

## **ATTACHMENT 22: Basis of Design Report Outline Example**

The following is an example of a Basis of Design Report outline for In Situ Chemical Oxidation by Permanganate Direct Injection. It should be noted that certain components of the Preliminary Basis of Design Report specified below may be omitted if a performance-based contracting approach will be adopted (see [Detailed Design and Planning Decision B](#)). Examples of omitted design components include the oxidant volume/dosage, injection infrastructure, and injection well design.

1. Project Introduction
  - 1.1 Site Background and Remediation Status
  - 1.2 Summary of Previous ISCO Test Results
  - 1.3 Remediation Drivers
2. Brief Summary of Conceptual Site Model  
(Reference other documents for details)
  - 2.1 Source Description
  - 2.2 Lithology
  - 2.3 Hydrogeology
  - 2.4 Geochemical Setting
  - 2.5 Contaminant Geometry
    - 2.5.1 Nature and Phases
    - 2.5.2 Extent and Location
3. ISCO Treatment Goals and Milestones
  - 3.1 Overall Site Remediation Action Objectives (RAOs)
  - 3.2 Treatment Train Description
  - 3.3 ISCO Treatment Goals
4. Target Treatment Zone Delineation
  - 4.1 Lateral Extent
  - 4.2 Depth Interval(s)
  - 4.3 Lithologic Setting and Complexity
5. Treatment Technology Description
  - 5.1 Oxidant Selection and Desired Reaction Chemistry
  - 5.2 Oxidant Delivery Design
6. Contracting, Design, and Implementation Approach
  - 6.1 Contracting Method
  - 6.2 Level of Design Detail
  - 6.3 Implementation Approach
7. ISCO Design Details
  - 7.1 Oxidant Dosage and Injectate Volume
    - 7.1.1 Calculations and Results
  - 7.2 Contaminant Contact and Reaction Time Design
  - 7.3 Injection Point Design and Installation Method
  - 7.4 Oxidant Storage, Transfer, Mixing, and Delivery Methods
    - 7.4.1 Injection Point Layout
    - 7.4.2 Process Flow Diagram
    - 7.4.3 Injectate Mixing and Transfer Process
    - 7.4.4 Injection Process and Depth Intervals
    - 7.4.5 Target Injection Volume, Rate, and Pressure

## 8. Contingency Evaluation

- 8.1 Technical Risk Analysis Results
- 8.2 Management Risk Analysis Results
- 8.3 Probability and Schedule/Cost Impact Results

## 9. Delivery and Treatment Performance Monitoring Program

- 9.1 Delivery Monitoring Program
  - 9.1.1 Monitoring Locations
  - 9.1.2 Parameters and Monitoring Frequency
- 9.2 Treatment Monitoring Program
  - 9.2.1 Monitoring Locations
  - 9.2.2 Parameters and Monitoring Frequency
- 9.3 Contingency Assessment Monitoring
- 9.4 Treatment Cessation Monitoring

## 10. Schedule

- 10.1 Injection Schedule and Number of Events
- 10.2 Delivery Monitoring Schedule
- 10.3 Treatment Monitoring Schedule
- 10.4 Potential Impacts of Contingency on Schedule

## 11. General Requirements

- 11.1 Health and Safety
- 11.2 Engineering Controls
- 11.3 Permitting Requirements
- 11.4 Waste Management

## 12. Implementation Cost Estimate

- 12.1 Construction and Injection Cost
- 12.2 Delivery Performance Monitoring Cost
- 12.3 Treatment Performance and Cessation Monitoring Cost
- 12.4 Potential Impacts of Contingency on Cost

## Appendix A. Preliminary Design Drawings

Basic design drawings are typically included with the Preliminary Basis of Design Report. At a minimum, the preliminary design drawing package includes the following:

- Process and instrumentation diagram (P&ID)
- ISCO treatment system layout
- Preliminary piping layout
- Well construction details