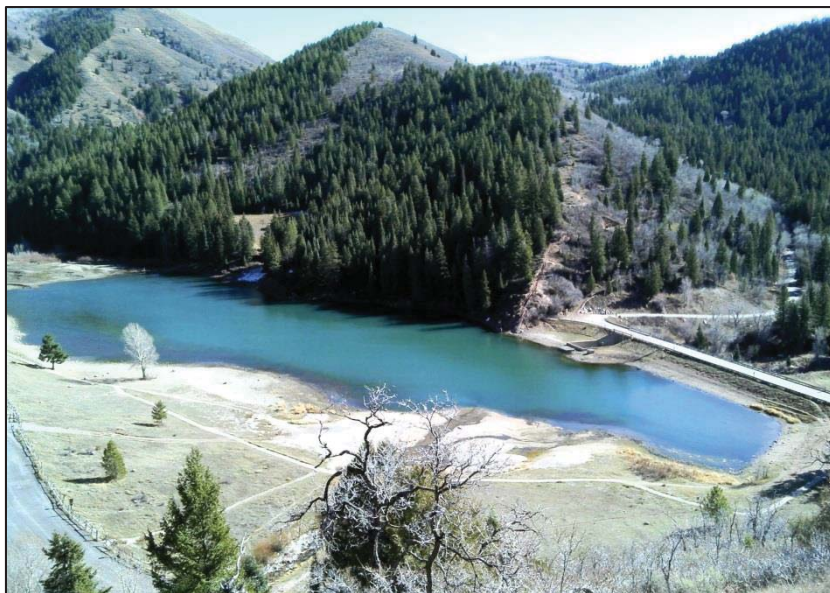




McMILLEN, LLC

Final Supplemental Watershed Plan No. 10 and Environmental Assessment for the Rehabilitation of Tibble Fork Dam

American Fork-Dry Creek Watershed
Utah County, Utah



Sponsoring Local Organization:

North Utah County Water Conservancy District
Utah Division of Wildlife Resources

Prepared by:

McMillen, LLC

Prepared for:

U.S. Department of Agriculture
Natural Resources Conservation Service

In cooperation with:

U.S. Department of Agriculture
U.S. Forest Service Uinta-Wasatch-Cache National Forest

January 2015

MEMORANDUM



To:	Bronson Smart NRCS Utah	Project:	Tibble Fork Dam Rehabilitation Plan-EA
From:	Dan Axness, PE Aimee Hill, NEPA Specialist	Cc:	
Date:	January 23, 2015		
Subject:	Tibble Fork Dam Final Plan-EA Errata and Additions		
Attachment:	Dam Rehabilitation Map January 2015		

1.0 INTRODUCTION

The Tibble Fork Dam Rehabilitation Draft Plan-EA was issued out for public comment in July 2014. A public meeting was held and several public and agency comments were submitted during the 30-day comment period.

During that comment period, project stakeholders began the process of obtaining a transfer of water rights for an additional 120 acre-feet of water previously stored at Silver Lake. Because the sponsors and stakeholders were aware of this potential, language had been inserted into the Draft Plan-EA document to inform the public that irrigation water storage/agricultural water management was currently in the process of becoming a primary purpose of the project.

2.0 PURPOSE AND NEED

The purpose and need of the dam rehabilitation project as presented in the Draft Plan-EA has been updated for the Final Plan-EA as follows:

The purpose and need of this project is for Tibble Fork Dam (#UT00299) to meet current USDA-NRCS and Utah State Dam Safety regulations and current engineering standards. It would also continue to provide current benefits for the primary authorized purposes of flood prevention and sediment retention ~~with secondary benefits of recreation and non-agricultural irrigation water storage along with the new primary authorized purpose of Agricultural Water Management. The dam will also continue to provide the secondary benefit of recreation.~~ Stabilizing the existing dam structures would address the risk of loss-of-life and flooding associated with a dam failure because the dam is not meeting current safety criteria.

2.1 PROPOSED REHABILITATION MEASURES AND REVISIONS

2.1.1 EXISTING DAM CONDITIONS

Tibble Fork Dam was designed with a total storage of 259 ac-ft with 175 acre-feet (ac-ft) allotted for sediment storage and 84 acre-feet allotted for flood storage. Due to sediment deposition and

subsequent sediment removal throughout its 50 year life, the structure currently provides 24 ac-ft of sediment storage and 84 ac-ft of flood storage for a total storage capacity of 108 ac-ft.

2.1.2 REHABILITATION MEASURES - REVISIONS

The Rehabilitation Alternative remains the Preferred Alternative. As presented in the Draft Plan-EA:

“Non-Agricultural Irrigation Water Storage

USDA-NRCS and the NUCWCD are planning to submit a request for obtaining approval for irrigation water storage to be added as an authorized purpose of the structure. The NUCWCD is in the process of coordinating final approvals for an additional 150 ac-ft for non-agricultural irrigation water storage within the reservoir. This 150 ac-ft is included in the 9-foot spillway raise.”

The Additional Purpose Request Tech Memo dated November 12, 2014 provided the contrast between the Draft Plan-EA Rehabilitation alternative and a new Rehabilitation alternative with the additional 120 ac-ft (not 150 ac-ft) of storage:

Rehabilitation Without Storage (Draft Plan-EA)

The proposed rehabilitation measures to meet applicable safety and performance standards, and to provide the required sediment and flood storage capacities without the additional 120 ac-ft of storage would include:

- Raising the dam embankment 9 feet
- Replacing and raising the principal and auxiliary spillways 9 feet
- Installation of a new toe drain
- Construction of a stability berm
- Repairs to the low-level outlet
- Excavation of sediment within the reservoir

The rehabilitation measures above would result in a total capacity of the structure of 305 ac-ft with 220 ac-ft allotted for sediment storage and 85 ac-ft allotted for floodwater storage.

Rehabilitation Alternative: With Additional Storage

The proposed rehabilitation measures to meet applicable safety and performance standards, and to provide the required sediment and flood storage capacities along with the additional 120 ac-ft of storage would include:

- Raising the dam embankment 15 feet
- Replacing and raising the principal and auxiliary spillways 13.8 feet and 12.7 feet respectively
- Installation of a new toe drain
- Construction of a stability berm
- Repairs to the low-level outlet
- Excavation of sediment within the reservoir

The rehabilitation measures above would result in a total capacity of 384 ac-ft with 175 ac-ft allotted for sediment storage, 85 ac-ft allotted for floodwater storage, and 120 ac-ft allotted for Agricultural Water Management storage.

Note: Table 1 below shows the preferred alternative information as updated January 2015.

Table 1. Comparison of Existing Dam and Final Plan-EA Preferred Alternative

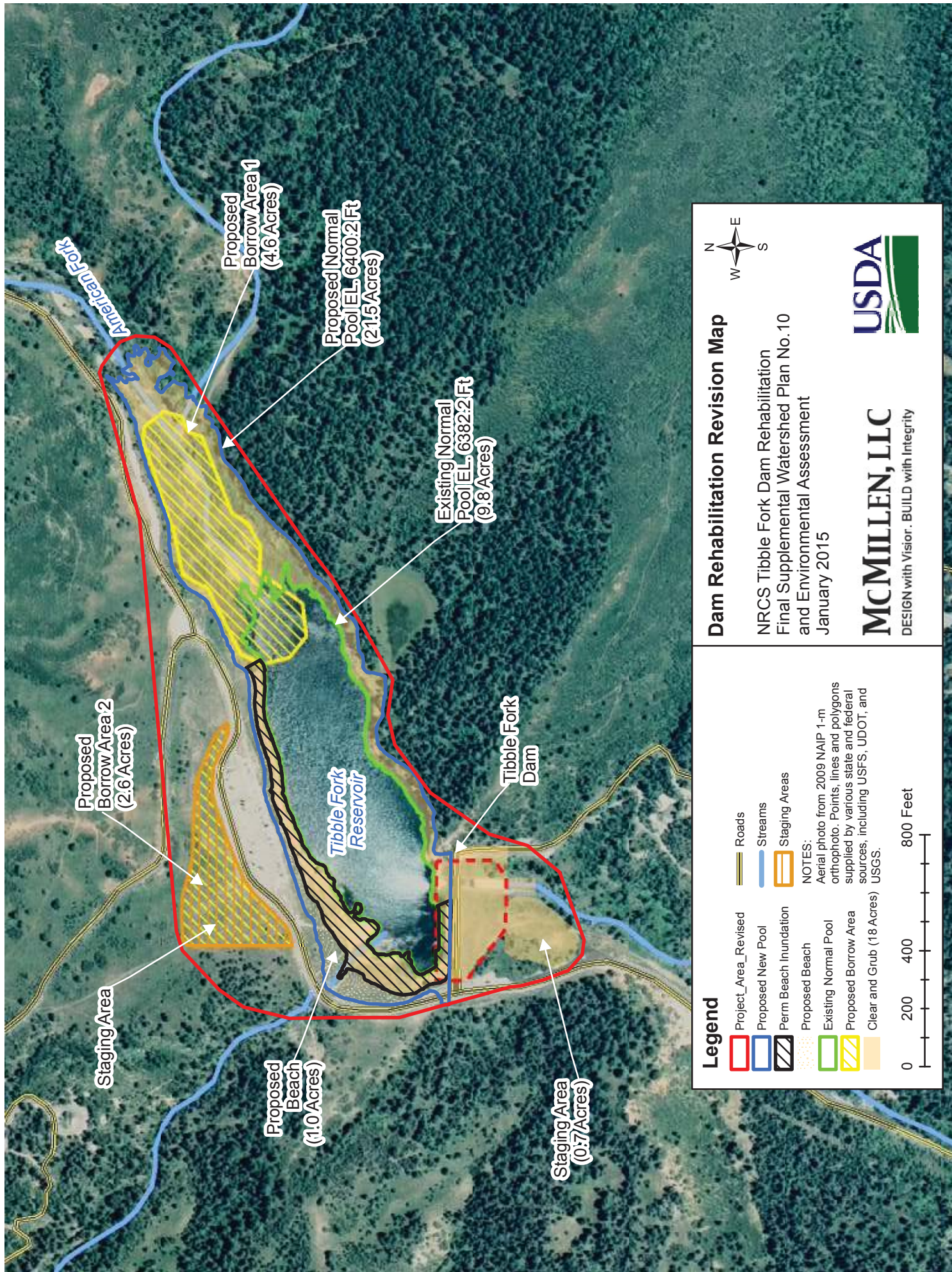
Description	Existing Conditions	Final Plan-EA Preferred Alternative
Principal Spillway Crest	6382.2' AMSL	6396' AMSL
Auxiliary Spillway Crest Elevation	6387.3' AMSL	6400.2' AMSL
Auxiliary Spillway Dimensions	30' Wide x 12'9" Tall at Entrance x 232' Long	30' Wide x 12' Tall at Entrance x 331' Long
Top of Dam (feet)	6394.5' AMSL	6409.5' AMSL
Top Width of Dam (feet)	18	18
Downstream Embankment Slope	2.5:1	2.5:1
Low-level Outlet	352 feet long, 30-inch reinforced concrete pipe	452 feet long, 30-inch reinforced concrete pipe
Reservoir Storage Capacity	108 ac-ft	384 ac-ft
Reservoir Area	9.8 ac	21.5 ac

3.0 CONCLUSION

The Final Plan-EA incorporates revisions that have become necessary to accurately depict the added project purpose. The additional purpose was granted on January 15, 2015, and in an effort to expedite the process and ensure that funding continues to be available for the sponsor, the Final Plan-EA is being submitted with document changes only. Language has been added throughout the document noting differences and updates from the Draft Plan-EA.

The difference in impacts to waters of the U.S. and wetlands is negligible, considering the inundation of a section of the American Fork upstream of the reservoir is assumed in the document. Further analysis of Operation and Maintenance (O&M) practices will determine actual impacts, which will be mitigated for if necessary and in cooperation with the USACE and USFS. O&M will be finalized during the permitting process and prior to construction.

The figures and Investigation and Analysis Report (Appendix D), including preliminary plans (conceptual design), remain dated July 2014.



Title and Document Status: Final Supplemental Watershed Plan No. 10 and Environmental Assessment (Final Plan-EA) for the Rehabilitation of Tibble Fork Dam. The project is located in Utah County, Utah.

Lead Agency: U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (USDA-NRCS)

Cooperating Agencies: USDA Forest Service (USFS) Uinta-Wasatch-Cache National Forest (UWCNF)

Sponsoring Local Organization: North Utah County Water Conservancy District (NUCWCD) and Utah Division of Wildlife Resources (UDWR)

Authority: This Final Plan-EA has been prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law (PL) 83-566, as amended by Section 313 of Public Law 106-472 and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, PL 91-190, as amended (42 U.S.C. 4321 et seq.).

Abstract: Tibble Fork Dam (#UT00299) was originally built in 1966 and was designed and constructed as a high hazard dam due to the high probability of loss-of-life if the dam should fail. The dam was originally planned, designed, funded, constructed and authorized for the primary purpose of sediment retention and flood protection. The dam also originally provided secondary benefit of recreation. In accordance with the rehabilitation provisions of USDA-NRCS's Small Watersheds Program, Tibble Fork Dam is eligible for rehabilitation funding due to its high hazard classification and outdated infrastructure. The purpose and need of this project is for Tibble Fork Dam (#UT00299) to meet current USDA-NRCS and Utah State Dam Safety regulations (Utah Division of Water Rights [UDWRi] 2014) and current engineering standards (USDA-NRCS 2005). Rehabilitation of the dam would continue to provide current benefits for the primary authorized purposes of flood prevention and sediment retention along with the new primary authorized purpose of irrigation water storage. The dam will also continue to provide the secondary benefit of recreation.

The Preferred Alternative includes rehabilitating and raising the dam, replacement and raising the auxiliary spillway, addition of irrigation water storage, and mitigation for impacts to recreation and wetlands. Rehabilitation of the dam would include installing new riprap on the upstream face, placing additional fill on the downstream face for stability, installing a new Tibble Fork Summer Homes access road on top of the stability berm, raising the auxiliary spillway and dam crest to restore the original storage design capacity, installing new toe drains, clearing vegetation around the dam and reservoir, and additional improvements for mitigation of recreation and wetland impacts. The total estimated installation cost is \$7,335,000.

Comments: USDA-NRCS has completed this Final Plan-EA in accordance with the National Environmental Policy Act (NEPA) guidelines and standards. The Draft Plan-EA was released for public review on July 24, 2014 and the comment period ended on August 22, 2014. Comments received during the Draft Plan-EA comment period are located in Appendix A of this Final Plan-EA and were incorporated into the project as appropriate.

Further information may be obtained for this project by contacting the following USDA-NRCS personnel:

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SUPPLEMENTAL WATERSHED PLAN AGREEMENT NO. 10

TABLE OF CONTENTS

SUMMARY OFFICE OF MANAGEMENT AND BUDGET FACT SHEET	S-1
S.1 Project Title	S-1
S.2 County, State	S-1
S.3 Congressional District	S-1
S.4 Sponsoring Local Organizations	S-1
S.5 Authority	S-1
S.6 Cooperating Agency	S-1
S.7 Purpose and Need for Action	S-1
S.8 Description of the Preferred Alternative Dam Rehabilitation – Spillway Replacement Alternative	S-1
S.9 Resource Information	S-4
S.10 Alternative Plans Considered	S-5
S.11 Project Costs	S-5
S.12 Project Benefits	S-5
S.13 Net Economic Benefits	S-5
S.14 Period of Analysis	S-6
S.15 Project Life	S-6
S.16 Environmental Impacts	S-6
S.17 Major Conclusions	S-9
S.18 Areas of Controversy and Issues to be Resolved	S-9
CHAPTER 1.0 INTRODUCTION	1-1
1.1 Changes Requiring the Preparation of a Supplemental Watershed Plan	1-1
1.2 Purpose and Need Statement	1-1
1.3 Scope of Final Plan-EA	1-2
1.3.1 Planning and NEPA Process History	1-3
1.3.2 Resources Issues Studied In Detail	1-3
1.3.3 Resource Issues Eliminated From Further Study	1-3
1.3.4 Decision Matrix	1-4
1.4 Project Background	1-4
1.5 Project Area and Existing Dam Conditions	1-4
CHAPTER 2.0 AFFECTED ENVIRONMENT	2-1
2.1 Soil and Geology	2-1
2.1.1 Soils	2-1
2.1.2 Geology	2-2
2.2 Water Resources	2-4
2.2.1 Surface Water and Water Quality	2-4

2.2.2	Hydrology.....	2-4
2.2.3	Water Rights.....	2-5
2.2.4	Water Quality	2-6
2.2.5	Watershed Resources Legal Framework	2-6
2.2.6	Waters of the U.S., Including Wetlands	2-8
2.2.7	Climate	2-8
2.3	Air Quality.....	2-9
2.4	Plants	2-9
2.4.1	Dominant Vegetation Communities	2-9
2.4.2	Riparian Areas.....	2-10
2.4.3	Special Status Plant Species	2-10
2.4.4	Threatened and Endangered Species	2-11
2.4.5	Noxious Weed and Invasive Plant Species	2-11
2.5	Animals	2-12
2.5.1	Fish	2-12
2.5.2	Wildlife.....	2-13
2.5.3	Threatened and Endangered Species	2-15
2.6	Human Environment	2-18
2.6.1	Cultural/Historical Resources.....	2-18
2.6.2	Land Use and Recreation	2-18
2.6.3	Noise/Light.....	2-23
2.6.4	Transportation/Infrastructure.....	2-23
2.6.5	Socioeconomics.....	2-24
2.6.6	Demographics.....	2-25
2.6.7	Land Rights	2-25
2.6.8	Agricultural Lands.....	2-25
2.6.9	Natural Areas, Parklands and Forest Resources.....	2-25
2.6.10	Visual Quality, Aesthetics and Scenic Beauty	2-26
2.6.11	Public Health and Safety	2-27
CHAPTER 3.0	ALTERNATIVES.....	3-1
3.1	Project Scoping	3-1
3.2	Formulation Process	3-1
3.3	Alternatives Considered but Eliminated from Detailed Study	3-1
3.3.1	Dam Decommissioning	3-2
3.3.2	Dam Rehabilitation—Straight Crest	3-2
3.3.3	Dam Rehabilitation—Storage Restoration through Sediment Removal	3-2
3.3.4	Dam Rehabilitation—Open-Channel Spillway Replacement	3-3
3.3.5	Dam Rehabilitation—New Open-Channel Abutment Spillway.....	3-3
3.3.6	Dam Rehabilitation—Abutment Spillway Alternative (Left)	3-3

