GJO–2002–299–TAR
GJO–MOA 1.9–3

Moab Project

Work Plan for Implementation of the Initial Action in the Sandbar Area Adjacent to the Moab Project Site

DRAFT

March 2002

Prepared for U.S. Department of Energy Grand Junction Office
under DOE Contract Number DE–AC13–96GJ87335.
Approved for public release; distribution is unlimited.

GJO–2002–299–TAR
GJO–MOA 1.9–3

Moab Project

Work Plan for Implementation of the Initial Action in the Sandbar Area Adjacent to the Moab Project Site

DRAFT

March 2002

Prepared for
U.S. Department of Energy
Grand Junction Office

Work Performed Under DOE Contract Number DE–AC13–96GJ87335
Task Order Number MAC02–16

X0007001

Contents

Page

Acronyms v
1.0 Introduction 1
2.0 Background 5
2.1 Purpose and Scope 5
3.0 Design Considerations 7
3.1 Biological Factors and Habitat 7
3.2 Ammonia Distribution 7
3.3 River Morphology and Stage 8
4.0 Design 11
5.0 Operations 13
5.1 Turbidity 13
5.2 Velocities 13
5.3 Erosion 13
5.4 Water Levels 14
6.0 Monitoring and Reporting 15
6.1 Monitoring 15
6.1.1 River Stage and Habitat 17
6.1.2 Marking and Mapping 17
6.1.3 Photographs 17
6.1.4 Operating Conditions 17
6.2 Reporting 17
7.0 Regulatory Compliance 19
7.1 Endangered Species Act 19
7.2 National Environmental Policy Act 19
7.3 Other Regulations 19
8.0 Health and Safety 21
9.0 Logistics and Schedule 23
10.0 References 25

Figures

Figure 1–1. Moab Site and Surrounding Area 3
Figure 3–1. Potentially Suitable Habitat in the Sandbar Area Adjacent to the Moab Site 9
Figure 6–1. Field Worksheet for Documenting Monitoring Observations and Operating Parameters 16
Figure 9–1. Activities Schedule 23

Plate is not available electronically.
Please email moabcomments@gjo.doe.gov to request

Plate 1. Initial Action Design

End of current text

Acronyms

cfs	cubic feet per second
DOE	U.S. Department of Energy
gpm	gallons per minute
NEPA	National Environmental Policy Act
UDOWR	Utah Division of Wildlife Resources
UMTRA	Uranium Mill Tailings Remedial Action
USFWS	U.S. Fish and Wildlife Service
WRR	work readiness review

