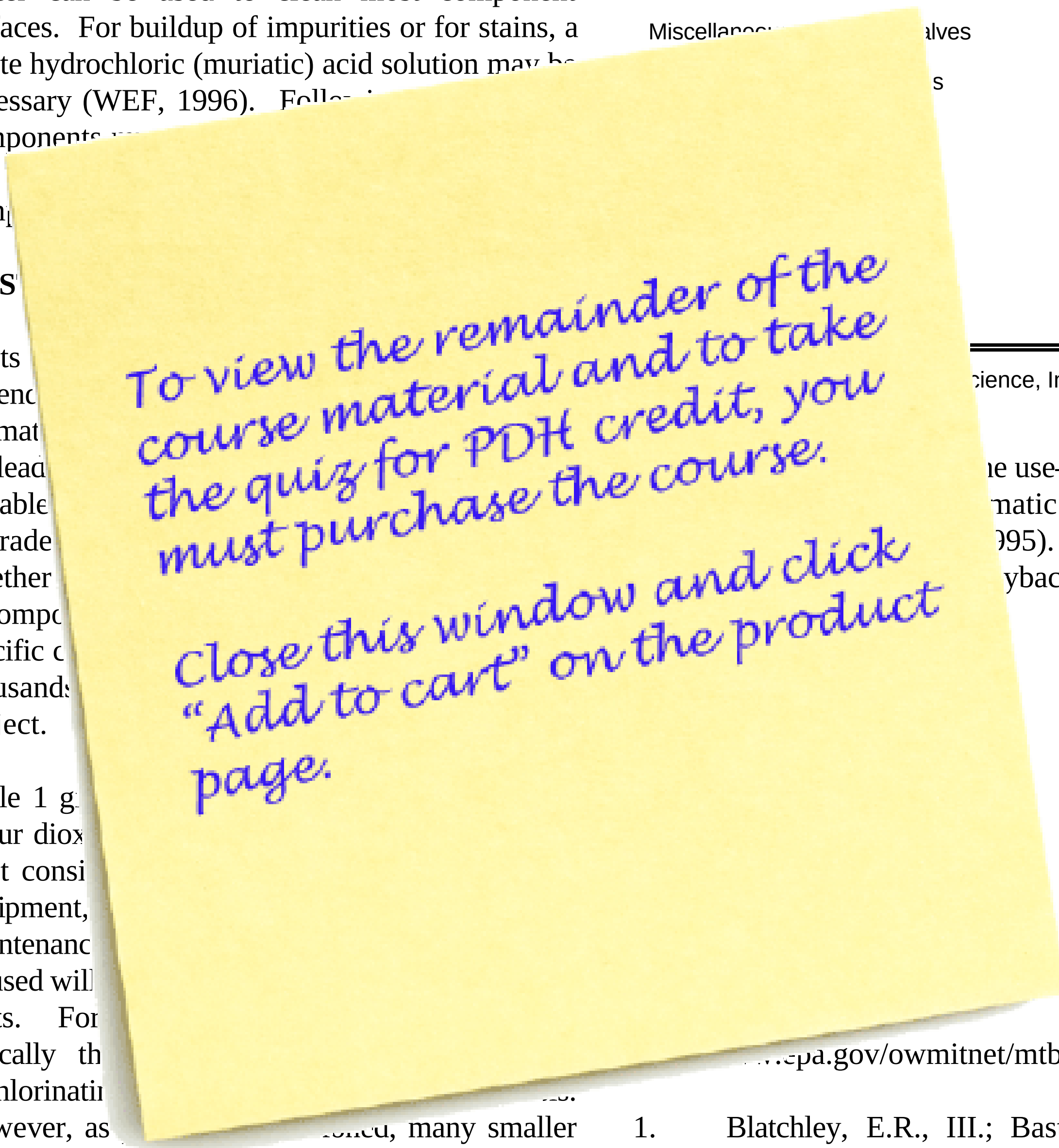

TABLE 1 COST OF A 2,800 PPD GAS SULFUR DIOXIDE SYSTEM IN 1994

Component	Cost ($)
Sulfonator and ancillary mechanical equipment	100,000
Gas Scrubber	150,000
Ventilation System	45,000
Miscellan... ...alves	30,000
...s	250,000
	75,000
	30,000
	680,000
	44,200
	724,200

...cience, Inc., 2000.

...e use—resulting from ...matic process control ...995). The savings ...yback period on the

... found at the

...epa.gov/owmitnet/mtbfact.htm

1. Blatchley, E.R., III.; Bastian, K.C.; and Duggirala, R.K., 1996. Ultraviolet Irraditation and Chlorination/Dechlorination for Municipal Wastewater Disinfection: Assessment of Performance Limitations. *Water Environment Research*. 68: 194-204.