3.4	Alternatives Considered for Detailed Study	3-3
3.4.1	No Action Alternative	3-4
3.4.2	Dam Rehabilitation – Spillway Replacement Alternative.....	3-4
3.5	National Economic Development	3-6
3.6	Summary and Comparison of Alternative Plans	3-6
CHAPTER 4.0	ENVIRONMENTAL CONSEQUENCES	4-1
4.1	Soil and Geology	4-1
4.1.1	Soils	4-1
4.1.2	Geology	4-2
4.2	Water Resources.....	4-3
4.2.1	Surface Water and Water Quality, Hydrology, and Legal Framework	4-3
4.2.2	Hydrology.....	4-4
4.2.3	Legal Framework	4-4
4.2.4	Water Rights.....	4-4
4.2.5	Waters of the U.S., Including Wetlands	4-4
4.2.6	Climate	4-5
4.3	Air Quality.....	4-6
4.4	Plants	4-7
4.4.1	Vegetation Communities	4-7
4.4.2	Riparian Areas	4-7
4.4.3	Special Status Plant Species	4-7
4.4.4	Threatened and Endangered Plant Species	4-8
4.4.5	Noxious Weeds and Invasive Plant Species	4-8
4.5	Animals	4-9
4.5.1	Fish	4-9
4.5.2	Wildlife.....	4-9
4.5.3	Threatened and Endangered Species	4-9
4.5.4	Migratory Birds/Bald and Golden Eagles	4-10
4.6	Human Environment	4-11
4.6.1	Cultural/Historic Resources	4-11
4.6.2	Land Use and Recreation	4-12
4.6.3	Noise/Light.....	4-15
4.6.4	Transportation/Infrastructure.....	4-15
4.6.5	Socioeconomics.....	4-17
4.6.6	Demographics.....	4-17
4.6.7	Land Rights	4-17
4.6.8	Agricultural Lands.....	4-18
4.6.9	Natural Areas, Parklands and Forest Resources.....	4-18
4.6.10	Visual Quality, Aesthetics and Scenic Beauty	4-18

4.6.11	Public Health and Safety	4-19
4.7	Past, Present, and Reasonably Foreseeable Actions.....	4-19
4.8	Risk and Uncertainty	4-19
CHAPTER 5.0	CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION.....	5-1
5.1	Consultation	5-1
5.2	Coordination.....	5-2
5.3	Public Participation	5-2
5.3.1	Scoping.....	5-2
5.3.2	Public Outreach Activities.....	5-2
5.3.3	Draft Plan-EA Public Comment.....	5-3
CHAPTER 6.0	PREFERRED ALTERNATIVE	6-1
6.1	Purpose and Summary.....	6-1
6.2	Rationale for Preferred Alternative Selection	6-1
6.3	Measures to be Installed	6-1
6.4	Mitigation	6-4
6.5	Permits and Compliance.....	6-6
6.6	Installation and Financing	6-7
6.6.1	Planned Sequence of Installation	6-7
6.6.2	Responsibilities	6-7
6.6.3	Contracting	6-7
6.6.4	Real Property and Relocations	6-7
6.6.5	Emergency Action Plan.....	6-7
6.6.6	Financing.....	6-8
6.7	Operation and Maintenance.....	6-8
6.8	Costs	6-9
CHAPTER 7.0	REFERENCES	7-1
CHAPTER 8.0	LIST OF PREPARERS.....	8-1
8.1	Final Plan-EA Preparers.....	8-1
CHAPTER 9.0	DISTRIBUTION LIST	9-1
9.1	Federal Government.....	9-1
9.2	Tribal Government	9-1
9.3	State Government	9-1
9.4	Local Government.....	9-3
9.5	Organizations	9-4
9.6	Private Parties.....	9-4
CHAPTER 10.0	ACRONYMS, ABBREVIATIONS, AND SHORT FORMS.....	10-1
CHAPTER 11.0	INDEX	1

LIST OF FIGURES

Figure 1-1. Downstream Face of Tibble Fork Dam	1-5
Figure 1-2. Upstream Face of Tibble Fork Dam	1-5
Figure 1-3. Access Road on Dam Crest	1-6
Figure 1-4. Low-Level Outlet Pipe Intake	1-6
Figure 1-5. Spillway Inlet	1-7
Figure 1-6. Spillway	1-7
Figure 1-7. Spillway Stilling Basin and Low-Level Pipe Outlet	1-7
Figure 1-8. Tibble Fork Reservoir Looking Upstream	1-8
Figure 1-9. Tibble Fork Reservoir Northwestern Shoreline	1-9
Figure 1-10. Tibble Fork Reservoir Northwestern Shoreline during Flood Event	1-9
Figure 1-11. Tibble Fork Reservoir Southern Shoreline	1-9
Figure 1-12. Tibble Fork Reservoir Sediment Deposition Area at Inlet	1-10
Figure 2-1. Tibble Fork Trailhead at End of Dam	2-20
Figure 2-2. Tibble Fork Reservoir Parking Area	2-21
Figure 2-3. Tibble Fork Dam Parking Area	2-21
Figure 2-4. Tibble Fork Reservoir from South Side of Reservoir Looking Northwest	2-26
Figure 2-5. Tibble Fork Dam from South Side of Dam (Downstream)	2-27

LIST OF TABLES

Table S- 1. Existing Resource Information	S-4
Table S- 2. Estimated Project Costs	S-5
Table S- 3. Estimated Annual Net Economic Benefits	S-6
Table S- 4. Summary of Resource Concerns and Impacts	S-6
Table 1-1. Tibble Fork Reservoir Storage Allocation	1-8
Table 2-1. Heavy Metal Analysis Constituents	2-2
Table 2-2. Basin Characteristics of the Tibble Fork Watershed above Tibble Fork Dam	2-4
Table 2-3. Peak Discharges for Various Return Periods	2-5
Table 2-4. Water Rights Summary Table	2-5
Table 2-5. Special-Status Plant Species with Suitable Habitat Identified in the Project Area	2-10
Table 2-6. Special Status Plant Species - Utah County, Utah	2-11
Table 2-7. Special Status Fish Species	2-12
Table 2-8. Special Status Wildlife Species	2-14
Table 2-9. UWCNF Management Indicator Species	2-15
Table 2-10. Federally Listed Species and Critical Habitat within Utah County, Utah	2-15
Table 2-11. Utah County Major Employers (Data for 2011)	2-24
Table 3-1. Summary and Comparison of Alternative Plans	3-7
Table 4-1. Wetlands and Waters of the U.S. Impact Summary Table	4-5
Table 5-1. Public Outreach Activities	5-3
Table 5-2. Draft Plan-EA Comment Summary	5-3
Table 6-1. Comparison of Existing Dam and Preferred Alternative	6-3
Table 6-2. Estimated Installation Cost	6-9
Table 6-3. Estimated Cost Distribution – Water Resource Project Measures	6-9
Table 6-4. Structural Data – Dams with Planned Storage Capacity	6-10
Table 6-5. Average Annual NED Costs	6-11
Table 6-6. Estimated Average Annual Flood Damage Reduction Benefits	6-11
Table 6-7. Estimated Average Annual Watershed Protection Damage Reduction Benefits	6-11

Table 6-8. Comparison of Annual NED Benefits and Costs	6-12
Table 8-1. List of Preparers	8-1

APPENDICES

Appendix A	Consultation, Comments and Responses Additional Purpose Request Tech Memo Utah SHPO Concurrence Letters USACE Consultation USFWS Consultation Draft Plan-EA Comments
Appendix B	Project Maps Map 1: Vicinity Map Map 2: Watershed Map Map 3: Project Map Map 4: Project Dam Area Map Map 5: Dam Rehabilitation Map Map 6: Dam Rehabilitation Map Map 7: Dam Rehabilitation Dam Raise Section Map 8: Dam Rehabilitation Spillway Plan and Profile Map 9: Mitigation for Recreation Impacts
Appendix C	Support Maps Map 10: Tibble Fork Dam Breach Inundation Map, Part 1 of 3 Map 11: Tibble Fork Dam Breach Inundation Map, Part 2 of 3 Map 12: Tibble Fork Dam Breach Inundation Map, Part 3 of 3 Map 13: Soils Map Map 14: Vegetation Map Map 15: Waters of the U.S. and Wetlands Map Map 16: Recreation Map Map 17: Forest Service Land Designation Map
Appendix D	Investigation and Analysis Report
Appendix E	Supporting Information 1958 Watershed Work Plan American Fork – Dry Creek Watershed 1963 Supplemental Watershed Work Plan Agreement #4 American Fork – Dry Creek Watershed 2014 Supplemental Watershed Work Plan Agreement #8 American Fork – Dry Creek Watershed Scoping Report Botanical and Wildlife Survey Report Wetland Delineation Report USFWS Biological Evaluation Letter

SUMMARY

OFFICE OF MANAGEMENT AND BUDGET FACT SHEET

S.1 Project Title

Final Supplemental Watershed Plan No. 10 and Environmental Assessment (Final Plan-EA) for the Rehabilitation of Tibble Fork Dam in American Fork-Dry Creek Watershed

S.2 County, State

Utah County, Utah

S.3 Congressional District

Utah Congressional District 3

S.4 Sponsoring Local Organizations

North Utah County Water Conservancy District (NUCWCD)
Utah Division of Wildlife Resources (UDWR)

S.5 Authority

Natural Resources Conservation Service (USDA-NRCS) – Lead Federal Agency under Public Law 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et. Seq.) 1954

S.6 Cooperating Agency

U.S. Department of Agriculture (USDA) U.S. Forest Service (USFS) Uinta-Wasatch-Cache National Forest (UWCNF)

S.7 Purpose and Need for Action

The purpose and need of this project is for Tibble Fork Dam (#UT00299) to meet current USDA-NRCS and Utah State Dam Safety regulations (UDWRi 2014) and current engineering standards (USDA-NRCS 2005). The dam would continue to provide current benefits for the primary authorized purposes of flood prevention and sediment retention along with the new primary authorized purpose of Agricultural Water Management. The dam will also continue to provide the secondary benefit of recreation. Stabilizing the existing dam structures would address the risk of loss-of-life and flooding associated with a dam failure because the dam is not meeting current safety criteria.

S.8 Description of the Preferred Alternative Dam Rehabilitation – Spillway Replacement Alternative

The Preferred Alternative is the Dam Rehabilitation—Spillway Replacement Alternative. Rehabilitation of the dam would consist of measures to meet current USDA-NRCS and Utah Dam Safety regulations, meeting current engineering standards and extending the life of the dam for 59 years starting in 2017. The rehabilitation features of the Preferred Alternative are shown in Appendix B-Maps 5 through 9, and are summarized below:

Raise Dam

Place and compact additional fill (93,000 cubic yards) on the crest and downstream face of the dam to raise the dam crest and ensure slope stability. Similarly, add zoned fill upstream of the existing right embankment to create a dogleg crest and to catch the existing grade of the north American Fork Canyon Road embankment. Place riprap (2,900 cubic yards) on the upstream face of the dam to protect the slope from wave action erosion at varying water surface elevations in the reservoir. Some of the fill material for the dam raise would be excavated from a borrow source (proposed borrow area 1) located at the entrance of American Fork River into the reservoir. The existing Tibble Fork Summer Homes access road on top of the dam would be removed and relocated for mitigation from recreation impacts.

Downstream Improvements

Construct a stability berm on the downstream face of the dam and install a new Tibble Fork Summer Homes access road on top of the stability berm. Install a new toe drain at the proposed new downstream toe of the dam (approximately 100 feet downstream of current toe) to collect and convey seepage water away from the dam infrastructure. Add extensions to the existing piezometer seepage monitoring instrumentation to allow continued piezometer access after the dam surface is raised.

Principal Spillway

The principal spillway is currently located on the north side of the auxiliary spillway and consists of a concrete intake structure that discharges water into the auxiliary spillway through reinforced concrete (RC) pipes. The principal spillway would be demolished and replaced up to approximately 14 feet higher utilizing a similar design. Raising the principal spillway would raise the existing normal water pool surface elevation of the reservoir from approximately 6382.2 feet AMSL to 6396 feet AMSL. This would increase the reservoir size from approximately 9.8 acres to 21.6 acres.

Auxiliary Spillway/Stilling Basin

The auxiliary spillway would be demolished and replaced with a covered, concrete box-type spillway (1,200 cubic yards of reinforced concrete) sufficiently sized to pass the PMP event (worst-case scenario flood event) without overtopping the dam or spillway walls. The spillway would be raised up approximately 13 feet from elevation 6387.3 feet AMSL to 6400.2 feet AMSL to increase the sediment and water storage capacity of the reservoir. The auxiliary spillway would be extended an additional 40 feet downstream. The stilling basin at the base of the auxiliary spillway would be demolished and a new stilling basin would be constructed that would extend approximately 60 feet downstream of the new auxiliary spillway.

Low-Level Outlet

Replace the low-level outlet gate in the reservoir and repair the outlet riser. Extend the low-level outlet pipe approximately 40-feet to connect to the new stilling basin.

Proposed Borrow Areas and Construction Staging

An approximate 4.6-acre area at the northeast side of the reservoir (proposed borrow area 1) would be excavated approximately 13 to 16 feet to increase reservoir storage capacity. Excavated material meeting required standards would be reused as fill to raise the dam and to level the proposed parking area below the dam. Proposed borrow area 1 side slopes would be graded at a 2:1 slope. An approximate 2.6-acre area northwest of the reservoir (proposed borrow area 2) would be excavated as a borrow source. Proposed borrow area 2 is a previously disturbed area that was used as a borrow source during the original construction of the dam. Proposed borrow area 2 will also be used as a construction staging area. An additional 0.7-acre construction staging area is proposed south of the reservoir on the west side of American Fork River.

Clearing and Grubbing

Approximately 13.5 acres of vegetation on the dam and around the reservoir would be permanently cleared and grubbed. Permanent vegetation removal would be performed on the dam for purposes of dam safety and between the existing normal pool and proposed normal pool elevations. Approximately 1.1 acres of vegetation would also be permanently cleared and grubbed for the new gravel parking area (for mitigation of recreation impacts) at the base of the dam. Additionally approximately 2.6 acres of clearing and grubbing would be performed for the staging/borrow area 2, but would be reseeded after construction completion.

Irrigation Water Storage – updated January 2015

USDA-NRCS and the NUCWCD obtained approval for Agricultural Water Management to be added as an authorized purpose of the structure on January 15, 2015 (memo dated November 12, 2014; see Appendix A). The new authorized purpose allows for an additional 120 ac-ft for irrigation water storage within the reservoir. This 120 ac-ft is an existing water right transfer and does not constitute a new water right. The storage has been incorporated into the Final Plan-EA, however the Conceptual Design attached in Appendix D remains as it was presented to the public in the Draft Plan-EA in July 2014.

Mitigation for Impacts to Recreation

A new approximately 1.1 acre gravel parking area would be constructed at the base of the dam embankment and would encompass the area used for construction staging.

Approximately 1.0 acre of new beach would be added to the west side of the reservoir to mitigate for the inundation of the existing beach. Filling, compacting and grading an area of the reservoir would be performed so that the new normal pool elevation of the reservoir meets the design edge of the new beachfront. Much of the new beachfront would be seeded with native grasses. Sand will be imported to the area immediately adjacent to the normal water line. Approximately 4,600 cubic yards of beachfront fill would be added with an additional approximately 560 cubic yards of sand.

The existing pedestrian bridge over Deer Creek would be demolished and a new pedestrian bridge would be constructed at a higher elevation to account for the pool elevation increase.

The access road to the Tibble Fork summer homes would be realigned and constructed on the new stability berm on the downstream slope of the dam.

To allow more controlled parking around the reservoir, the existing paved parking area layout would be altered to increase parking from 83 spaces to 60 passenger vehicle and 25 truck/trailer spaces. The road adjoining the paved parking area would be realigned to the north of the parking area to provide improved public safety, and a new roundabout would be added at the hairpin turn to allow safe turn around for vehicles pulling trailers.

Wetland Mitigation

Approximately 1.0 acre of reservoir open water, 2.6 acres of stream open water and approximately 500 linear feet of stream open water would be impacted from this alternative. Impacts to these waters of the U.S. would be self-mitigating as the reservoir area would be increased by approximately 11 acres for this alternative. Approximately 0.1 acres of emergent wetland, 0.6 acres of scrub shrub wetland, and 0.6 acres of forested wetland would also be impacted from this alternative (as accounted for in the July 2014 conceptual design). To calculate costs associated with mitigation of impacts to wetlands the following general assumed mitigation ratios were used:

- Emergent Wetland: 1:1

- Scrub Shrub Wetland 1:1
- Forest Wetland 5:1

S.9 Resource Information

Table S-1 lists the relevant resource information for Tibble Fork Dam and Reservoir:

Table S- 1. Existing Resource Information

Resource	Description
Latitude / Longitude	40.48109/ -111.64629 (WGS84)
Hydrologic Unit Number	16020201 (Utah Lake)
Climate	July average 90.1°F January average 20.0°F
Topography	Mountainous
Annual Precipitation / Snowfall	24.8 inches / 85.1 inches
Watershed Area	185.5 square miles
Total Reservoir Drainage Area	35 square miles
Reservoir Area	9.8 acres
Sediment Storage	175 ac-ft
Floodwater Storage	84 ac-ft
Recreation Storage	0 ac-ft
Irrigation Storage	0 ac-ft
Total Reservoir Storage	108 ac-ft
Land Uses	Forest
Land Ownership	Federal 100% (USFS UWCNF)
Population (Utah County)	Population: 540,504
Demographics (Utah County)	White: 86.1% Hispanic or Latino: 9.2% Two or More Races: 1.6% Asian: 1.4% Native Hawaiian and Other Pacific Islanders: 0.6% American Indian and Alaska Native: 0.5% Black: 0.5%
Farms Present (Utah County)	16,700
Land in Farms (Utah County)	11,094,700 acres
Average Farm Size (Utah County)	664 acres

S.10 Alternative Plans Considered

Alternatives that were analyzed in detail in this Final Plan-EA include the No Action Alternative and Dam Rehabilitation—Spillway Replacement Alternative.