End of current text

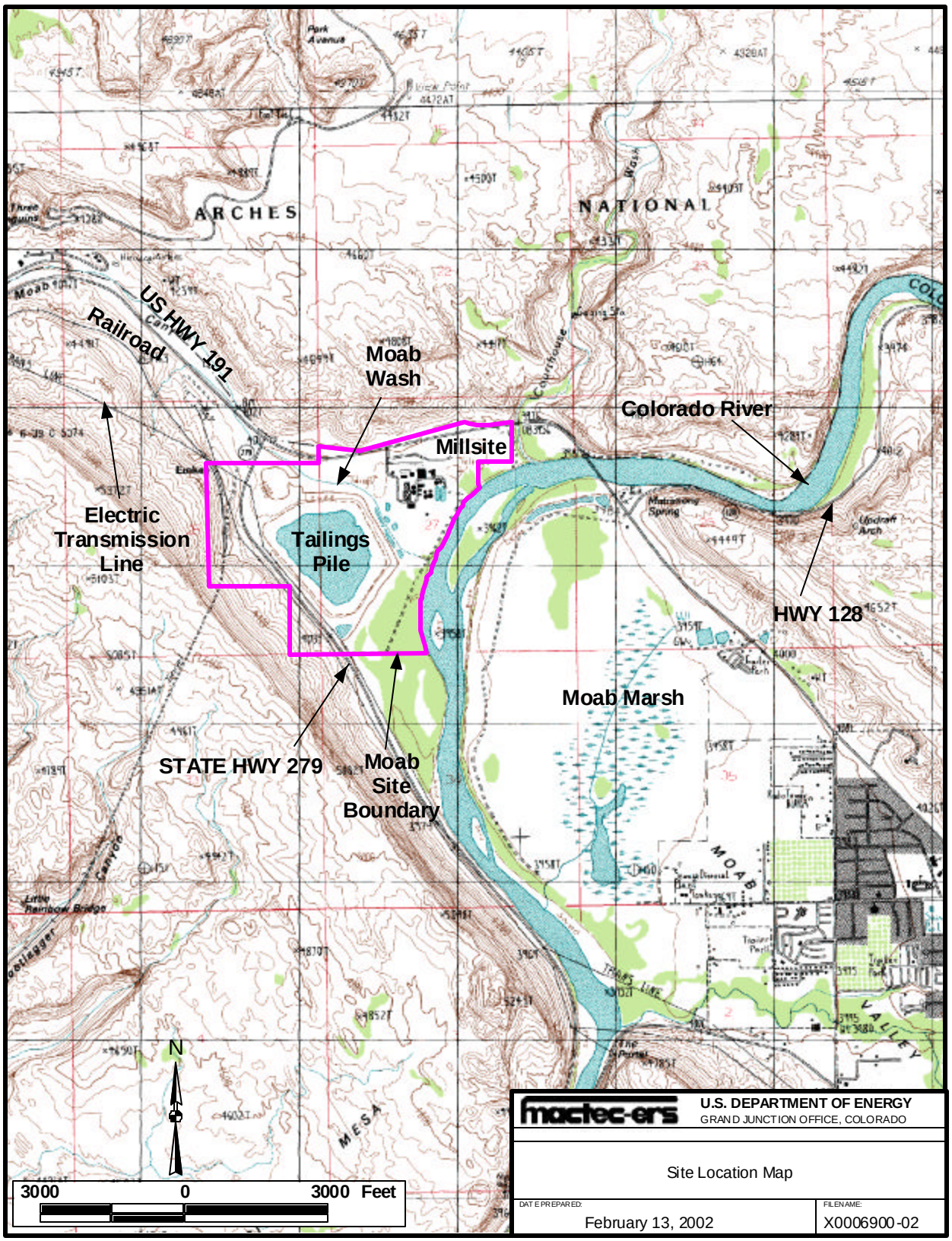
1.0 Introduction

The Moab Project Site (Moab site) is a former uranium-ore processing facility located approximately 3 miles northwest of the city of Moab in Grand County, Utah (Figure 1–1). The plant was constructed in 1956 by the Uranium Reduction Company, which operated the mill until 1962 when the assets were sold to the Atlas Minerals Corporation (Atlas). Operations continued under Atlas until 1984. When the processing operations ceased in 1984, the mill had accumulated an estimated 10.5 million tons of uranium mill tailings in an unlined impoundment in the floodplain of the Colorado River. The tailings pile covers approximately 130 acres, is about 0.5 mile in diameter, averages about 94 feet in height above the surface of the Colorado River terrace, and is located about 750 feet west of the Colorado River. Atlas placed an interim cover over the tailings pile as part of decommissioning activities on going between 1988 and 1995. In October 2001, the title of the property and responsibility for remediation of the tailing pile and contaminated groundwater beneath the site were transferred to the U.S. Department of Energy (DOE).

Results of previous investigations (ORNL 1998, SMI 2001, DOE 2002) suggest that contaminants have leached from the tailings pile into the shallow groundwater. Characterization data indicate that some of the more mobile contaminants have migrated downgradient and are discharging into the Colorado River. DOE and stakeholders have expressed concern about risk to sensitive aquatic species that may inhabit the slow-moving water at the edge of the river where ammonia is discharging.