- The No Action alternative assumes that with no Federal funds, the NUCWCD would operate the debris basin as is until Utah Dam Safety mandates rehabilitation. The NUCWCD-funded alternative would consist of upgrading the auxiliary spillway in order to pass the Inflow Design Flood (IDF), and constructing dam stability measures as needed to meet current dam safety requirements. These stability measures may include downstream toe improvements (compaction/replacement of foundation materials), repair of toe drains and construction of a downstream stability berm. Material for construction of the downstream stability berm would be obtained from sources outside of forest service property. Auxiliary spillway upgrades may include notching the spillway crest, localized repairs, riprapping for spillway protection, and riprapping the stilling basin. The total installation cost estimate for this alternative is \$1,252,000 as detailed in Appendix D.
- The Dam Rehabilitation—Spillway Replacement Alternative would rehabilitate the dam to meet current USDA-NRCS and Utah State Dam Safety regulations and engineering standards. The dam crest, auxiliary spillway and principal spillway would be raised, the low-level outlet and downstream conditions would be improved, and additional improvements would be made for impacts to recreation. A detailed list of actions for the rehabilitation are listed in Section S.8. The total installation cost estimate for this alternative is \$7,335,000 as detailed in Appendix D.

The National Economic Development (NED) Alternative is the alternative or combination of alternatives that reasonably maximizes the net economic benefit of the project consistent with protecting the Nation's environment. For the rehabilitation program, when human life is potentially at risk, the NED alternative is defined as the federally assisted alternative with the greatest net economic benefits. The National Economic Development (NED) Alternative is the Dam Rehabilitation—Spillway Replacement Alternative.

S.11 Project Costs

The estimated project cost for the Preferred Alternative is summarized in Table S-2.

Table S- 2. Estimated Project Costs

	PL 83-566 Funds		Other Funds		Total	
Structure Rehabilitation	\$4,257,500	65%	\$2,292,500	35%	\$6,550,000	89%
Technical Assistance	\$775,000	-	\$10,000	-	\$785,000	11%
Total	\$5,032,500	69%	\$2,302,500	31%	\$7,335,000	100%

S.12 Project Benefits

Tibble Fork Dam would be rehabilitated for the primary benefits of sustained sediment retention and flood protection, a new primary benefit of irrigation water storage, and a secondary benefit of recreation.

S.13 Net Economic Benefits

The estimated project economic benefits for the Preferred Alternative are summarized in Table S-3. The

Preferred Alternative is also the National Economic Development (NED) Alternative for the project and has associated flood protection, sediment retention, irrigation water storage, and recreation benefits.

Table S- 3. Estimated Annual Net Economic Benefits

Alternative	Average Annual Benefits	Average Annual Costs	Benefit Cost Ratio
Tibble Fork Dam Rehabilitation	\$260,000	\$347,000	0.75

S.14 Period of Analysis

The standard period of analysis for dam rehabilitation under PL 83-566 is a minimum of 50 years and a maximum of 100 years. Tibble Fork Dam was analyzed for a period of 59 years starting after installation is completed in 2017. After 59 years, sediment accumulation in the reservoir would begin to reduce the economic benefit of the structure. Note that the operational life of the dam is expected to be greater than 100 years and some of the benefits associated with the dam will continue after the 59 year period of analysis.

S.15 Project Life

The life of Tibble Fork Dam would be extended for 59 years starting in 2017.

S.16 Environmental Impacts

Table S-4 lists the resources of concern and impacts associated with the Preferred Alternative. Resources that would not be affected by the project are not listed in this table and include surface water quality, hydrology, legal framework, special status plant species, threatened and endangered plant or animal species, cultural/historical resources, demographics, agricultural lands, natural areas, parklands, and forest resources.

Table S- 4. Summary of Resource Concerns and Impacts

Effects	No Action	Dam Rehabilitation – Spillway Replacement
Soils and Geology		
Soils/Prime and Unique Farmlands	Disturbance to soils from proposed excavation, regrading, compacting.	Direct impacts during construction. Construction-related disturbance would be short term in duration and temporary measures would be removed at the end of the project. Indirect impacts may occur during precipitation events. Slopes and stream banks during construction activities could become unstable and erode leading to an increase in sediment accumulation in the reservoir. No impacts to prime and unique farmlands.
Geology	Soil disturbance and impacts to sedimentation and erosion	The geology in the vicinity of the project would not experience direct, indirect or cumulative effects from dam rehabilitation except for sedimentation and erosion. Direct and potential indirect impacts from soil disturbance and potential sediment entering American Fork River during construction. BMPs would be implemented to reduce sediments entering waterways during and after construction.

Effects	No Action	Dam Rehabilitation – Spillway Replacement
		Increase sediment storage capacity of reservoir from 24 ac-ft to 175 acre-feet. O&M practices would include operating both outlet gates to remove any accumulated sediment.
Water Resources		
Water Rights	Increase of 120 acre feet for irrigation water storage (existing water rights in the vicinity of the project)	Adding 120 ac-ft for irrigation water storage (existing water rights in the vicinity of the project) within the reservoir.
Waters of the U.S. Including Wetlands	Impacts to jurisdictional waters of the U.S. from construction activities.	Loss of approximately 0.1 acres emergent wetland, 0.6 acres of scrub shrub wetland, 0.6 acres forested wetland (subject to change). Impacts to 1 acre of open water of reservoir, 2.6 acres of open water of American Fork River above reservoir, 500 feet of river channel impacts (potentially inundated due to reservoir management practices), 100 linear feet of American Fork River below dam, and 80 linear feet of Deer Creek. Project will increase surface area of reservoir to 21.6 acres.
Climate	During precipitation events, slopes and stream banks could become unstable and erode which could lead to an increase in sediment accumulation in the reservoir.	Climate change in Utah is resulting in declining snowpack and an increase in droughts. Direct effects from the reduction in precipitation in the area would result in a lower risk for high volumes of water to flow through the reservoir and over the spillway. Decline of precipitation in the watershed upstream of the basins may result in reduction of vegetative cover causing slopes and stream banks to become unstable and susceptible to erosion during high volume precipitation events. This could lead to an increase in sediment accumulation in the basins decreasing the economic viability of the reservoir.
Air Quality		
Air Quality	Emissions from construction activities.	Construction activities would temporarily adversely affect air quality. BMPs would be implemented to reduce the release of fugitive dust from the project area.
Plants		
Vegetation Communities	Permanent removal and temporary disturbance to vegetation during construction.	Approximately 11.8 acres of vegetation consisting of upland, riparian and wetland vegetation types would be permanently cleared. Approximately 2.7 acres of vegetation would be temporarily cleared for construction staging/proposed borrow area 2. Temporarily disturbed vegetation would be restored using native plant species.
Riparian areas	Disturbance to riparian areas and USFS designated RHCA.	Approximately 2.1 acres of permanent riparian vegetation removal which is also located within the USFS designated RHCA. Approximately 100 linear feet of permanent riparian vegetation removal downstream of the dam for extension

Effects	No Action	Dam Rehabilitation – Spillway Replacement
		of the principal spillway and new stilling basin.
Noxious Weed and Invasive Plant Species	Increased potential for establishment of invasive plants	Would put the project area at risk for future invasion of noxious weeds. BMPs will be implemented during construction to prevent the spread of noxious weeds.
Animals		
Fish	Dewatering of reservoir during construction	Direct beneficial impact to fish and associated habitat by increasing the reservoir size to 21.6 acres of available fish habitat. Temporary impacts during construction as the reservoir would not be stocked. Fish present in the reservoir would be salvaged and transplanted downstream of the dam or into Silver Lake Flat Reservoir prior to start of construction. Water in Tibble Fork Reservoir would be pumped/bypassed around the dam during construction so that American Fork River downstream of the dam does not become dry and negatively impact fish. A screen would be placed upstream of the reservoir to prevent fish from swimming downstream to the pump/bypass.
Wildlife	Impacts to habitat from construction activities.	4.5 acres of potential wildlife habitat permanently cleared and/or inundated. Not expected to impact large amounts of habitat within the UWCNF or to cause a loss of occupancy by special-status species or MIS. Temporary construction effects may cause wildlife dispersal from the area surrounding Tibble Fork Dam. This dispersal is not expected to adversely affect wildlife in the area.
Migratory Birds/Bald and Golden Eagles	Clearing of 4.5-acres of riparian, upland and upland stands of trees	Approximately 4.5-acres of migratory bird/bald and golden eagle habitat, including riparian, adjacent upland and upland stands of trees would be removed. Measures would be installed to ensure ground-disturbing activities do not result in the “take” of an active nest or migratory bird protected under the MBTA.
Human Environment		
Land Use/Recreation	Disruption of lands and increased traffic for construction in recreational area.	A portion of Trail No. 237 would be temporarily inaccessible for approximately 60 days. Increase in construction traffic in the Tibble Fork parking areas for 180 days. Limited access and possible displacement of Tibble Fork Trailhead for 120 days. Increased travel time for recreationist for 180 days during construction to summer homes, Silver Lake Flat Reservoir, Timpanogos Cave, and campgrounds/day-use sites along American Fork River below and above reservoir. Tibble Fork Reservoir would be closed to the public for approximately 150 days for construction activities. Enhance recreation after construction completion from increased reservoir surface

Effects	No Action	Dam Rehabilitation – Spillway Replacement
		area and additional available parking.
Noise/ Light	Construction related noise.	Temporary adverse effect for noise and light in the project area during construction.
Transportation/ Infrastructure	Increased traffic during construction and realignment of summer home access road on dam and North American Fork Canyon Road north of existing parking area.	Temporary effects from increased traffic and/or flagging operations on American Fork Canyon Road and North American Fork Canyon Road during construction. Direct impact to Tibble Fork Summer Home access and American Fork Canyon Road through realignment. Indirect impact of increased traffic after construction from increased recreationists visiting the area.
Socioeconomics	Increased employment opportunity	Temporary socioeconomic benefits from additional employment requirements for one year during the dam rehabilitation. Reduction to the threat of dam failure and the associated socioeconomic hardships that might occur.
Land Rights	Special Use Permits for rehabilitation activities	A new Special Use Permit(s) or a modification to the existing permit from the USFS would be required for dam rehabilitation construction activities, increased reservoir surface water elevation, road improvements, staging area use outside of the project footprint, and changes in the use of the dam.
Visual Quality, Aesthetics and Scenic Beauty	Disturbance to terrain and construction equipment	Temporary impact during construction activities from temporarily disturbed areas and equipment parked or operating in the project area.
Public Health and Safety	Adverse effect from the loss-of-life downstream of the dam.	Reduction of loss-of-life potential.

The impacts noted in Table S-4 will be avoided or minimized to the maximum extent practicable by employing BMPs, and by minimizing or altogether avoiding the actions contributing to the impacts during construction and after the project has been implemented. Compensatory mitigation for impacts to wetlands are anticipated for the preferred alternative. The United States Army Corps of Engineers (USACE) is being consulted regarding waters of the U.S. and wetland impacts to comply with the Section 404 permitting process.

S.17 Major Conclusions

The Dam Rehabilitation—Spillway Replacement Alternative is the most environmentally friendly alternative and also has the greatest net economic benefits of all alternatives analyzed. This alternative is both the Preferred Alternative and the NED Alternative.

S.18 Areas of Controversy and Issues to be Resolved

There has been no controversy regarding the rehabilitation of Tibble Fork Dam.

Agency and public involvement have been instrumental in the addition of the Agricultural Water Management purpose, which required the following revisions to the project from the Draft Plan-EA document:

- Raising and replacing the principal and auxiliary spillways

- Change in height of the structures allows for the additional 120 ac-ft of additional storage, increasing the total capacity of the reservoir to 384 acre-feet
- Increases the reservoir size to 21.6 acres
- Minor increase in impacts to the American Fork River and wetlands upstream, and recreation areas.

The following issues are currently unresolved; however commitments will be made and finalized prior to construction:

- Temporary reduction of recreational opportunities in the vicinity of Tibble Fork Reservoir during construction in 2016.
- Permanent impacts to waters of the U.S. and wetlands upstream of the reservoir will be largely dependent on the management of the reservoir. Discussion of Operation and Maintenance of the reservoir is on-going and will be finalized and agreed upon prior to construction.
- Impacts to waters of the U.S. and wetlands will be mitigated per Section 404 permitting requirements. Mitigation will be decided in further consultation with the USFS UWCNF and the USACE.

CHAPTER 1.0

INTRODUCTION

The USDA-NRCS, as lead Federal agency, is proposing to partially fund the rehabilitation of Tibble Fork Dam (#UT00299) located within the American Fork-Dry Creek Watershed in Utah County, Utah (Appendix B-Map 1). USDA-NRCS performed an assessment of Tibble Fork Dam in 2004 (USDA-NRCS 2004) which concluded that Tibble Fork Dam does not meet current USDA-NRCS and Utah State Dam Safety regulations (UDWRt 2013) and engineering standards (USDA-NRCS 2005) for a high hazard dam (potential “Loss of Life”). The rehabilitation of Tibble Fork Dam is eligible for inclusion in the Small Watershed Rehabilitation Program (Public Law [PL] 83-566, as amended by PL 106-472) which authorizes Federal funding (65% of project cost) and technical assistance to rehabilitate aging flood control dams.

This Final Plan-EA is being prepared by the USDA-NRCS to comply with the requirements of the National Environmental Policy Act (NEPA) of 1969 and its implementing regulations, which are set forth in the Council on Environmental Quality (CEQ) regulations 40 CFR Parts 1500-1508; the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) of 1983 established pursuant to the Water Resources Planning Act of 1965 (PL 89-80) as amended by Executive Order 12322 (September 17, 1981), and USDA-NRCS policy and guidelines (USDA-NRCS 2006 and 2011). The format of this Final Plan-EA follows the plan format outline that must be followed for all Watershed Project Plans as outlined in the USDA-NRCS National Watershed Program Manual (USDA-NRCS 2014b) Parts 501 through 505 and USDA-NRCS National Watershed Program Handbook (USDA-NRCS 2014a) Parts 600 through 606.

Tibble Fork Dam is located within the boundaries of the USFS UWCNF. This Final Plan-EA has been prepared in cooperation with the USFS and to comply with USFS NEPA standards set forth in 36 CFR Part 220, as well as the 2003 Uinta National Forest Land and Resource Management Plan (USFS 2003a). The USFS 2003 Final Environmental Impact Statement for the 2003 Land and Resource Management Plan was also referenced for compliance within this Final Plan-EA (USFS 2003b).

1.1 Changes Requiring the Preparation of a Supplemental Watershed Plan

USDA-NRCS performed an assessment of Tibble Fork Dam (USDA-NRCS 2004) which concluded that Tibble Fork Dam does not meet current USDA-NRCS and Utah State Dam Safety regulations (UDWRt 2013) and engineering standards (USDA-NRCS 2005) for a high hazard dam. In order to bring the dam up to current regulations and engineering standards, dam modification measures and cost sharing are required to complete the project. The Supplemental Watershed Plan #10 addresses the changes to the dam and required cost share by the Sponsor for the project.

1.2 Purpose and Need Statement

In accordance with the rehabilitation provisions of USDA-NRCS’s Small Watersheds Program, Tibble Fork Dam is eligible for rehabilitation funding due to its high-hazard classification and outdated infrastructure.

The purpose and need of this project is for Tibble Fork Dam (#UT00299) to meet current USDA-NRCS and Utah State Dam Safety regulations (UDWRi 2014) and current engineering standards (USDA-NRCS 2005). The dam would continue to provide current benefits for the primary authorized purposes of flood

prevention and sediment retention along with the new primary authorized purpose of irrigation water storage. The dam will also continue to provide the secondary benefit of recreation. Stabilizing the existing dam structures would address the risk of loss-of-life and flooding associated with a dam failure because the dam is not meeting current safety criteria.

The Preferred Alternative is the Dam Rehabilitation—Spillway Replacement Alternative. Rehabilitation of the dam would consist of measures to meet current USDA-NRCS and Utah Dam Safety regulations, meeting current engineering standards and extending the life of the dam for 59 years starting in 2017.

1.3 Scope of Final Plan-EA

This Final Plan-EA has been organized into the following chapters:

- Summary: Office of Management and Budget Fact Sheet – This section presents a summary of the entire document and project.
- Chapter 1: Introduction – This chapter describes the purpose and need for the project and background information pertaining to the proposed project.
- Chapter 2: Affected Environment – This chapter contains the past and current conditions of the project area and describes relevant environmental resources that would be affected by the alternatives.
- Chapter 3: Alternatives – This chapter provides a summary of the alternatives considered for detailed study as well as alternatives considered for the project but were eliminated from detailed study. It also states which is the preferred alternative as well as the National Economic Development (NED) alternative and provides a resource impact comparison of all alternatives considered.
- Chapter 4: Environmental Consequences – This chapter describes the analysis of impacts to resources from each of the alternatives considered for detailed study. These impacts include direct, indirect and cumulative impacts.
- Chapter 5: Consultation, Coordination, and Public Participation – This chapter summarizes the steps taken to involve government agencies, tribes and the public in the project. It also presents a summary of anticipated permits and approvals required prior to the start of construction that should be obtained outside of the NEPA process.
- Chapter 6: Preferred Alternative – This chapter describes the preferred alternative for the project and presents the economic evaluation.
- Chapter 7: References – This chapter lists the references used in support of the information presented in the document.
- Chapter 8: List of Preparers – This chapter contains a list of the document preparers, respective agency or company, and their associated qualifications.
- Chapter 9: Distribution List – This chapter lists the government entities that the local notice of availability for this document was distributed to for comment.
- Chapter 10: Acronyms, Abbreviations and Short Forms – This chapter defines the acronyms, abbreviations and short forms used throughout the report.
- Chapter 11: Index – This chapter lists key words, phrases, subheadings and agencies/organizations along with appropriate page numbers where they occur throughout the document.
- Appendices – This section of the document provides supporting documentation for the information presented in the report.

1.3.1 Planning and NEPA Process History

USDA-NRCS performed an assessment of Tibble Fork Dam in 2004 (USDA-NRCS 2004) which concluded that the dam does not meet current USDA-NRCS and Utah State Dam Safety regulations (UDWRt 2013) and engineering standards (USDA-NRCS 2005) for a high hazard dam. The NUCWCD requested financial assistance to rehabilitate the dam in 2009. The planning of the project started in August 2012 with the kick-off of the NEPA Plan-EA preparation process. USDA-NRCS held a public scoping period for the project which started on December 31, 2012 and closed on January 31, 2013. There were 7 scoping comments submitted during the scoping period. A Draft Plan-EA was prepared for public comment and the comment period started on July 24, 2014 and closed on August 22, 2014. Chapter 5.3.3 discuss the comments received and how (if applicable) they were incorporated into the Final Plan-EA.

1.3.2 Resources Issues Studied In Detail

The following resource considerations were determined to be relevant to the decisions that must be made concerning the Tibble Fork Dam Rehabilitation project and require further analysis in this Final Plan-EA. These resources were selected by internal project coordination and through public scoping.

- | | |
|--|--|
| <ul style="list-style-type: none"> • <u>Soils and Geology</u> • <u>Water Resources</u> <ul style="list-style-type: none"> Surface Water Hydrology Water Quality Water Resources Legal Framework Waters of the U.S. Including Wetlands Climate • <u>Air Quality</u> • <u>Plants</u> <ul style="list-style-type: none"> Dominant Vegetation Communities Riparian Areas Special Status Plant Species Noxious Weeds & Invasive Plant Species | <ul style="list-style-type: none"> • <u>Animals</u> <ul style="list-style-type: none"> Fish and Wildlife Threatened and Endangered Species Migratory Birds/Bald and Golden Eagles • <u>Human Environment</u> <ul style="list-style-type: none"> Cultural/Historical Resources Land Use/Recreation Noise/Light Transportation/Infrastructure Socioeconomics Demographics Land Rights Agricultural Lands Natural Areas and Parklands Visual Quality, Aesthetics & Scenic Beauty Public Health and Safety |
|--|--|

1.3.3 Resource Issues Eliminated From Further Study

As directed by CEQ regulations 1500.1(b), 1500.2(b) and other sections, the USDA-NRCS eliminated the following resource considerations from detailed study because the proposed action would cause only inconsequential or no effect to occur to these resources. In accordance with USDA-NRCS policy, an Environmental Evaluation (located in Appendix D) was completed for the proposed project which documented the environmental conditions at the project site. Other than the information presented below; this Final Plan-EA contains no further information on these eliminated resource issues.

- | | |
|---|---|
| <ul style="list-style-type: none"> • Coral Reefs • Ecologically Critical Areas • Environmental Justice and Civil Rights • Essential Fish Habitat • Floodplain Management | <ul style="list-style-type: none"> • Regional Water Resources Plans • Scientific Resources • Sole Source Aquifers • Social Issues • Wild and Scenic Rivers |
|---|---|

1.3.4 Decision Matrix

The NRCS, with input from the Sponsoring Local Organization, must decide on a preferred federally assisted alternative with the greatest net benefits, otherwise known as the National Economic Development (NED) plan. The USDA-NRCS must also decide if the Preferred Alternative would or would not constitute a major federal action significantly affecting the quality of the human environment. If the USDA-NRCS State Conservationist (responsible official) determines that the selected alternative would not significantly affect the quality of the human environment, then the USDA-NRCS State Conservationist will prepare and sign a Finding of No Significant Impact (FONSI), and the project may proceed. If the USDA-NRCS State Conservationist determines that the selected alternative would significantly affect the quality of the human environment, then an Environmental Impact Statement (EIS) and a Record of Decision (ROD) must be prepared and signed before the project can proceed.

1.4 Project Background

Tibble Fork Dam was built within the American Fork–Dry Creek Watershed under the Small Watersheds Program (PL 83-566) and construction of the dam was completed in 1966. Initial filling of the reservoir occurred in 1967. The dam was originally designed to serve the primary authorized purposes of sediment retention and flood protection, but later adopted the secondary benefit of recreation. In 2004, the project Sponsor (NUCWCD) requested an assessment of the dam. As a result of sediment accumulation in Tibble Fork Reservoir, Tibble Fork Dam may no longer be capable of serving its sediment retention and flood protection purposes. There were also concerns regarding whether Tibble Fork Dam could sufficiently handle the Probable Maximum Precipitation (PMP) flood event given the existing hydrologic conditions within the watershed.

Tibble Fork Dam exists in series with Silver Lake Flat Dam upstream and both are situated within the American Fork watershed. If either dam fails, the general public, USFS staff and National Park Service Timpanogos Cave staff present in American Fork Canyon, and occupants of the cities of Alpine, Highland, American Fork, and Lehi would be in imminent danger since they are located in the breach inundation area of the dam.

1.5 Project Area and Existing Dam Conditions

Tibble Fork Dam was designed and constructed as a high hazard dam, meaning there was a high probability of loss-of-life if the dam should fail. The dam is located along a stretch of the American Fork River in Utah County, Utah and has a total drainage area of approximately 35 square miles (Appendix B-Map 2). The drainage area also includes an upstream dam (Silver Lake Flat Dam) that regulates flows along Silver Creek prior to discharging into the American Fork River. Tibble Fork Dam was planned, built and authorized for the primary purpose of sediment retention and flood protection, but later adopted the secondary benefit of recreation. The dam was originally designed to have a 50-year economic sediment pool storage capacity with a designed sediment storage capacity of 175 acre-feet and flood storage capacity of 84 acre-feet.

The work area consists of the extents depicted in Appendix B-Map 3, and covers an area of approximately 44 acres. This area encompasses the construction limits that would be utilized during the rehabilitation of Tibble Fork Dam. The existing dam conditions are described in this chapter and include the following elements.

- Earth Embankment Dam – paved road over the crest
- Low-Level Outlet

- Principal Spillway
- Auxiliary Spillway
- Reservoir
- Recreation Areas

Dam: The dam is located on the American Fork River adjacent to North American Fork Canyon Road. The top of the dam is at elevation 6,394.5 feet Above Mean Sea Level (AMSL). The top width of the dam is 18 feet and the top length is 450 feet. The dam is approximately 52 feet tall at its highest point and is a constructed earthen embankment (Figures 1-1 and 1-2).

The dam has been maintained by the owner (NUCWCD) in accordance with the Operations and Management (O&M) agreements. The top of the dam is open to the public since it also serves as access to the Tibble Fork Summer Homes (Figure 1-3). The dam face contains herbaceous species and there are no shrubs or trees growing on the upstream or downstream face of the dam. Structural features of the dam are identified in Appendix B-Maps 3 and 4.

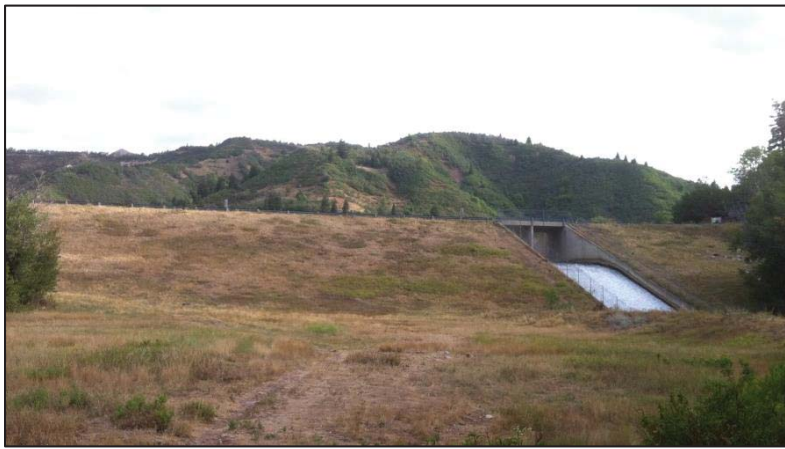


Figure 1-1. Downstream Face of Tibble Fork Dam



Figure 1-2. Upstream Face of Tibble Fork Dam



Figure 1-3. Access Road on Dam Crest

Low-Level Outlet: The low-level outlet system consists of a 352-foot long, 30-inch diameter reinforced concrete pipe passing through the dam with an intake structure in the pool area of the reservoir. The intake gate is near the normal water line along the upstream face of the dam (Figure 1-4). The outlet contains a gate that controls the release of water through the dam and discharges into a reinforced concrete stilling basin at the end of the auxiliary spillway (Figure 1-7).



Figure 1-4. Low-Level Outlet Pipe Intake

Principal Spillway/Auxiliary Spillway: The principal spillway is located on the north side of the auxiliary spillway and consists of a concrete intake structure with a metal trash rack and a top elevation of approximately 6382.2 feet AMSL. The principal spillway discharges water through three 27-inch RC pipes that extend south into the auxiliary spillway headwall (Figure 1-5). The auxiliary spillway consists of a walled, concrete, open-channel chute that is 30 feet wide and approximately 232 feet long. The auxiliary spillway crest is at an elevation of approximately 6,387.3 feet AMSL. The first 111 feet of the auxiliary spillway consists of level box inlet weir structure. After 111 feet the auxiliary spillway transitions from approximately level to a slope of 2.5:1 for the remaining approximately 112 feet of the spillway (Figure 1-6). A baffled concrete stilling basin followed by a riprap-lined energy dissipater exists at the exit of the auxiliary spillway into American Fork River (Figures 1-6 and 1-7).

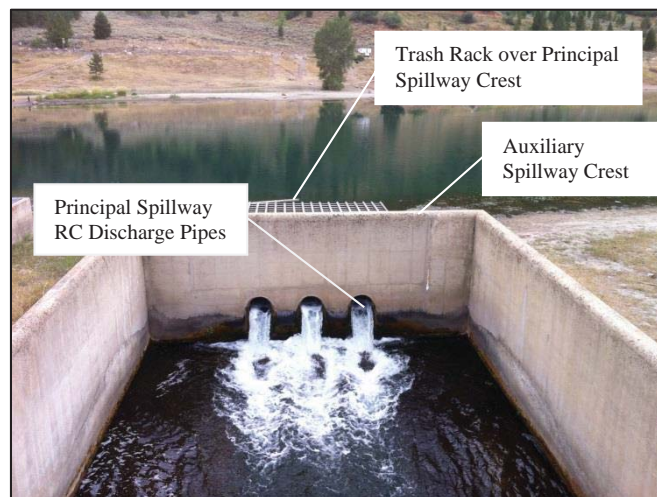


Figure 1-5. Spillway Inlet

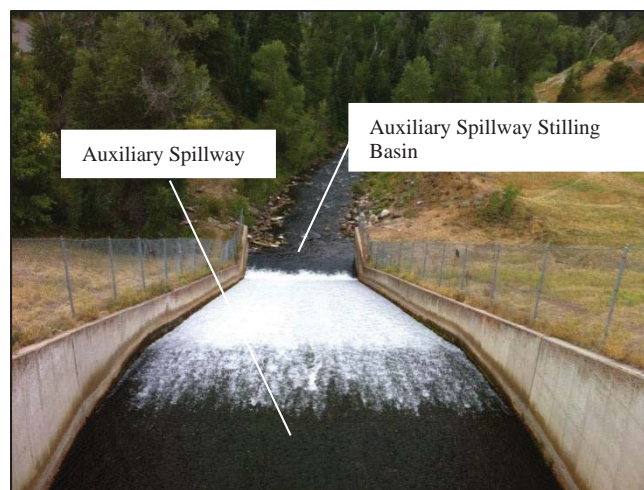


Figure 1-6. Spillway

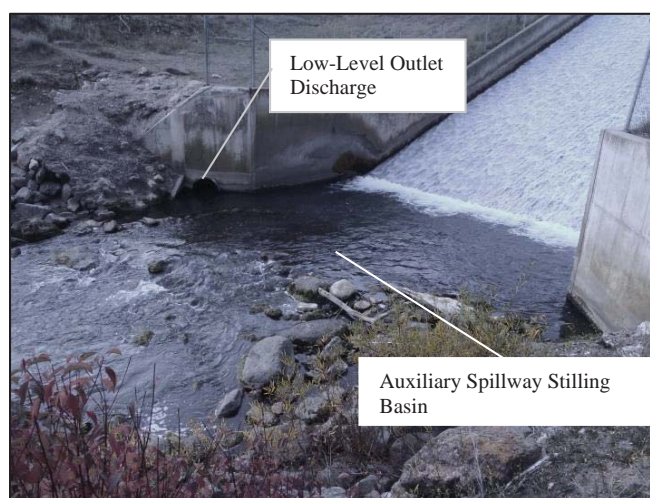


Figure 1-7. Spillway Stilling Basin and Low-Level Pipe Outlet

Reservoir: Table 1-1 lists the original water allocations for Tibble Fork Reservoir (Alpine Soil Conservation District et al 1958) and revised allocations (Alpine Soil Conservation District *et al.* 1963), compared to the current conditions (UDWRe 2011).

Table 1-1. Tibble Fork Reservoir Storage Allocation

Item	Original Allocations Volume (ac-ft) ^{1*}	Revised Allocations Volume (ac-ft) ²	Current Conditions ³
Sediment Storage	166	175	24
Floodwater Storage	93	84	84
Recreation Storage	0	0	0
Irrigation Storage	0	0	0
Total	259	259	108

¹ Alpine Soil Conservation District et al 1958

² Alpine Soil Conservation District et al 1963

³ Utah Division of Water Resource 2011

*Note: the 166 ac-ft of sediment storage shown in the original allocations was also considered to be recreation storage (fishery).

The current total capacity of the reservoir has been estimated at 108 acre-feet due to sediment accumulation over the last 47 years. Thus, in order for Tibble Fork Reservoir to maintain 84 acre-feet of floodwater storage capacity, the reservoir can only accumulate 24 acre-feet of sediment in the coming years until it reaches the end of its design life. At an estimated sediment supply rate of 2.8 acre-feet per year, this means that the reservoir will no longer be able to satisfy its flood protection role in approximately 8 to 9 years. Figures 1-8 through 1-12 depict the condition of the reservoir and shoreline and a detailed discussion of sedimentation is discussed in Chapter 2.1.2 and Appendix D.



Figure 1-8. Tibble Fork Reservoir Looking Upstream



Figure 1-9. Tibble Fork Reservoir Northwestern Shoreline



Figure 1-10. Tibble Fork Reservoir Northwestern Shoreline during Flood Event



Figure 1-11. Tibble Fork Reservoir Southern Shoreline



Figure 1-12. Tibble Fork Reservoir Sediment Deposition Area at Inlet

CHAPTER 2.0

AFFECTED ENVIRONMENT

The purpose of this chapter is to describe the area that could be affected by the alternatives analyzed in further detail including the physical, ecological, economic and social environment, as well as present and future general land cover and uses, and other watershed amenities. The purpose of describing the affected environment is to define the context in which the impacts could occur.

In this chapter the Work Area is defined as the resources that occur within the largest footprint of the alternatives disturbance area as depicted in Appendix B-Map 3. The term Study Area is often much larger, typically county wide to ensure that all resources are accounted for during project research. If a different disturbance area is analyzed for a particular resource, it will be called out in its respective section.

2.1 Soil and Geology

2.1.1 Soils

2.1.1.1 Soil Classification

Soil information for the project area was obtained from the USFS (2012a) because there has been no USDA-NRCS soil survey completed for this area. Soils found are depicted in Appendix C-Map 13 and consist predominately of Storm Family with very gravelly loam on 40% to 60% slopes surrounding the reservoir, and Burgi Family gravelly loams at 0% to 5% slopes at the reservoir. Climber Family-Horrocks Family complex on 35% to 80% slopes are present along the southeast side of the reservoir. Due to the presence of gravel in the soil type, the erodibility of the soil is expected to be only moderate.

The soils within the reservoir and dam area are typical of a creek system with vegetated loams consisting of cobbles and loam within the soil profile. Soils were verified at the site with sediment samples taken from the reservoir and surrounding upland area. The samples revealed the presence of coarse sediment and gravels with small amounts of decaying plant matter. Soils within the reservoir and dam area are also considered only moderately erodible.

2.1.1.2 Prime and Unique Farmlands

Prime and unique farmland is a designation for areas that support the growth of specific high-value food and fiber crops and are considered of national importance. Farmland of statewide importance is identified by state agencies as important for agricultural use in the state, but is not of national significance. This land must be of a particular soil type and irrigated to receive this designation. There are no prime or unique farmlands or farmlands of statewide importance within the Work Area.