DOE, in consultation with stakeholders, is implementing an initial short-term action to reduce the potential for site-contributed ammonia to adversely affect endangered fish species, specifically the Colorado pikeminnow. This initial action consists of introducing clean upstream river water into the mixing zones along the bank of the Colorado River to dilute concentrations of un-ionized ammonia where suitable habitat may exist. This work plan outlines the design, operations, and monitoring procedures that will be used to conduct this initial action.

End of current text



n:\moa\999\0006\01\003\x00069\x0006900.apr d50849 2/13/2002, 11:48

Figure 1–1. Moab Site and Surrounding Area

2.0 Background

DOE, other federal agencies, and stakeholders have expressed concern that elevated levels of ammonia in the groundwater from the Moab site are reaching the Colorado River. The U.S. Fish and Wildlife Service (USWFS) is concerned because the segment of the Colorado River adjacent to the site is designated critical habitat for endangered fish species. The U.S. Geological Survey's Columbia Environmental Research Center conducted a study in 1998 which determined that ammonia concentrations contributed by the Moab site could adversely affect endangered fish, of which only the Colorado pikeminnow (formerly known as the Colorado squawfish) is known to actually occur in the area. The study also concluded that the existing Utah Ambient Water Quality Criteria are protective of endangered fish species.

DOE recently completed a field study that provides a detailed characterization of the sandbar area in the river adjacent to the Moab site (DOE 2002). This additional characterization focuses directly on ammonia concentrations in the area of affected fish habitat and is more detailed than the studies conducted by Shepherd Miller, Inc. (SMI 2001) and Oak Ridge National Laboratory (ORNL 1998). Results from the more recent DOE characterization were used to prepare a design for an initial action to mitigate the potential for site-contributed ammonia to adversely affect endangered fish in the sandbar area.

2.1 Purpose and Scope

The objective of this initial action is to protect endangered fish, with an emphasis on the Colorado pikeminnow, by diluting concentrations of un-ionized ammonia in the mixing zone of the Colorado River where suitable habitat may exist. This will be accomplished by introducing clean upstream river water into areas of potentially suitable habitat without altering the physical suitability of the habitat. This initial action is considered experimental, and operating conditions will be optimized by trial using an observational approach. Specific tasks addressed in this work plan consist of the design, operation, and monitoring and reporting.

End of current text

3.0 Design Considerations

Biological factors, distribution of ammonia concentrations in the mixing zone, and changes in river morphology and stage will influence the location, timing, and duration of the initial action. The approach used to design the dilution system considers these factors.

3.1 Biological Factors and Habitat

Biological factors include species presence, life-stage of concern, and food supply availability. The species of primary concern is the Colorado pikeminnow, though it is assumed that the razorback sucker could inhabit the area. Limited data are available on the critical habitat of the razorback sucker. For purposes of this initial action, it is assumed that habitat suitable for the Colorado pikeminnow will also be suitable for the sucker.

Relatively high ammonia concentrations are present in the quiet backwaters of the river adjacent to the Moab site. Spawning in the Colorado River has been confirmed to occur in bouldery areas with fast moving water mostly in the reach between Palisade and Grand Junction, Colorado (McAda and Kaeding 1991; Tyus and Haines 1991). Therefore, the presence of spawning life stage in the Colorado River is not of primary concern in the vicinity of the site with respect to this initial action. Similarly, the presence of larval stage is not a primary concern in the backwater areas adjacent to the site, since the distance from the spawning areas to the millsite is approaching the maximum potential range of larval drift (Stanford 1994; Tyus and Haines 1991).

However, the segment of river adjacent to the millsite appears to provide suitable habitat for young-of-the-year and adults. The Utah Division of Wildlife Resources (UDOWR) (USFWS 1998) has defined physical characteristics of suitable habitat to include (1) backwater or slow-moving eddies, (2) a sandy-silt substrate, and (3) water depths of less than 2 feet (ft). Potentially suitable habitat adjacent to the millsite, identified through field mapping and consultation with the UDOWR (Bleil 2002) is delineated in Figure 3–1. Three “ideal locations” within an area of approximately 600 to 800 ft south of Moab Wash are the subject of this initial action.