2.1.1.3 Soil and Sediment Contamination

A sediment survey of Tibble Fork Reservoir was conducted in order to sample sediments for metals content, among other objectives (AMEC 2010). Sediment samples were tested for the metals listed in Table 2-1. Sediment sample results show levels of arsenic that exceed both the Reportable Detection Limit (RDL) and the EPA Residential Regional Screening Level (RSL). Also, two of the samples indicated levels of lead (Pb) that exceed both the RDL and the EPA Residential RSL. EPA RSLs do not

address non-human health end-points, such as ecological impacts. Further evaluation would be suggested if sediment is moved off-site or downstream. Refer to Appendix D for more information regarding soil and sediment quality analyses.

Table 2-1. Heavy Metal Analysis Constituents

Common Name	Constituent	Above EPA Screening Level
Antimony	Sb	No
Arsenic	As	Yes
Barium	Ba	No
Cadmium	Cd	No
Chromium	Cr	No
Cobalt	Co	No
Copper	Cu	No
Iron	Fe	No
Lead	Pb	Yes
Magnesium	Mg	No
Manganese	Mn	No
Molybdenum	Mo	No
Nickel	Ni	No
Silver	Ag	No
Selenium	Se	No
Strontium	Sr	No
Tin	Sn	No
Zinc	Zn	No
Zirconium	Zr	No
Mercury	Hg	No

2.1.2 Geology

Tibble Fork Dam is situated in the American Fork Canyon drainage in the Wasatch Mountains northeast of the cities of Lehi and American Fork, Utah. The Wasatch Mountains are part of the Middle Rocky Mountains physiographic province. The western side of the Wasatch Mountains forms the eastern boundary of the Basin and Range Physiographic Provinces which occurs west of the Wasatch Fault (USDA-NRCS 2012a). The Wasatch Fault occurs approximately five miles (8 kilometer (km)) west of the Tibble Fork Dam and is the structural element that separates the two provinces. Appendix D provides details of the Wasatch Fault and its implications on the seismic stability of the dam. The geologic units in the immediate vicinity of the dam and reservoir include the following:

- Quaternary alluvial deposits (Qal): stream gravel, valley fill, and low angle alluvial cones;
- Quaternary alluvium/colluvium (Qac): These deposits are interbedded and hard to distinguish between colluvium and alluvium.
- Quaternary Glacial Deposits (Qm): includes the glacial moraine deposits composed dominantly of monzonite and metamorphic; may include some glacial outwash;
- Tertiary Volcanic Rocks of East Traverse Mountains (Tvte): interbedded ash-flow tuff, volcanic debris flow/lahar breccias, and minor fluvial volcano-sedimentary rocks;
- Tertiary Tibble Formation (Tt): coarse red conglomerate, with some greenish reworked tuff, breccia, and white algal limestone; and

- Mississippian Great Blue Limestone (Mgb): Upper Mississippian dark-gray to nearly black, light- to medium-gray-weathering, thin- and regularly bedded limestone and shaly limestone (Constenius and others 2011).

The left abutment of Tibble Fork Dam is founded in the tertiary Tibble formation and is composed of red conglomerate containing igneous intrusive rock and quartzite. Below the centerline of the dam, is Quaternary Alluvial deposits (Qal) Quaternary alluvium/colluvium (Qac), and volcanic tuff (Tvte). Along the right abutment, soil is covering any bedrock exposure, although a combination of Tvte and Qg have been noted there (Constenius and others 2011). The tertiary Tibble formation is a sandy pebble to boulder conglomerate and contains a layer of tuffaceous (fragmental, volcanic) sediment. Tuffaceous sediments have been observed 60 meters downstream of the left abutment. The Tibble formation is at most 750 meters thick and has fluvial origins. Quaternary glacial moraine deposits contain silt- to boulder-sized sediment, and are typically bedded, poorly sorted, and may contain deposits from glacial outwash. Outcroppings of the Mississippian Great Blue Limestone are observed downstream of the right abutment of the Tibble Fork Dam.

2.1.2.1 Landslides

A historical landslide is located a little over one mile upstream of Tibble Fork Reservoir. Although the landslide is unstable and actively eroding (USDA-NRCS 2011), deposits due to the landslide do not present any immediate hazard to the dam (NUCWCD 1997). The landslide is noted as contributing between 54% and 63% of the total volume of sediment entering Tibble Fork Reservoir (Appendix D-Section D.2).

2.1.2.2 Earthquakes (Seismicity)

The Tibble Fork Dam area has been historically seismically active and the potential for a large earthquake exists. However, few historic earthquakes of large magnitude (over 6.0) have been documented in Utah. The Investigation and Analysis Report (Appendix D) includes available data relevant to the Project and the Wasatch Front.

2.1.2.3 Sedimentation and Erosion

Tibble Fork Dam was originally designed for an economic sediment pool storage capacity of 50 years and a designed sediment storage capacity of 175 acre-feet. The constructed reservoir capacity of the dam was 259 acre-feet, while the current estimated capacity of the reservoir is 108 acre-feet (UDWRe 2011). However, due to the lack of a suitable bathymetric survey of the reservoir in recent years, it is difficult to determine the exact current reservoir capacity and to pinpoint the exact accumulation volume over the past 47 years. Currently, the calculated sediment accumulation in the reservoir is 2.8 acre-feet per year and the existing sediment volume is approximately 151 acre-feet. A detailed description of the sedimentation analysis is presented in Appendix D.

Sedimentation and erosion conditions upstream of the reservoir are relatively stable. Much of the upstream watershed is located in USFS wilderness area with no development. Other portions of the upstream watershed are located on USFS land that was historically mined. Currently there are minimal mining operations that could input sediment into the reservoir. Thus, erosion in American Fork River and sedimentation in the reservoir are expected to stay the same and there are minimal BMPs that could be implemented to reduce erosion due to the flash-flood nature of the watershed above the dam.

Seasonal fluctuations in Tibble Fork Reservoir water levels can make it difficult for native vegetation to establish itself on areas between the minimum and full pool elevations. Consequently, barren soil conditions are evident in these areas, allowing for wind and water erosion to occur.

2.2 Water Resources

2.2.1 Surface Water and Water Quality

Tibble Fork Reservoir is fed by American Fork River, Deer Creek, and Tibble Fork Creek in Utah County, Utah. The headwaters of the watershed are located in the Central Wasatch Range of the USFS UWCNF and Lone Peak Wilderness, and include White Baldy, Twin Peaks, Mt. Baldy, and Sugarloaf Mountains. The watershed divide varies in elevation between 8,500 and 11,000 feet AMSL (Appendix B-Map 2). All of the water in the watershed above elevation 6,382 feet AMSL flows through Tibble Fork Reservoir. The American Fork River exits the reservoir and dam and continues down the American Fork Canyon passing through the UWCNF and Timpanogos Cave National Monument. Exiting the American Fork Canyon, the river flows through northern Utah County and empties into Utah Lake on the north shore.

The Tibble Fork watershed is part of the Utah Lake Hydrologic Unit (16020201) and receives an average of approximately 50 to 55 inches of precipitation per year, with the majority of that precipitation falling during the months of October through April in the form of snow. Peak flows in American Fork River historically occur during spring run-off, but some of the snow-melt is now captured in both Silver Lake Flat Reservoir and Tibble Fork Reservoir, and released slowly in the later spring and early summer months for irrigation purposes.

2.2.2 Hydrology

The Tibble Fork Watershed above Tibble Fork Dam is nested within the Central Wasatch Range in Utah County, Utah. Table 2-2 gives important basin characteristics of the Tibble Fork Watershed above the Tibble Fork Dam. Surface waters of the American Fork River originate across a 35 mi² basin, whose divide is partly defined by the Utah-Wasatch County line and the Utah-Salt Lake county line. USGS Gaging Station 10164500, located approximately 3.25 river miles downstream of the dam, has a 65-year record of discharge that indicates an average daily flow rate of 57.4 cfs. However, flow in the American Fork River is partially regulated by both Tibble Fork Dam and Silver Lake Flat Dam, located approximately 3 miles upstream. Tibble Fork Dam was completed in 1966 and Silver Lake Flat Dam was completed in 1971; therefore flow data from 1971 and later would account for the attenuating effects the dams have on American Fork River flows. This leads to an average daily flow of 54.7 cfs.

Table 2-2. Basin Characteristics of the Tibble Fork Watershed above Tibble Fork Dam

Basin Parameter	Value
Area (sq. mi.)	35
Mean Basin Elevation (ft)	8,660
Mean Annual Precipitation (in.)	42.4
Average Basin Slope (%)	45.4

The mean basin elevation of the Tibble Fork Watershed is 8,660 feet. Because of its height, the watershed develops a snowpack during the winter months, which then contributes to surface water as snowmelt in the spring and summer. Data from the Timpanogos Divide snow telemetry (SNOTEL) site indicates a mean maximum average monthly snow water equivalent (SWE) of 24.0 inches, recorded at elevation 8,140 AMSL. Assuming this SWE value is applicable uniformly across the watershed leads to an average

yearly flow rate of 62.8 cfs. This is higher than the average flow rate calculated using gage data. However, it does not account for losses due to evaporation, transpiration, infiltration, or impoundments or precipitation in the form of rain. What is indicated is that snowmelt factors largely in the hydrology of the basin, and that snowmelt is responsible for both the peak of the hydrograph occurring in late spring/early summer, and the possibility of large-scale flooding due to rain-on-snow events.

A study conducted by UDWR (2011) estimates the floods caused by the 100-year storm and the 24- and 72-hour Probable Maximum Precipitation (PMP) events. Estimates of these critical storm events are used in the design of water resources-related projects in order to ensure the adequate design of structures should a critical storm take place. In the original design of Tibble Fork Dam, the Inflow Design Flood (IDF) for the dam and spillway was 4,673 cfs with one-foot of freeboard on the dam (SCS 1966). In a subsequent analysis (UDWR 2011), UDWR investigated three critical storm events, which are the 100-year/24-hour storm, the 24-hour PMP, and the 72-hour PMP. Discharges associated with these storms are provided in Table 2-3.

Table 2-3. Peak Discharges for Various Return Periods

Storm	Discharge (cfs)
1966 IDF	4,673
100-Year/24-Hr	4,248
72-Hr PMP	4,440
24-Hr PMP	4,880

Tibble Fork Reservoir was designed to have 84 acre-feet of flood storage associated with the dam. Based on the available storage as compared to the overall flow regime of the American Fork River, the amount of flood reduction is negligible from storage in the reservoir and is not analyzed in detail.

2.2.3 Water Rights

Existing water rights at Tibble Fork Reservoir are listed in Table 2-4 below.

Table 2-4. Water Rights Summary Table

Owner	cfs	ac-ft	Use	Point of Diversion	Notes
Pleasant Grove Irrigation Company		166	I*	Tibble Fork	Water right 55-6955 supplemental to 55-4156, 1457, 6952/6956, 7062, 70706 and 7198 with all segments taken from 55-1456
Lehi Irrigation Company		166	Fish Culture/R*	Tibble Fork	Water right 55-7071, to use 166 ac-ft initially to fill reservoir; 12 ac-ft diverted annually to replace losses due to evaporation, transpiration and seepage***
American Fork Irrigation Company		166	I*, S*, D*	Tibble Fork	Water right 55-7200, to use 166 ac-ft initially to fill reservoir; 12 ac-ft diverted annually to replace losses due to evaporation, transpiration and seepage
USA Forest Service		166	Not Specified	Tibble Fork	Water right 55-7376
USA Forest Service		1.18	R	Tibble Fork	Water right 55-7392, limited to 1.18 ac-ft for recreation purposes amounting to an

Owner	cfs	ac-ft	Use	Point of Diversion	Notes
					estimated 11,400 visitors a day.
Water Rights Pending**		120	I*	Tibble Fork	Pending Division of Water Resources Approval

*I=irrigation, S=stock, D=domestic, R=recreation

**Information obtained from Bronson Smart, P.E., State Conservation Engineer with the USDA-NRCS

***Based on June 21, 1963 agreement to use 166 acre-feet initially to fill reservoir; 12 acre-feet diverted annually to replace losses due to evaporation, transpiration, and seepage

2.2.4 Water Quality

Water quality in Tibble Fork Reservoir is “excellent”, according to a published summary by Utah DEQ’s Division of Water Quality (UDEQ 2013a). There are currently no constituent concentrations in the reservoir that exceed state-specified limits but, elevated metals concentrations due to historic mining activities have been reported in the past (Appendix D); however, these metals are attached to the sediment layer and are not typically found in the open water column. The lake does not thermally stratify, due to its shallow depths.

2.2.5 Watershed Resources Legal Framework

Utah’s antidegradation policy (UAC R317-2-3) does not prohibit degradation of water quality, unless the Water Quality Board has previously considered the water to be of exceptional recreational or ecological significance (Category 1 or Category 2 waters). All of the streams within the boundary of USFS land in Utah are Category 1 streams and the antidegradation policy applies to these streams. Since the project is located on USFS land, the antidegradation policy applies to the rehabilitation of Tibble Fork Dam.

The USFS is directed by several major federal laws, as amended, to protect watershed resources through sound management. These major federal laws include:

- Organic Administration Act of 1897.
- Multiple Use-Sustained Yield Act of 1960.
- Endangered Species Act of 1973.
- National Forest Management Act of 1976.
- Federal Land Policy and Management Act of 1976.
- Clean Water Act of 1977.

The USFS must also comply with State of Utah laws and regulations to protect watershed resources. These state laws include:

- Utah Water Quality Act – Title 19, Section 5 (Utah State Legislature 2012).
- Division of Water Quality Rules – Title R317 (Division of Administrative Rules 2012).

The USFS has developed a Memorandum of Understanding (FS# 09-MU-11046000-027) with the Utah Department of Environmental Quality (UDEQ) relative to the Utah Nonpoint Source Pollution Management Plan (UDEQ 2000). The USFS complies with the rules and regulations outlined in the plan. The USFS must also conform to two executive orders designed to protect watershed resources. These orders include:

- Executive Order 11988 (Floodplain Management).
- Executive Order 11990 (Protection of Wetlands).

Additional USFS management direction for watershed resources is identified in the Uinta National Forest Land and Resource Management Plan (LRMP) (USFS 2003a). The following standards and guidelines outlined in the plan must be followed for any project occurring on USFS land:

- Soil and Water Resource Management Standards and Guidelines (III-8 through 10)
 - Maintain or improve long-term soil productivity and hydrologic function of the soil by limiting activities that would cause detrimental soil disturbance.
 - Avoid land use practices that reduce soil moisture effectiveness, increase average erosion, cause invasion of exotic plants and reduce abundance and diversity.
 - Borrow material should be taken from upland sources wherever feasible.
 - Where practical, on-site topsoil should be conserved and replaced on disturbed areas.
 - Riprap or other erosion protection materials should be sufficient in size and placed in such a manner as to withstand peak flows comparable to a 100-year flood.
 - Reduce stream sedimentation created as a result of construction.
 - Cleaning or dredging of de-silting basins, ponds, and reservoirs should be done in a way that minimizes the transport of accumulated fine sediment downstream.
- Aquatic, Terrestrial and Hydrologic Resources Standards and Guidelines III-43 and Management Prescription (IV-4 through 5)
 - Total soil resource commitment should be limited to no more than 4 percent of the riparian area acreage with this prescription within any given watershed.
 - Vegetation management activities may be allowed if they maintain or enhance biophysical resources
 - This prescription includes lands where management emphasis is on preserving, maintaining, or restoring quality aquatic, terrestrial and/or hydrologic conditions.
 - Emphasis is on maintaining or improving existing quality aquatic, terrestrial, and hydrologic conditions through limited to moderate management activity.
 - Managed for quality habitat to contribute toward maintenance and/or recovery of plant and animal species. Resources are maintained or improved to achieve desired conditions for habitats of Threatened, Endangered, Sensitive, and Management Indicator species (MIS).
- Watershed Emphasis Standard and Guidelines/Management Prescriptions (III-43)
 - Watershed emphasis are managed to achieve high quality soil productivity and watershed conditions.
- Total soil resource commitment should be limited to no more than 3 percent of the riparian area acreage with this prescription within any given watershed. Aquatic and Terrestrial Habitat Standards and Guidelines/Management Prescription (III-44 through 46)
 - This prescription applies to areas with multiple habitats.
 - Vegetation management activities may be allowed if they maintain or enhance biophysical resources.
 - Designated, hardened, dispersed recreational facilities may be developed to concentrate use and reduce resource impacts to the biophysical resources.

2.2.6 Waters of the U.S., Including Wetlands

National Wetland Inventory (NWI) maps from the USFWS (1983) as well as wetland data obtained from the USFS (2012a) identified the following waters of the U.S. and wetlands within the project area.

- Tibble Fork Reservoir: Palustrine, Aquatic Bed, Intermittently Exposed, Impounded (PABGh)
- Unnamed Wetland: Palustrine, Unconsolidated Shore, Seasonally Flooded, Impounded (PUSCh)
- Unnamed Wetland: Palustrine, Unconsolidated Shore, Temporarily Flooded, Impounded (PUSAh)
- American Fork River: Riverine, Upper Perennial, Unconsolidated Bottom, Intermittently Exposed (R3UBG)
- Deer Creek (not classified)

A waters of the U.S. and wetlands inventory was performed on October 2012 and June 2013 to confirm the presence of jurisdictional waters and/or wetlands. The inventory resulted in a finding of the following potential jurisdictional waters of the U.S. within the project area (Appendix C-Map 15).

- 9.8 acres of open water reservoir (Tibble Fork)
- 0.1 acres of emergent wetland
- 0.6 acres of scrub shrub wetland
- 0.6 acres of forested wetland
- 2.6 acres open water streams (American Fork above Tibble Fork Reservoir)
- 300 linear feet open water streams (American Fork below Tibble Fork dam)
- 470 linear feet open water streams (Deer Creek)
- 107 linear feet open water streams (Mill Canyon Drainage)

The information obtained during the waters of the U.S. and wetlands inventory was compiled into a Wetland Delineation Memo Report dated June 2014 (included in Appendix E). The Memo Report provides additional detail on the areas identified, surveyed and delineated.

2.2.7 Climate

While uncertainties remain regarding the timing, extent, and magnitude of climate change impacts, the scientific evidence predicts that continued increases in greenhouse gas emissions will lead to climate change. A number of reports (State of Utah 2007) have concluded that climate is already changing; that the change will accelerate, and that human greenhouse gas (GHG) emissions, primarily carbon dioxide emissions, are the main source of accelerated climate change. Projected climate change impacts include air temperature increases, sea level rise, changes in the timing, location, and quantity of precipitation, and increased frequency of extreme weather events. These changes will vary regionally and affect renewable resources, aquatic and terrestrial ecosystems, and agriculture.

In Utah, climate change is predicted to result in warmer, drier climates. State of Utah's (2007) study found the following:

Utah is projected to warm more than the average for the entire globe and more than coastal regions of the contiguous United States. The expected consequences of this warming are fewer frost days, longer growing seasons, and more heat waves. Studies of precipitation and runoff over the past several centuries and climate model projections for the next century indicate that ongoing greenhouse gas emissions at or above current levels will likely result in a decline in Utah's mountain snowpack and the threat of severe and prolonged episodic drought in Utah is real. (p. 2)

2.2.7.1 Local Climate

Tibble Fork Dam is located seven miles northeast of Alpine, Utah at approximate elevation 6,395 feet AMSL. The closest weather station to the dam is at the National Park Service Timpanogos Cave (Station 428733) in the American Fork Canyon approximately 4.5 miles to the southwest and at an elevation of approximately 5,640 feet AMSL (Western Regional Climate Center 2012). Timpanogos Cave averages a yearly rainfall of 24.8 inches and yearly snowfall of 85.1 inches. The highest average monthly rainfall occurs in May with 2.81 inches and the lowest occurs in July with 1.03 inches. The highest average monthly snowfall occurs in January with 20.4 inches. The average temperature reaches its maximum in July at 90.1°F, while the minimum is 20°F and occurs in January. On average, there are 222 sunny days per year in Alpine, Utah (City Data 2012).

During winter and spring, temperatures average below freezing and most of the precipitation comes in the form of snow with a deep snowpack accumulating in many of the higher elevations. By late spring, temperatures warm up in the lower valley elevations and the mountain snowpack begins to melt. The high mountain roads and trails are not normally free of snow until mid- to late-June. The summer season brings warm temperatures to most areas in the valleys with hot temperatures in the desert areas. Afternoon thunderstorms become common by June and can be expected into September. The topographic effect of the steep mountains rising abruptly from the valley floor, in conjunction with convective-type storms, produces the intense rainfall which is the principal cause of flood damage in this watershed (Alpine Soil Conservation District *et al.* 1958). Winds are typically gentle to moderate, with occasional strong winds.

2.3 Air Quality

The Air Conservation Act (Title 19, Section 2 of the Utah Code) provides authority to enact rules pertaining to Air Quality activities. The UDEQ Division of Air Quality (DAQ) is responsible for ensuring that the air in Utah meets health and visibility standards established under the Federal Clean Air Act. To fulfill this responsibility, DAQ is required by the federal government to ensure compliance with the EPA National Ambient Air Quality Standards (NAAQS) statewide and visibility standards at national parks.

The closest air monitoring station that is currently in use is located in Highland, Utah in Utah County approximately seven miles to the southwest of Tibble Fork Dam. Areas that are not in compliance with the NAAQS are referred to as nonattainment areas. Based on maps showing nonattainment areas (UDEQ 2013b), Utah County is considered a nonattainment area for PM₁₀—particulate matter, while all other criteria pollutants in Utah County are in compliance with the air quality standards. Tibble Fork Dam is located at the far eastern edge of the nonattainment area, along the Utah and Wasatch County borders, and is likely not affected.

2.4 Plants

A botanical survey was conducted in the project area for the rehabilitation of Tibble Fork Dam. The survey report (McMillen 2013) is located in Appendix E and describes botanical occurrences and habitat in detail.

2.4.1 Dominant Vegetation Communities

A basic land cover map depicting the approximate location of land cover types was obtained from USFS (2012a) and is provided in Appendix C-Map 14. Plant communities surveyed (McMillen 2013) typically consisted of riparian shrubs and trees within the delta of Tibble Fork Reservoir, as well as around the perimeter of the reservoir, with Douglas fir (*Pseudotsuga menziesii*), Engelmann spruce (*Picea engelmannii*), Rocky Mountain maple (*Acer glabrum*), and quaking aspen (*Populus tremuloides*)

dominating the upland areas. Weed species are distributed widely throughout disturbed areas, such as along the sides of roads and other exposed edges surrounding the dam and reservoir. A complete list of plants observed during the survey is located in Appendix B of the Survey Report (see Appendix E). There appears to have been no active timber harvest in the area of Tibble Fork Dam since its construction in 1966.

2.4.2 Riparian Areas

Riparian ecosystems are generally defined as those areas adjacent to flowing waterways and standing water bodies that have a distinct plant community different than that of nearby uplands. Riparian plant communities provide essential ecological functions, including stabilization of riverbanks, trapping of nutrients and sediments, buffering flood events, and contributing one of the most diverse and productive habitats available (UDWR 1996). Undisturbed riparian zones are home to a wide range of resident and migratory wildlife and provide refuge from predators and extreme summer heat. As noted in 2.4.1, Dominant Vegetation Communities, the typical community found in the project area is that of riparian shrubs and trees.

The eastern side of Tibble Fork Reservoir, both to the north and south of the reservoir boundary, has been designated as a Riparian Habitat Conservation Area (RHCA) by the USFS (2012a) as depicted in Appendix C-Map 14. The RHCA provides protection for riparian forests and maintains ecological functions and processes necessary for the creation and maintenance of habitat for fish and other riparian-dependent organisms.

2.4.3 Special Status Plant Species

Federal- and state-listed special-status plant species are listed in Appendix A of the Survey Report (see Appendix E), and are compiled from the *Inventory of Sensitive Species and Ecosystems in Utah* (UDWR 1998) which includes all plant species known to occur in Utah County, UT under the Utah Natural Heritage Program (UNHP) rank of S2 sensitivity or more sensitive. Plants assigned this threshold rank are rare or very vulnerable to extinction or extirpation, according to UNHP. The plant species on this list for which suitable habitat was found in the area of the reservoir and downstream is included in Table 2-5. Suitable habitat is based on the presence of known plant communities that support the species in question, suitable elevation ranges, climatic conditions, and geographic range. Although no special-status species were encountered during the site survey, suitable habitat for several sensitive species was identified.

Table 2-5. Special-Status Plant Species with Suitable Habitat Identified in the Project Area

Common Name	Scientific Name
Book Cliffs twinpod	<i>Physaria acutifolia</i> Rydb. var. <i>purpurea</i> Welsh & Reveal
Graham's twinpod	<i>Physaria grahamii</i> C. Morton
Indian Canyon twinpod	<i>Physaria rapanda</i> Rollins
Long-styled twinpod	<i>Physaria stylosa</i> Rollins
Utah angelica	<i>Angelica wheeleri</i> S. Watson
Utah ivesia	<i>Ivesia utahensis</i> S. Watson
Wasatch cliff-bush	<i>Jamesia americana</i> Torrey & Gray var. <i>macrocalyx</i> (Small) Engler
Wasatch fitweed	<i>Corydalis caseana</i> A. Gray ssp. <i>Brachycarpa</i> (Rydb.) G. Ownbey

2.4.4 Threatened and Endangered Species

A Biological Evaluation (BE) has been completed for the project and concluded that there would be no effect to threatened or endangered species listed for Utah County. The BE was submitted to the United States Fish and Wildlife Service (USFWS) on July 21, 2014 to comply with Section 7 of the Endangered Species Act. A copy of the BE letter has been included in Appendix E. USFWS indicated in a response email dated July 25, 2014, that as a federal agency the USDA-NRCS is able to make a no effect determination without their concurrence. The USFWS email response has been included in Appendix A. The information in Table 2-6 below summarizes the threatened and endangered species that were considered in an effects analysis in the BE.

Table 2-6. Special Status Plant Species - Utah County, Utah

Common Name	Scientific Name	USFWS Status ¹	Likely to Occur in Project Area (Yes/No)
Deseret milk-vetch	<i>Astragalus desereticus</i>	T	No
Clay phacelia	<i>Phacelia argillacea</i>	E	No
Ute ladies' tresses	<i>Spiranthes diluvialis</i>	T	No

USFWS Status – (E) Endangered, (T) Threatened

2.4.5 Noxious Weed and Invasive Plant Species

Noxious weeds are non-native plants introduced into an area that spread quickly and can be difficult to control. They can invade croplands, rangeland, forests, prairies, rivers, lakes and wetlands causing both ecological and economical damage. Noxious weed species for Utah State are listed in Appendix A of the Survey Report (Appendix E). From this list, the following three noxious weed species were observed:

- St. Johnswort (*Hypericum perforatum*): Class A Early Detection Rapid Response
- Canada thistle (*Cirsium arvense*): Class C Weed Containment
- Houndstongue (*Cynoglossum officinale*): Class C Weed Containment

The majority of the noxious weed species observed in the Project Area were adjacent to high public-use areas (e.g., near parking lots) and in other disturbed areas (e.g., near the dam abutments) in patches and single occurrences. The presence of noxious weeds depended on the soil type, amount of disturbance, and surrounding land use. Observations regarding the conditions of the area within and adjacent to the Project Area indicate that general public use (outdoor recreation) has led to the spread and establishment of noxious weed populations. However, noxious weeds and invasive plant species are not common in the landscape primarily due to the lack of development in the UWCNF. The USFS controls noxious weed establishment adjacent to area roads, but does not control establishment on the dam or within 50 feet of the Tibble Fork Reservoir. The NUCWCD is responsible for controlling the establishment of vegetation on the dam at its own discretion.

2.5 Animals

2.5.1 Fish

2.5.1.1 Fish Habitat

Tibble Fork Reservoir is a managed lake with water level fluctuations which vary based upon the time of year and seasonal precipitation. The reservoir reaches its fullest level during the spring when there is more water flowing into the reservoir than the low-level outlet and principal spillway can convey downstream past the dam. The dam typically reaches its highest point during May-June, and at this time the auxiliary spillway on top of the dam becomes active. There are no permanent large woody debris habitat features or aquatic vegetation within the reservoir. Fish habitat within the reservoir varies based on the operating regime of the NUCWCD, such that annual fish spawning habitat is moderately available to fish. Fish habitat in the reservoir is also dependent on the species and life-stage. Habitat consists of deep water cover, shallow water feeding, and spawning areas at the upstream periphery of the reservoir, and the American Fork River at the inlet to the reservoir and at the spillway basin.

American Fork River is a partially-regulated perennial stream above the reservoir and is partially regulated below the dam. Regulation above the dam is due to Silver Lake Flat Dam obstructing natural flows of Silver Creek, which is a tributary of American Fork River upstream of Tibble Fork Reservoir. American Fork River contains typical high-elevation stream habitat consisting of large woody debris, riffles, pools, and spawning gravels. Tibble Fork Dam is a fish barrier to upstream migration of fish and there are no upstream fish passage operations in place. Fish are able to pass downstream over the spillway or through the low-level outlet.

Fish tissue samples with elevated levels of heavy metals including arsenic, lead, cadmium and zinc have been collected in the American Fork River in the past (USFS 2002d). Elevated levels of heavy metals in fish were found to be from water and soils contamination associated with past mining operations. In June of 2002 a fish consumption advisory was issued for the North Fork of the American Fork Canyon. Since that time efforts have been made to clean up contamination associated with the past mining operations. There is currently no fish consumption advisory for fish in the American Fork River or Tibble Fork Reservoir according to the State of Utah Fish Advisories webpage (State of Utah 2013).

2.5.1.2 Special Status Fish Species

The information documented in this chapter is compiled from existing data and lists within the vicinity of Tibble Fork Dam. No formal studies were conducted for the preparation of this Final Plan-EA. Table 2-7 identifies the fish species on the USFWS Utah County list (USFWS 2013), the UDWR Utah Conservation Data Center (2012a, 2012b and 2012c) for sensitive species occurring in the Dromedary Peak and Timpanogos Cave 7.5' quadrangle maps, and the USFS Uinta National Forest list (USFS 2013).

Table 2-7. Special Status Fish Species

Common Name	Scientific Name	USFWS Status ¹	State Status ²	USFS Status ³	Suitable Habitat Present
Bonneville cutthroat trout	<i>Oncorhynchus clarkii utah</i>	--	CAS	S	Yes
Bonytail	<i>Gila elegans</i>	E	--	--	No
Colorado pikeminnow	<i>Ptychocheilus lucius</i>	E	--	--	No
Colorado River cutthroat trout	<i>Oncorhynchus clarkii pleuriticus</i>	--	CAS	S	Yes ⁴

Common Name	Scientific Name	USFWS Status ¹	State Status ²	USFS Status ³	Suitable Habitat Present
Humpback chub	<i>Gila cypha</i>	E	--	--	No
June sucker	<i>Chasmistes liorus</i>	E	--	--	No
Least chub	<i>Iotichthys phlegethontis</i>	C	--	--	No
Razorback sucker	<i>Xyrauchen texanus</i>	E	--	--	No
Southern leatherside chub	<i>Lepidomeda aliciae</i>	--	SPC	S	No

Notes: ¹ USFWS Status – (E) Endangered, (T) Threatened, (C) Candidate

² State Status – (CAS) Conservation Agreement Species, (SPC) Wildlife Species of Concern

³ USFS Status – (E) Endangered, (T) Threatened, (S) Sensitive

⁴ Suitable habitat is present in the drainage; however this species is not native nor has it been documented to occur in the area and would only occur if it was transplanted to Tibble Fork Reservoir or American Fork.

Special status species include all taxa with federal or state protective status. These statuses are defined as follows:

- USFWS Status - Species listed by the United States Fish and Wildlife Service (USFWS).
 - Listed or Proposed Species - Species that are listed and protected under the Endangered Species Act (ESA) of 1973, as Endangered (E) or Threatened (T), or proposed for listing.
 - Candidate (C) - Species for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation has not occurred because of other higher priority listing activities. Candidate species receive no statutory protection under the ESA.
- USFS Status - Species on the Intermountain Region's Threatened (T), Endangered (E) & Sensitive (S) Species program list for the Uinta National Forest (USFS 2013).
- State Species - Species listed by the Utah Division of Wildlife Resources (UDWR) that require special protection.
 - Conservation Agreement Species (CAS) – species or subspecies of concern that receive special management under a conservation agreement developed or implemented by the State to preclude the need for listing under the ESA
 - Wildlife Species of Concern (SPC) – Species for which there is a credible scientific evidence to substantiate a threat to continued population viability.

2.5.1.3 Fish Stocking

Periodic stocking (up to twice a week) of fish by the UDWR (2013) has been performed in Tibble Fork Reservoir for more than ten years, with an average annual release of approximately 14,000 rainbow trout (*Oncorhynchus mykiss*). In 1991, the reservoir was also stocked with 30 albino rainbow trout and currently supports populations of brook trout (*Salvelinus fontinalis*), and brown trout (*Salmo trutta*).

2.5.2 Wildlife

The Botanical and Wildlife survey was conducted in the project area for the rehabilitation of Tibble Fork Dam. The report (McMillen 2013) is located in Appendix E, which describes wildlife occurrences and habitat in detail.

2.5.2.1 Wildlife Habitat

Tibble Fork Reservoir and Dam are located within the Wasatch Mountains, which are characterized by moderate to steep slopes and rocky, pointed mountain summits. Vegetation in the vicinity of the project area is categorized as aspen-fir, oak-maple, and spruce vegetation communities. The combination of geographical location and a diverse mixture of vegetation communities results in high wildlife species richness, particularly mammals and birds.

Native ungulates are common inhabitants of this area and the UDWR Utah Conservation Data Center has identified the area as habitat for moose, Rocky Mountain elk, and mule deer (UDWR 2012a). Ruffed grouse habitat is also located in the project area due to the presence of fir and spruce trees (UDWR 2012a). There are numerous conifer and deciduous trees large enough to support raptor nests in the area surrounding the reservoir, as well as riparian and deciduous trees that would support nests for migratory bird species.

Tibble Fork Reservoir, Deer Creek, and areas of American Fork River upstream of the reservoir have sufficient habitat to support amphibians and reptiles during certain times of the year. These aquatic features provide wet soils and slack and moving water habitat that would support amphibians, reptile, and other species native to the area.

2.5.2.2 Special Status Wildlife Species

The information documented in this chapter is compiled from existing data, lists within the vicinity of Tibble Fork Dam, and the Botanical and Wildlife Survey Report located in Appendix E. Table 2-8 identifies the wildlife species on the USFWS Utah County list (USFWS 2013), the UDWR (2012a, 2012b and 2012c) Utah Conservation Data Center list for sensitive species occurring in the Dromedary Peak and Timpanogos Cave 7.5' quadrangle maps, and the USFS Uinta National Forest list (USFS 2013). The definition of each species status is listed in Chapter 2.5.1.2.