3.2 Ammonia Distribution

Discharge locations where elevated ammonia concentrations in the shallow groundwater are entering and mixing with the river water in the habitat areas will influence the location of the initial action. Mixing zones are defined generally as areas where contaminants are entering a water body and dilution with ambient water is in progress but has not yet reached concentrations meeting standards for all pollutants. This initial action will attempt to reduce ammonia concentrations in the mixing zone by diluting the backwater habitat with upstream river water unaffected by elevated ammonia concentrations.

Sampling and analysis results of shallow groundwater from the more recent DOE characterization are shown in Figure 3–1. Ammonia (as nitrogen) shown on this figure reflects relatively high concentrations occurring in groundwater beneath most of the sandbar areas mapped as potentially suitable habitat. During higher river stage in June, these mapped areas become inundated. The resulting mixing zone, where ammonia concentrations discharging from

the shallow groundwater system enter backwater areas of the sandbar, is the target of this initial action.

3.3 River Morphology and Stage

Habitat availability and quality depend upon the time of year and changes in river morphology and stage. The critical time for species survivability is from mid-June through mid-August, following spawning and after spring runoff (USFWS 1998). Lower river stages following spring runoff create backwaters that can develop into suitable habitat. These backwaters develop as the sandbar areas become exposed and the velocities and water depth between the bar and bank decrease. Based on SMI observations (SMI 2001) the sandbar is completely inundated at flows in the Colorado River greater than approximately 15,000 cubic feet per second (cfs). Because natural processes can physically alter the characteristics of the river channel, the exact location of potentially suitable habitat targeted for this initial action (Figure 3–1) can change seasonally or annually.