Table 2-8. Special Status Wildlife Species

Common Name	Scientific Name	USFWS Status ¹	State Status ²	USFS Status ³	Suitable Habitat Present
Bald eagle	<i>Haliaeetus leucocephalus</i>	--	SPC	S	Yes
Bighorn sheep	<i>Ovis canadensis</i>	--	--	S	No
Black swift	<i>Cypseloides niger</i>	--	SPC	--	No
Bobolink	<i>Dolichonyx oryzivorus</i>	--	SPC	--	No
Boreal toad	<i>Bufo boreas</i>	--	SPC	S	Yes
Canada lynx	<i>Lynx canadensis</i>	T	--	T	No
Columbia spotted frog	<i>Rana luteiventris</i>	--	CAS	S	No
Ferruginous hawk	<i>Buteo regalis</i>	--	SPC	--	Yes
Fisher	<i>Martes pennant</i>	--	--	S	No
Flammulated owl	<i>Otus flammeolus</i>	--	--	S	No
Fringed myotis	<i>Myotis thysanodes</i>	--	SPC	--	Yes
Greater sage-grouse	<i>Centrocercus urophasianus</i>	C	C	S	No
Kit fox	<i>Vulpes macrotis</i>	--	SPC	--	No
Northern goshawk	<i>Accipiter gentilis</i>	--	CAS	S	Yes
Peregrine falcon	<i>Falco peregrines anatum</i>	--	--	S	Yes

Common Name	Scientific Name	USFWS Status ¹	State Status ²	USFS Status ³	Suitable Habitat Present
Short-eared owl	<i>Asio flammeus</i>	--	SPC	--	No
Spotted bat	<i>Euderma maculatum</i>	--	--	S	Yes
Three-toed woodpecker	<i>Picoides tridactylus</i>	--	SPC	S	Yes
Townsend's big-eared bat	<i>Corynorhinus townsendii townsendii</i>	--	SPC	S	Yes
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	C	C	S	No

Notes: ¹ USFWS Status – (E) Endangered, (T) Threatened, (C) Candidate

² State Status – (CAS) Conservation Agreement Species, (SPC) Wildlife Species of Concern, (C) Candidate

³ USFS Status – (E) Endangered, (T) Threatened, (S) Sensitive

2.5.2.3 Management Indicator Species

The UWCNF utilizes Management Indicator Species (MIS) to assess management effects on habitat for all vertebrate species, monitor selected habitats, and provide sufficient populations for wildlife-related recreation (USFS 2012b). Management indicator species were chosen to provide habitat needs of all vertebrate species, to monitor selected habitats that could become limiting to some species through forest management activities, and to provide sufficient populations of selected species to meet demands for wildlife-related recreation. Table 2-9 displays the MIS and the habitat community represented.

Table 2-9. UWCNF Management Indicator Species

Common Name	Scientific Name	Habitat Community Represented
American Beaver	<i>Castor canadensis</i>	Riparian
Bonneville Cutthroat Trout	<i>Oncorhynchus clarkii utah</i>	Aquatic
Colorado Cutthroat Trout	<i>Oncorhynchus clarkii pleuriticus</i>	Aquatic (Not native in this watershed)
Northern Goshawk	<i>Accipiter gentilis</i>	Aspen, Conifer, Mixed Conifer
American Three-Toed Woodpecker	<i>Lepus americanus</i>	Conifer, Spruce/Fir

2.5.3 Threatened and Endangered Species

A review of the USFWS ESA list for Utah County dated April 2, 2013 (USFWS 2013) was performed within the vicinity of Tibble Fork Dam. This review identified species that historically have used, or currently use habitat or could potentially migrate into the area. Table 2-10 identifies the ESA-listed species in Utah County.

Table 2-10. Federally Listed Species and Critical Habitat within Utah County, Utah

Common Name	Scientific Name	Federal Status	Designated Critical Habitat within the Project Area?
Fish			
Bonytail chub	<i>Gila elegans</i>	Endangered	No
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>	Endangered	No
Humpback Chub	<i>Gila cypha</i>	Endangered	No
June Sucker	<i>Chasmistes liorus</i>	Endangered	No

Common Name	Scientific Name	Federal Status	Designated Critical Habitat within the Project Area?
Least Chub	<i>Itoichthys phlegethontis</i>	Candidate	No
Razorback Sucker	<i>Xyrauchen texanus</i>	Endangered	No
Wildlife			
Canada Lynx	<i>Lynx canadensis</i>	Threatened	No
Greater Sage-grouse	<i>Centrocercus urophasianus</i>	Candidate	No
Yellow-billed Cuckoo	<i>Coccyzus americanus occidentalis</i>	Proposed Threatened	No

A review of the USFWS Information, Planning, and Conservation System (IPaC) identified the June sucker, Least chub, Canada lynx, greater sage-grouse, and the yellow billed-cuckoo within the vicinity of the project area (USFWS 2013b). The Bonytail, Colorado pikeminnow, Humpback chub, and Razorback sucker were not on this list and will not be discussed further in this chapter.

June Sucker

The June sucker is listed as Endangered by the USFWS (51 FR 10851-10857) and is primarily found in Utah Lake and the Provo River approximately 13 miles southwest of the project area. There have been no recorded observations of the June sucker in the upper American Fork River or its tributaries and they are not expected to be present within the project area. Tibble Fork Dam and other smaller fish passage barriers restrict the movement of fish upstream in the American Fork River. June suckers typically reside in larger streams with slower water velocities. Critical habitat for the June sucker has only been designated in the Provo River, which is a tributary to Utah Lake outside of the project area (51 FR 10851-10857).

Least Chub

The Least chub is listed as Candidate by the USFWS (76 FR 66370-66439), and typically inhabits slow moving stream segments and spring seep pools with dense vegetation. There are no documented occurrences of the Least chub in the upper American Fork River or its tributaries and the river does not contain suitable habitat. They are not expected to be present within the project area. There is no critical habitat designated for the Least chub because they are listed as Candidate.

Canada Lynx

The Canada lynx is listed as Threatened by the USFWS (65 FR 16052-16086) and typically resides in moist boreal forests at high elevations that have cold, snowy winters. The predominant vegetation of boreal forests consists of montane conifer trees with minimal human disturbance. The Canada lynx is nocturnal and its major food source is the snowshoe hare. The area surrounding the reservoir and dam does not contain a large unfragmented tract of montane coniferous forest and is disturbed from recreational human presence. The Canada lynx is not expected to occur in the vicinity of the project because there is no suitable habitat or prey base within the vicinity of the site. The USFWS has published a critical habitat designation for the Canada lynx (74 FR 8616-8702); however, there is no designated critical habitat in Utah.

Greater Sage-Grouse

The greater sage-grouse is listed as Candidate by the USFWS (76 FR 66370-66439) and inhabits sagebrush plains, foothills, and mountain valleys that contain sagebrush as the primary plant community. There is no primary sagebrush plant communities located within the immediate vicinity of the project area. The greater sage-grouse is not expected to occur in the project area since there is no suitable habitat

within the vicinity of the dam. There is no critical habitat designated for the greater sage-grouse since they are listed as Candidate.

Yellow-billed Cuckoo

The yellow-billed cuckoo is a medium-sized bird that has become extremely rare in its historic range. The USFWS considers cuckoo occurring west of the Rocky Mountain crest to be a distinct population segment (USFWS 2011), and as of December 2, 2013, the public comment period is reopened for the proposal to list the western distinct population segment of the yellow-billed cuckoo as a Threatened Species under the Endangered Species Act (ESA). There is also a proposed rule to be published in 2014 to designate critical habitat for this species. The yellow-billed cuckoo is currently listed as Candidate by the USFWS (76 FR 66370-66439) and typically inhabits lowland large space riparian areas (~100+ acres) with dense cottonwood trees, willows, and other riparian shrubs. They prey upon large insects from tree and shrub foliage. The reservoir and dam are located in a mountainous area primarily composed of aspen and conifer trees with minimal riparian species. The project area does not contain a large unfragmented tract of riparian habitat suitable for the yellow-billed cuckoo and they are not expected to inhabit this area. There is currently no critical habitat designated for the yellow-billed cuckoo.

A Biological Evaluation (BE) has been completed for the project and concluded that there would be no effect to threatened or endangered species listed for Utah County. The BE was submitted to the United States Fish and Wildlife Service (USFWS) on July 21, 2014 to comply with Section 7 of the Endangered Species Act. A copy of the BE letter has been included in Appendix E. USFWS indicated in a response email dated July 25, 2014, that as a federal agency the USDA-NRCS is able to make a no effect determination without their concurrence. The USFWS email response has been included in Appendix A.

2.5.4 Migratory Birds/Bald and Golden Eagles

Wintering, year-round, or breeding populations of bald and golden eagles have the potential to be present in the study area. These birds are afforded particular protection under two separate Acts of Congress. Under authority of the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712), it is unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs. "Take" is defined as any attempt or success at pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting. Migratory Bird Permits must be obtained through the USFWS Migratory Bird Permit Office for any unavoidable violation of the MBTA.

The Eagle Protection Act (16 U.S.C. 668) provides specific protection for bald and golden eagles. The act makes it illegal to take, possess, sell, purchase, barter, or transport any bald or golden eagle, alive or dead, or any part, nest, or egg thereof. "Take" includes pursuing, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing.

Utah is home to one of the largest state populations of wintering bald eagles, with more than 1,200 eagles counted in Utah in recent years (UDWR 2009). Wintering range includes the study area (UCDC 1999). During winter, bald eagles roost communally in sheltered stands of trees, typically selecting roosts near an open water body. Habitat for the species is located in the project area and it is likely that the species would occur in the project area.

The USFWS list of birds of conservation concern (USFWS 2008) for the Southern Rockies/Colorado Plateau includes 27 migratory bird species, including the yellow-billed cuckoo, the bald and golden eagle, and the willow flycatcher among others. Tibble Fork Reservoir and associated riparian zones likely provide for habitat to support breeding, nesting, and rearing in certain stretches of the creek. However, the lack of abundant wetlands in the immediate project area indicates that the immediate project area provides little in the way of important habitat for the migratory bird populations known in the region.

2.6 Human Environment

2.6.1 Cultural/Historical Resources

Section 106 of the National Historic Preservation Act of 1966 (36 CFR Part 800) requires Federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council of Historic Preservation a reasonable opportunity to comment. A report describing the cultural resources inventory at Tibble Fork Dam and Reservoir was prepared for the project (Native-X 2013). As part of the report preparation, a literature review of known and recorded cultural resources was conducted in November 2012. The literature review consisted of accessing both archival and digital records maintained by the Department of Heritage and Arts, Division of State History, Antiquities Section; Government Land Office plat maps, and the National Register of Historic Places (NRHP). The results of the literature review did not find any sites within the Area of Potential Effect. However, the search did identify a nearby historic mining town of Silver Lake City within the Tibble Fork Dam area. It was determined that the likelihood of any remaining archaeological potential of this city is minimal.

After the literature review was completed, a pedestrian survey was conducted by Native-X, Inc. on November 4 and 5, 2012 and August 27, 2013 to examine the project area. There were no cultural resource sites discovered during the survey. Tibble Fork Dam was built in 1966 and is less than 50 years old; therefore, it is not eligible for the National Register of Historic Places.

USDA-NRCS has coordinated with Utah SHPO regarding the project under Section 106 formal consultation (Utah State Antiquities Project Number: U-12-XN-1052f). The report prepared for the project (Native-X 2013) describing the results of the literature review and pedestrian survey concluded that there are no cultural or historical sites within the Preferred Alternative Work Area. The report was submitted to Utah SHPO and other consulting parties in October 2013 for a concurrence on the determination of no effect to historic properties or cultural resources. Utah SHPO issued a formal concurrence letter on October 31, 2013 (Utah Division of State History 2013) and this letter is presented in Appendix A. A formal comment letter was sent to the Ute Indian Tribe of the Uintah & Ouray Reservation requesting concurrence on October 31, 2013. At the issuances of this report a response had not yet been received from the Tribes. Section 106 Consultation with SHPO has been completed for the project.

2.6.2 Land Use and Recreation

2.6.2.1 Land Use

General land use in the project area and surrounding area is forest with a rural residential area to the south of the reservoir. The entire project area and surrounding lands are owned by the USFS, are located within the boundaries of the UWCNF, and are managed by the Pleasant Grove Ranger District. Various USFS land designations in the vicinity of Tibble Fork Dam are illustrated in Appendix B-Map 17 and include USFS Roadless Area, Summer Homes Area and USFS Wilderness.

Tibble Fork Reservoir and Dam are accessed from the south via the American Fork Canyon Road (Hwy 92/FSR70098) and North American Fork Canyon Road (Route 144/FSR 70085), and from the north via Granite Flat Campground Road (FSR 70010) and North American Fork Canyon Road (Route 144/FSR 70085). There are approximately 40 privately-owned vacation homes located to the southeast of Tibble Fork Dam off of Tibble Fork Road in the Tibble Fork Summer Homes area. The access road to this permitted private community is on top of the dam and the entrance gate is adjacent to the dam on the east side.

Tibble Fork Dam is located within the American Fork Management Area of the UWCNF. Within the National Forest, it has been designated as a “wildland-urban interface” which is defined as the area where buildings and/or structures meet or intermingle with undeveloped wildland vegetation. Within the wildland-urban interface boundary, Tibble Fork Reservoir and Dam are designated as “dispersed recreation”. The dispersed recreation designation is described as activities that take place outside of developed camping or concessionaires (operated facilities, excluding motorized recreation). The private residences in the Tibble Fork Summer Homes area are designated as “general recreation”, which includes private recreation properties that were platted many years ago.

2.6.2.2 Recreation

The Tibble Fork Reservoir area provides numerous recreational opportunities to the public during the summer months when the American Fork Canyon Road is open. Recreational opportunities include hiking, biking, climbing, camping, canoeing, fishing, horseback riding, hunting, picnicking, motorized recreation, photography, and nature viewing. The following USFS designated recreational trails and areas (USFS 2012a) are located near the project site as depicted on Appendix C-Map 16.

Trails: Aside from several dispersed trails that follow the perimeter of the reservoir, the following trails can be found in the vicinity of Tibble Fork Dam:

Trails within project work area

- Tibble Fork Trail No. 041: This non-motorized trail (2.9 miles) begins next to the left abutment of the dam and ends at the junction of Ridge Trail and South Fork Little Deer Creek trail.
- Trail No. 237: This non-motorized trail begins at the northern end of Tibble Fork Reservoir and continues to the Horse Transfer Station Trailhead.

Trails outside of project work area

- Mill Canyon Trail No. 040: This non-motorized trail begins at North American Fork Canyon Road just beyond the reservoir and continues across the river and follows Tibble Fork Creek for a stretch before turning into the forest. The trail is 3.5 miles long and ends at Ridge Trail.
- Silver Lake Trail No. 036: This non-motorized trail (4.4 miles) begins at the northern end of the reservoir at the Silver Lake Trailhead, approximately 1.75 miles north-northwest of the project work area, and travels up to Silver Lake.
- Silver Lake Flat Connector Trail No. 045: This non-motorized trail is a connector (1 mile) located approximately 2,000 feet north of the project work area, that links the horse transfer station, located across from the Granite Flat Campground, to Silver Lake Flat Dam. This trail is known to have high levels of use including horses, hikers and other types of user groups on any given day.
- Deer Creek-Dry Creek Trail No. 043: This non-motorized trail begins at Granite Flat Campground that extends northwest to Box Elder Peak.
- Box Elder Trail No. 044: This non-motorized trail begins at the Box Elder trailhead at the Granite Flat Campground and continues west towards Box Elder Peak.

Trailheads: The following trailheads are located within the vicinity of the project area:

Trail heads within the project work area

- Tibble Fork Trailhead: This area is the start of the Tibble Fork Trail on the southern side of Tibble Fork Reservoir near the left abutment of the dam (Figure 2-1).

Trailheads outside of the project work area

- Silver Lake Trailhead: This area is the start of the Silver Lake Trail No. 036 on the northern side of Silver Lake Flat Reservoir, approximately 1.75 miles north-northwest of the project work area.
- Box Elder Trailhead: This area is the start of the Box Elder Trail No. 044 at the Granite Flat Campground, approximately 3,500 feet northwest of the project work area.

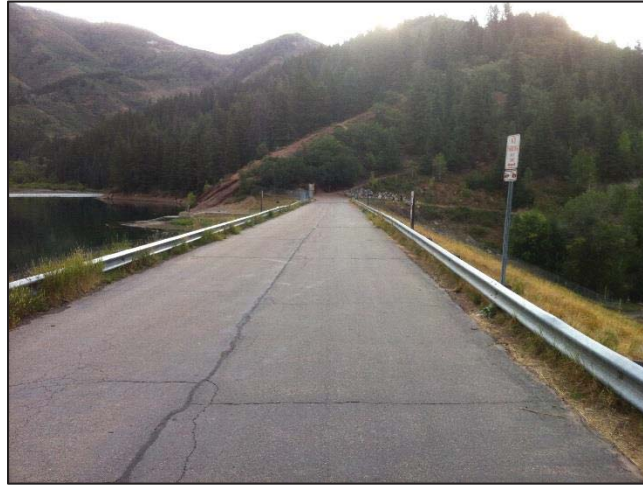


Figure 2-1. Tibble Fork Trailhead at End of Dam

Campgrounds: The following campgrounds are located within the vicinity of the project area but are not located within the project work area:

- Granite Flat: This campground is located to the south of the connection between the paved (Granite Flat Campground Road) and unpaved (Silver Lake Flat Road) entrance to Silver Lake Flat Dam, approximately 700 feet north of the project work area. It offers 44 single sites, 8 double sites, and 3 group sites. Picnic tables and campfire rings are provided, as are vault toilets and drinking water. Horseshoe pits and a grassy baseball field are also located on-site. Roads and parking spurs at the campground are paved.
- Little Mill: This campground is located along American Fork Canyon Road approximately two miles downstream from Tibble Fork Dam. It offers 34 single sites, 2 double sites, and 1 group site. Picnic tables and campfire rings are provided, as are flush toilets. Roads and parking spurs at the campground are paved.

Summer Homes: The Tibble Fork Summer Homes are located downstream of the dam outside of the breach inundation area and consist of the following elements:

- Approximately 40 private homes located off of Tibble Fork Road and approximately 500 feet downstream of the dam.

Horse Transfer Station: The following horse transfer station is located within the vicinity of the project area but is not located within the project work area:

- Horse Transfer Station: This station is the trailhead of Silver Lake Flat Connector Trail No. 045 located approximately 2,000 feet north of the project work area where equestrian riders can park and load/unload horses. A vault toilet is provided at this transfer station.