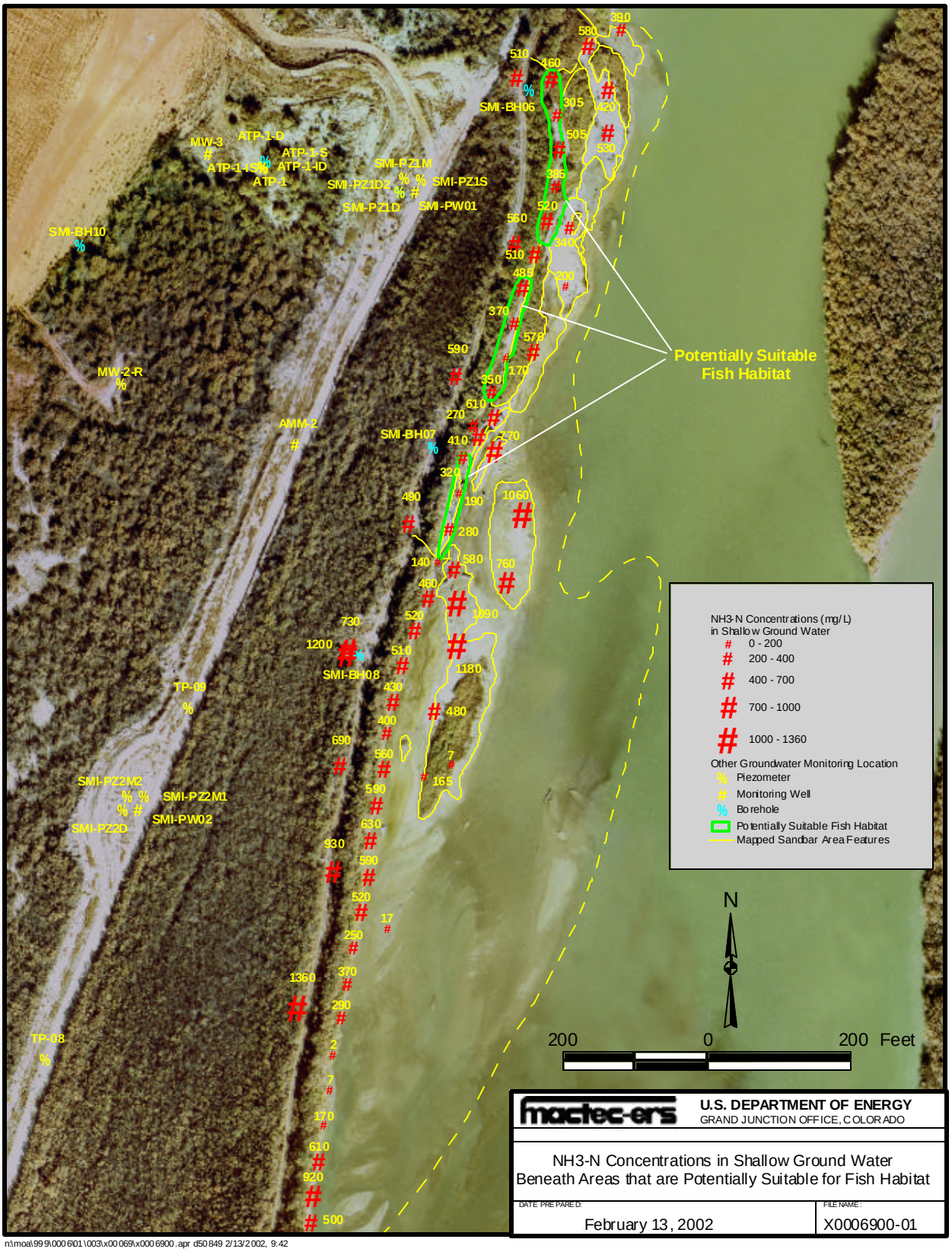


Figure 3–1. Potentially Suitable Habitat in the Sandbar Area Adjacent to the Moab Site

4.0 Design

This initial action will attempt to reduce ammonia concentrations in the backwater areas identified as potentially suitable habitat by dilution with upstream river water. A plan view of the point of diversion, the delivery line, and the distribution system is provided on Plate 1. Parameters and assumptions used to develop the design are as follows:

- The duration of the action is approximately 1 to 3 months depending on river stage. The estimated start date is June 1 to July 1, 2002. The estimated end date is August 1 to September 1, 2002.

- Water will be diverted from the Colorado River through a screened intake (1/4 to 3/8 inch mesh) at the nearest location just upstream of Moab Wash.

- A water delivery system using a diesel-powered portable trailer-mounted pump will be used. A maximum rate not to exceed 1,360 gallons per minute (gpm), as specified by the nonconsumptive portion of the water permit for the Moab site, is adequate to meet the dilution objectives.

- Delivery piping will be placed aboveground, parallel to the existing bank road, for at least the first year of operation. The first year of operation is a trial year.

- Upstream river water will be distributed from the delivery piping to three backwater areas along a 600-ft section of the sandbar beginning just south of Moab Wash (Figure 3–1). Flow meters and valves will be used to measure and control the rate of upstream river water released at each of the three distribution points.

- Different manifold options to distribute upstream river water in the backwater areas will be tested in the field under actual operating conditions. The final manifold design will be selected on the basis of performance results. Manifold options that offer the greatest potential to distribute a large volume of water with minimal turbidity and velocity will be investigated.

End of current text

5.0 Operations

Field observations of the sandbar area adjacent to the Moab site will be conducted in May and June, as needed during spring runoff, to determine when to begin operation of the dilution system. The UDOWR will be consulted to assist in determining the presence and extent of potentially suitable habitat (USFWS 1998): (1) backwater or slow-moving eddies, (2) a sandy-silt substrate, and (3) water depths of less than 2 ft. Operation of the dilution system will begin as soon as physical characteristics of suitable habitat (Bleil 2002) have been identified.

All reasonable precautions will be taken to minimize modification to habitat by operation of the dilution system. However, some increase in turbidity, flow velocity, erosion, and water level through the sandbar area is an unavoidable consequence of discharging the relatively large volume of water required for this initial action. Operation of the system will begin by slowly increasing the volume of upstream river water to one or all of the three backwater areas shown in Figure 3–1. Different manifold options will be investigated to determine the most effective operating condition to discharge a large volume of water with minimal turbidity and velocities before the system is operated at full capacity.

Discharge rates will be decreased if turbidity, velocities, erosion, or water levels increase to a condition that could significantly modify or destroy the habitat. This evaluation will be made subjectively by field observations. Qualitative descriptions for each parameter listed below will be used as a guide to determine if the discharge rate should be decreased or the initial action discontinued.

5.1 Turbidity

Some turbidity is acceptable (Bleil 2002, USFWS 1998) because young-of-the-year use murky and milky water to hide from predators. Field observations will ensure that velocities are maintained sufficiently low so the turbidity does not increase beyond murky or milky conditions. Most of the increase in turbidity can be expected to occur near the points of discharge.

5.2 Velocities

Young-of-the-year tend to enter the backwater habitats using eddies that form on the downstream mouth (Bleil 2002; Miller et. al. 1982). Relatively high flow velocities could flush the backwaters and discourage the young-of-the-year from entering the habitat. Therefore, the velocities will be maintained low enough through the bar so that slow moving eddy currents are not prevented from forming at the mouth.

5.3 Erosion

Bank erosion and removal of the sandy-silt substrate could alter the suitability of the habitat if the discharge rate is above the erosive velocity for the channel. Visual observations of sediment transport, bed scouring, and bank erosion will be made to ensure the discharge rate is maintained below erosive velocities.

5.4 Water Levels

As the Colorado River stage decreases in the late summer, the backwater areas begin to dry up and will eventually reach a level that prevents egress for young-of-the-year. At this low river stage the water level in the sandbar area is no longer considered suitable for habitat, and the dilution will be discontinued for the season. A determination will be made on a case-by-case basis as to when to cease discharge to suspected habitat areas. The determination will be made to cease discharge once the river stage will no longer naturally provide habitat.

Conversely, water depths greater than 2 ft in the backwater areas would not be considered habitat. Increasing water levels in the backwater areas greater than 2 ft in depth as a result of this initial action is not an expected consequence.

6.0 Monitoring and Reporting

Measuring the success of the initial action is dependent upon well-planned design and operational criteria as outlined in Sections 4.0 and 5.0, in addition to well-defined objectives and minimizing uncertainties. Although the discussion in Section 3.0 identifies some of the biological, chemical, and physical considerations that can reduce uncertainties and optimize success, other factors, such as predation, ambient water quality, and recreational river activities are outside DOE's control. Because of the inherent variation within the critical habitats where endangered fish may be exposed to ammonia, the qualitative operational parameters presented in Section 5.0 are proposed as the performance measures for this initial action. Success in meeting the objectives for this initial action is based on the following assumptions:

- Existing data are sufficient to determine concentrations of ammonia and the locations of ammonia discharge to the river that may adversely affect fish species.
- Areas where potentially suitable habitat exists can be determined on the basis of visual observations of the water levels following spring runoff and the physical characteristics of the backwater areas.
- Potentially suitable habitat for young-of-the-year and juveniles (critical life phase) exists within the zone of ammonia contamination, and endangered fish species may be present in these areas at least some time during operation of the dilution system.
- Introducing a total flow rate of up to 1,360 gpm of upstream river water to the backwater areas is sufficient to dilute the ammonia concentrations to beneficial levels.
- Visual observations of turbidity, flow velocity, erosion, and the water level through the sandbar area are sufficient to optimize the operating conditions of the dilution system.
- Some increase in turbidity, flow velocity, erosion, and the water level through the sandbar area is an acceptable and unavoidable consequence of discharging a relatively large volume of water required for this initial action, as long as habitat is not damaged or destroyed.
- Limiting factors outside DOE's control may affect the success of initial actions.

6.1 Monitoring

Visual observations of the sandbar area and operating parameters of the dilution system will be monitored at least weekly and recorded on the field worksheet presented in Figure 6–1. The worksheet will be kept in a field logbook. A description of the monitoring activities is provided in the following sections.

Field Worksheet for the Initial Action at the Sandbar Area

Date:	Operator Name:
Photo Point No.	Location of Area:
River Stage at Cisco Gauging Station (cfs):	River Elevation at Stilling Well:

Description of Habitat

Channel width (ft):	Water depth (ft):
Backwater or slow-moving eddies?	Sandy silt substrate?
Other:	

Operating Conditions

Flow rate (gpm):	Flow velocities (ft/s):
Turbidity:	Erosion:
Other:	

System Configuration

Figure 6–1. Field Worksheet for Documenting Monitoring Observations and Operating Parameters

6.1.1 River Stage and Habitat

Visual observations will be performed after spring runoff to determine when the sandbar is exposed. Once the sandbar is exposed, visual monitoring will continue to determine the presence of suitable fish habitat in three previously identified locations. Physical characteristics of suitable habitat, including the presence of backwater or slow-moving eddies, sandy-silt substrates, and water depths will be documented.

6.1.2 Marking and Mapping

Suspected fish habitat areas will be marked with stakes and the areal extent will be mapped by a global positioning system.

6.1.3 Photographs

A photo reference point will be established at each of the three suspected fish habitat areas. Photographs will be taken at each photo reference point at least annually.

6.1.4 Operating Conditions

Operating conditions, including flow rates, turbidity, velocities, erosion, water levels, and duration of discharges. The system configuration, such as the relocation of flexible portions of the system due to changing habitat and the type of discharge manifold in use, will be recorded.

6.2 Reporting

The initial action is planned to begin in the spring of 2002 and continue for 3 to 5 years.

Results of the initial action will be reported annually to USFWS by January 31 for the preceding calendar year. Each annual report will summarize the results of the previous year and include operational time frames and parameters, descriptions of activities, monitoring results, decision points, habitat mapping, and photographs.

End of current text

7.0 Regulatory Compliance

7.1 Endangered Species Act

DOE has been conducting informal consultation with the USFWS and UDOWR since transfer of the site to DOE. Consultation has included concurrences received from USFWS on March 23, 2001, September 12, 2001, and January 30, 2002. DOE recently requested concurrence from USFWS to conduct this initial action. The action will not be performed until concurrence is received.

7.2 National Environmental Policy Act

Appropriate National Environmental Policy Act (NEPA) documentation will be prepared prior to the action being performed. The level of required NEPA documentation is dependent upon USFWS concurrence.

7.3 Other Regulations

DOE has complied with other regulations including 404 Nationwide Permit Regulations for installation of a stilling well. In addition, water rights necessary to accomplish this work plan have been transferred to DOE.

End of current text

8.0 Health and Safety

The site-specific Health and Safety Plan (DOE 2001) has been prepared for the Moab site in accordance with the requirements of 29 CFR 1910.120. All fieldwork will be performed according to the site-specific health and safety requirements developed for this task (DOE 2001).

End of current text

9.0 Logistics and Schedule

A work readiness review (WRR) will be conducted at the Grand Junction Office before the team mobilizes for construction and operation of the initial action. The purpose of the WRR is to ensure that all personnel, facilities, systems, and processes are ready before the start of fieldwork and to minimize the possibility of delays and problems due to incomplete planning and preparations.

Topics that will be addressed include health and safety, training requirements, personnel resources, site access, equipment and supplies, and work tasks. The scope of the WRR will be defined by a checklist specific to the field task.

A general schedule for each activity is presented in Figure 9–1.

ID	Task Name	Duration	Early Start	Late Finish
1	**Initial Action - Year 1**	**211 days**	**03/19/02**	**01/07/03**
2	Procure System Components	30 days	03/19/02	04/29/02
3	Construct System	20 days	04/30/02	05/27/02
4	Monitor for Presence of Habitat	10 days	05/20/02	05/31/02
5	Start Dilution Operations	1 day	06/03/02	06/03/02
6	Operate System	65 days	06/04/02	09/02/02
7	Monitor for Absence of Habitat	10 days	08/20/02	09/02/02
8	Stop Dilution Operations	1 day	09/03/02	09/03/02
9	Prepare Annual Report	90 days	09/04/02	01/07/03

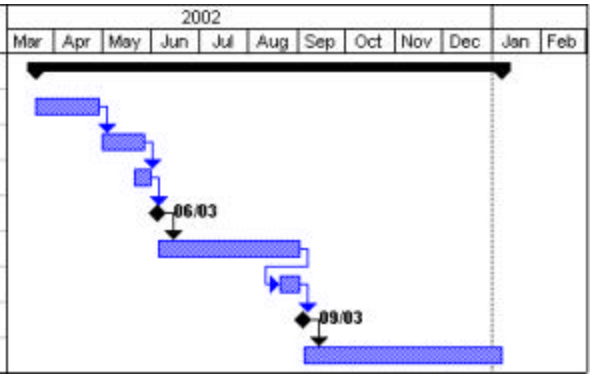


Figure 9–1. Activities Schedule

End of current text

10.0 References

Bleil, 2002. Memorandum to Record File dated January 7, 2002, "Trip Report–Field Meeting 12/19/01 with M. Hudson, Utah Division of Wildlife Resources, to Discuss habitat Requirements for Endangered Fish in the Vicinity of the Moab Site," GJO–MOA 06.01, prepared for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

McAda, C.W. and L.R. Kaeding, 1991. *Movements of adult Colorado squawfish during the spawning season in the upper Colorado River*, Trans. Am. Fish. Soc. 120:339-345.

Miller, W.H., D.L. Archer, J. Valentine, H.M. Tyus, R.A. Valdez, and L.R. Kaeding, 1982. *Colorado River fishery Project Final Report Summary*, U.S. Fish and Wildlife Service, Salt Lake City, Utah, 42 pp.

Oak Ridge National Laboratory (ORNL), 1998. *Limited Ground Water Investigation of the Atlas Corporation, Moab Mill, Moab Utah*, prepared for the U.S. Fish and Wildlife Service, Salt Lake City, Utah.

Shepard Miller, Inc. (SMI), 2001. *Site Hydrogeologic and Geochemical Characterization and Alternatives Assessment for the Moab Mill Tailings Site, Moab, Utah*, April.

Stanford, J.A., 1994. *Instream flows to assist the recovery of endangered fishes of the Upper Colorado River Basin*, Biological Report 24, National Biological Survey, Washington, D.C., 47 pp.

Tyus, H.M. and G.B. Haines, 1991. *Distribution, habitat use, and growth of age-0 Colorado squawfish in the Green River Basin, Colorado and Utah*, Trans. Amer. Fish. Soc. 120:79-89.

U.S. Department of Energy (DOE), 2001. *Moab Health and Safety Plan*, GJO–MOA 1.3, prepared for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado.

———, 2002. *Chemistry of Ground Water in the Colorado River Sandbar Area–Moab, Utah, UMTRA Project Site*, ESL–RPT–2002–03, prepared for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, January.

U.S. Fish and Wildlife Service, 1998. *Final Biological Opinion for the Proposed Reclamation of the Atlas Mill Tailings Site in Moab, Utah*, FWS/R6 6–UT–97–F–0 C.2., July.

End of current text