Parking Areas: The following parking areas are located within the vicinity of the project area:

Parking areas located within the project work area

- Tibble Fork Reservoir: This is a USFS designated parking area on the north side of the Tibble Fork Reservoir (Figure 2-2).
- Tibble Fork Dam: This parking area is dispersed and not designated by the USFS. This is a day-use only area used for recreational access to the reservoir and is located on the west side of the reservoir near the right dam abutment (Figure 2-3).

Parking areas located outside of the project work area

- Silver Lake Flat: This parking area is located on the west side of Silver Lake Flat reservoir approximately 1.5 miles north-northwest of the project work area, and is dispersed and not designated by the USFS. This is a day-use only area used for recreational access to Silver Lake Flat reservoir.
- Silver Lake Trailhead Parking: This is a USFS designated parking area on the north side of Silver Lake Flat, approximately 1.75 miles north-northwest of the project work area.



Figure 2-2. Tibble Fork Reservoir Parking Area



Figure 2-3. Tibble Fork Dam Parking Area

Reservoirs: The following reservoirs are located within the immediate vicinity of the project area:

Reservoirs located within the project work area

- Tibble Fork: This reservoir is stocked with rainbow trout, and the reservoir and fishing are open to the public year round. Fishing regulations at the reservoir follow the UDWR general rules for licensing, possession limits and other regulations. There is currently no fish consumption advisory for fish in Tibble Fork. No motors are allowed on this reservoir. Vehicle access to the reservoir is open year round.

Reservoirs located outside of the project work area

- Silver Lake Flat: This reservoir is stocked with brook trout and rainbow trout numerous times per year. Fishing regulations at the reservoir follow the UDWR general rules for licensing, possession limits and other regulations. There is currently no fish consumption advisory for fish in Silver Lake Flat. The reservoir is accessible by vehicle, but access to the reservoir is closed to vehicles over 50 inches in width for winter months.
- Silver Lake: This reservoir is stocked with brook trout and arctic grayling once annually. Fishing regulations at the reservoir follow the UDWR general rules for licensing, possession limits and other regulations. The lake can be accessed by foot by following the Silver Lake Trail No. 036. The trailhead is located on the north side of Silver Lake Flat.

Day-Use Sites: There are five day-use picnic areas along American Fork Canyon Road and North American Fork Canyon Road up to Tibble Fork Reservoir, which include Mile Rock, Martin, Roadhouse, Echo, and Grey Cliffs. These sites are occupied during daylight hours only and overnight camping is not allowed.

USFS Recreation Opportunity System

The American Fork Canyon receives over a million visitors on an annual basis according to the USFS. The Tibble Fork Reservoir receives approximately 84,000 visitors per year. The USFS Recreation Opportunity Spectrum (ROS) identifies recreation opportunities on a continuum ranging from “Primitive” and “Semi-Primitive Non-Motorized” to “Semi-Primitive Motorized” and “Roaded Natural” to “Roaded Modified” and “Rural” (USFS 2002a; 2002c). The entire Tibble Fork project area is designated as “Roaded Modified” (USFS 2003a). “Roaded Modified” has typically been defined as areas exhibiting evidence of forest activities that are dominant on the landscape. Standards generally include:

- Visual Quality: Not to exceed the Maximum Modification Visual Quality Objective (USFS 2002b).
- Access: All forms of access and travel modes may occur although roads are not well suited to highway-type vehicles. Off Highway Vehicle on designated routes are encouraged.
- Remoteness: Remoteness from urban conditions and public access is provided only by the USFS road system.
- On-site Recreation Development: Facilities and structures are maintained to accommodate the types and levels of use anticipated for the site and area.
- Social Encounters: User meets less than 20 other parties per day on trails and in dispersed areas during at least 80% of the primary use season. Numerous other parties may be encountered on roads.
- Visitor-caused impacts are noticeable, but not degrading to basic resource elements.

The USFS Recreation Opportunity system defines the “Roaded Modified” category as meeting less than 20 parties (assume party is 4 people average) per day at Tibble Fork Dam, on trails and in dispersed areas during at least 80% of the primary use season (May-October).

Weekends and Holidays

The UWCNF experiences increased levels of recreationists on the weekends during the summer months. This increase results in higher volumes of automobile traffic on the American Fork Canyon Road, North American Fork Canyon Road, and Granite Flat Campground Road. The following holidays are recognized in the State of Utah, and the Tibble Fork area may also experience large increases in recreationists during the spring, summer, and fall time periods:

- Memorial Day: Last Monday of May
- 4th of July
- Pioneer Day: July 24
- Labor Day: First Monday in September

2.6.3 Noise/Light

Tibble Fork Dam and surrounding area is within the UWCNF and adjacent to the Lone Peak Wilderness. Ambient noise is generally negligible, with the exception of a few vehicles traveling on North American Fork Canyon Road. Water flowing through the spillway of Tibble Fork Dam adds to the ambient noise level, but the effect is fairly localized and is not thought to contribute to the overall ambient noise of the area. All-Terrain Vehicles (ATVs) and motorcycles are used by recreationists in the area and contribute localized noise to the area, but on an infrequent basis. Ambient light in the forested project area from vehicles is negligible and there is no lighting associated with the dam.

2.6.4 Transportation/Infrastructure

Tibble Fork Reservoir and Dam are accessed via the following roads (USFS 2012a):

- American Fork Canyon Road: From Interstate 15, the American Fork Canyon Road (Hwy 92/FSR70098) runs east up the canyon for about five miles.
- North American Fork Canyon Road: The North American Fork Canyon Road (Route 144/FSR 70085) travels northeast for 2½ miles to the Tibble Fork Reservoir.

The American Fork Canyon Road is closed during the winter and road closure can extend into the spring and early summer due to high waters, lingering snowpack, and mudslides. USFS entrance fees are collected at the American Fork Canyon Entrance Station near the mouth of the canyon. Entrance fees are as follows:

- 1- to 3-Day: \$6.00
- 7-Day: \$12.00
- Annual: \$45.00

2.6.4.1 Roadless Area

The USFS has designated roadless areas within the UWCNF that are defined as areas without any improved roads maintained for travel by standard passenger type vehicles (USFS 2003a). Roadless areas within the project area are depicted in Appendix C-Map 17. This area begins approximately 1/3 mile

downstream of Tibble Fork Dam on either side of North American Fork Canyon Road and continues to the dam, where it encompasses the western and southern forested areas surrounding the reservoir. The majority of the project area is located outside of this roadless area, with exception of the dam itself and an area downstream of the dam.

The entire Tibble Fork site is designated as a Roaded Modified Area which allows for: 1) the construction of temporary roads, 2) the construction of new classified roads, and 3) the reconstruction or realignment of existing classified roads to address public safety and resource concerns (USFS 2003a and 2003b).

2.6.5 Socioeconomics

Utah County was founded in 1892 and the northern boundary is located approximately 20 miles south of Salt Lake City, Utah. The County Seat is the city of Provo. Provo and Orem constitute the heart of Utah County's economic sphere, and the area is classified as one of Utah's two major Metropolitan Statistical Areas. Brigham Young University lies on the eastern foothills of Provo, and Orem is home to Utah Valley University. Health care and computer technologies are also an integral part of the Utah County economy. Table 2-11 shows the major employers in Utah County (Utah's Right 2011).

Table 2-11. Utah County Major Employers (Data for 2011)

Employer	Business	# Employees
Brigham Young University	Education Services	5,000-6,999
Intermountain Health Care, Inc.	Health Care And Social Assistance	3,000-3,999
Utah Valley University Foundation,	Education Services	3,000-3,999
IM Flash Technologies, LLC	Manufacturing	1,000-1,999
Nestle Prepared Foods Company	Manufacturing	1,000-1,999
Vivint, Inc.	Construction	1,000-1,999
Adobe Systems Incorporated	Information	500-999
Alpine School District	Education Services	500-999
Central Utah Medical Clinic	Health Care And Social Assistance	500-999
Chrysalis Utah, Inc.	Health Care And Social Assistance	500-999
Intermountain Health Care, Inc.	Health Care And Social Assistance	500-999
Myfamily.com, Inc.	Information	500-999
Nexeo Staffing, LLC	Admin., Support, Waste Mgmt, Remediation	500-999
Novell Inc.	Information	500-999
Pinnacle Security Group, LLC	Admin., Support, Waste Mgmt, Remediation	500-999
State Of Utah	Health Care And Social Assistance	500-999
State Of Utah	Education Services	500-999
Timpanogos Regional Medical Service	Health Care And Social Assistance	500-999
Us Synthetic Corporation	Manufacturing	500-999

Tibble Fork Dam is located approximately 16 miles northeast of the metropolitan areas in Utah County and within the boundaries of the UWCNF. There are no private industries or major employers within the project area.

2.6.5.1 Environmental Justice

There are no low-income or minority populations located within the project area at Tibble Fork Dam that would be adversely impacted.

2.6.6 Demographics

Population, demographic, and economic data for Utah County were collected from the U.S. Census Bureau 2012 census (Census Bureau 2012). In 2012, Utah County's population was 540,504 (94% urban, 6% rural). Of the county's total population, 86.1% are White, 9.2% are Hispanic or Latino, 1.6% are two or more races, 1.4% are Asian, 0.6% are Native Hawaiian and Other Pacific Islanders, 0.5% are American Indian and Alaska Native, and 0.5% are Black. The percentage of residents living in poverty in Utah County in 2010 was 12.9%, compared to the 11.4% poverty level in the State of Utah. The National average poverty level in 2010 was 13.8%.

The 2010 unemployment rate in Utah County was 7.5% as compared to 7.6% for the State of Utah. The unemployment rate in Utah County has been highly variable during the last ten years ranging from 2% in 2000 to 7.5% in 2010. Per capita income in Utah County in 2011 was \$20,794 and the average per capita income in Utah State was \$23,650. The National per capita income in 2010 was \$27,334.

2.6.7 Land Rights

Tibble Fork Reservoir and Dam are located within the boundaries of the UWCNF. A Special Use Permit was issued to the NUCWCD to operate and maintain the dam for sediment, debris, and flood storage. The USDA-NRCS is the lead agency preparing the NEPA compliance document and is partially funding the dam rehabilitation. There are no private lands located within the project area.

2.6.8 Agricultural Lands

Utah County continues to have the largest amount of agricultural lands in Utah, with 11,094,700 acres in 2007 (Census of Agriculture 2007). There were 16,700 farms, averaging 664 acres in Utah County in 2007. Approximately 79% percent of farms in Utah County are irrigated, harvested crop land. Agriculture lands can be found from the mouth of the American Fork Canyon to Utah Lake, but most are located within the valley lands from Orem to the south end of the valley. Many of the agricultural lands have been threatened by housing developments. There are no agricultural lands within the project area and approximately 30 acres in the dam breach inundation area.

2.6.9 Natural Areas, Parklands and Forest Resources

Natural Areas

The entire project area and surrounding lands are owned by the USFS, are located within the boundaries of the UWCNF, and are managed by the Pleasant Grove Ranger District. Natural areas are not located within the project area. The closest natural area to the project area is the Lone Peak Wilderness, located approximately 1,300 feet to the west. The Lone Peak Wilderness was designated in 1978 by the U.S. Congress and consists of 30,088 acres of land managed by the Forest Service. The wilderness consists of rugged terrain with narrow canyons and high peaks in a geologically complex region (UM 2014).

Parklands/Forest Resources

Timpanogos Cave, managed by the National Park Service is located off American Fork Canyon Road approximately 2.6 miles east of the mouth of the canyon and approximately 4 miles southwest of the

project area. The monument and parking areas are situated directly on the side of the road. The location of the Timpanogos Cave National Monument is depicted in Appendix B-Map 1.

The site is located within the Uinta National Forest managed as one unit with the Wasatch-Cache National Forest by the National Forest Service (NFS). The Uinta National Forest consists of approximately 1,376 square miles of forest offering scenic beauty and many recreational opportunities. The National Forest is located near large urban population centers and is one of the most heavily visited in the nation. Forest resources managed for the Uinta National Forest by the NFS include timber harvest, grazing, water protection and recreation.

2.6.10 Visual Quality, Aesthetics and Scenic Beauty

Tibble Fork Dam and Reservoir are located within the American Fork Canyon drainage in the Wasatch Mountains northeast of the towns of Lehi and American Fork. The Tibble Fork viewshed, including the Deer Creek drainage and surrounding glaciated basins, is dominated by granite rock and sub-alpine conifer forest, rocky slopes, aspen, mountain shrubs, and grass-forb meadow habitat. A typical view of the reservoir and surrounding area is depicted in Figure 2-4. Figure 2-5 shows the dam itself from downstream.

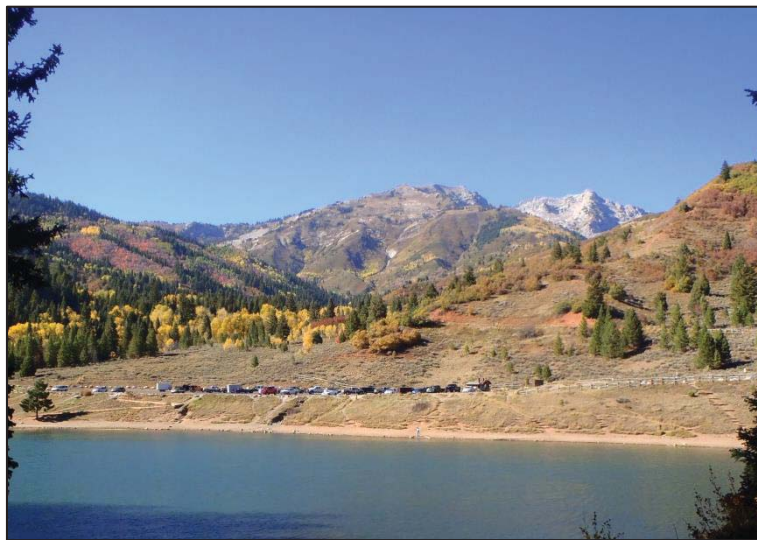


Figure 2-4. Tibble Fork Reservoir from South Side of Reservoir Looking Northwest



Figure 2-5. Tibble Fork Dam from South Side of Dam (Downstream)

The shoreline of Tibble Fork Reservoir appears to be natural when the reservoir is full, but exhibits the characteristic bare soil banks of a reservoir when the water level is low. The dam itself does not look natural at any reservoir level due to the consistent slopes, manicured riprap, outlet structures, and lack of vegetation. The dam embankment would likely be apparent from the foreground views (within 0.5 miles) along North American Fork Canyon Road upon approach to the reservoir. It is unlikely that the dam would be obvious from background views (more than 2 miles). Unless the reservoir water is flowing over the auxiliary spillway, the low-level outlet intake, and the principal and auxiliary spillway would likely be visible offshore in foreground views. From the downstream side of the dam, an approximate 250-foot long, open concrete spillway is visible in the near foreground where the spillway empties into the American Fork River.

The USFS Visual Quality Objectives (VQO) takes into consideration distance zones, as well as sensitivity levels and landscape variety classes. The Tibble Fork Dam, Reservoir, and adjacent areas are designated as “maximum modification” (USFS 2012a), which permits a dominant change to the original landscape, particularly in the foreground and middle-ground. The Lone Peak Wilderness is designated as “preservation” and requires that no visible change occurs in the landscape (Appendix C-Map 17).

2.6.11 Public Health and Safety

2.6.11.1 Dam Breach Analysis and Hazard Classification

The current hazard classification for Tibble Fork Dam is high hazard, meaning that if the dam should fail for any reason, there is a high probability that loss-of-life would occur. The potential losses exist due to the hazards associated with the recreation areas, homes, businesses, and schools that are downstream of the site and within the flood zone (Map 10, 11 & 12). Due to the dam’s high-hazard classification, it must be able to pass a flood event equivalent to the PMP event through the open channel spillway without overtopping the dam or causing catastrophic failure. The PMP event is defined as the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area. Such an event might occur in the Tibble Fork watershed if an extreme snow melt were to occur due to an extreme precipitation event (rain on snow). The downstream floodplain outside of American Fork Canyon is continuing to develop rapidly and it is certain that additional homes and businesses will continue to be constructed within the dam breach inundation zone in the future.

The dam and reservoir were built in 1966. A Dam Failure Inundation Study was completed in 1992 for both Silver Lake Flat and Tibble Fork Dams. The conclusion of this report was that the auxiliary spillways of both dams meet agency criteria. The hydrologic design conditions used for sizing the low-level outlet (principal spillway) and spillway (auxiliary spillway) were re-evaluated in 2011 with regards to current hydrological design criteria and the results are documented in a study completed by UDWR (UDWR 2011). The findings of this report state that the current spillway at Tibble Fork Dam will pass the PMP event (4,880 cfs), but that the spillway walls are overtopped by one foot near the slope break in the spillway where the chute begins.

2.6.11.2 Dam Failure Consequences

The exact event magnitude, duration and timing of dam failure scenarios are extremely difficult variables to predict. The most likely scenario would be from overtopping due to excessive inflows into the reservoir from the PMP event. If Tibble Fork Dam were to suddenly fail at a high reservoir stage (over the top of dam), the catastrophic impacts would include potential loss-of-life to any person located within the American Fork Canyon as well as residents and businesses in the cities of Alpine, Highland, American Fork, and Lehi near the mouth of the canyon. Sediment deposition from the dam failure would also likely fill culverts and drainages in the valley, potentially creating additional flooding issues in the low-lying residential and commercial areas during precipitation events.

In the event of Tibble Fork Dam failure, a large volume of water would surge down the American Fork River canyon with a peak discharge of approximately 50,000 cfs. The flood wave would exit the canyon and inundate the cities of Alpine, Highland, American Fork, and Lehi. Maps of the dam breach inundation area (USDA-NRCS 2013b) are located in Appendix C-Maps 10 through 12.

An analysis of the population-at-risk (PAR) was performed using the dam failure scenario. The method used to estimate the loss-of-life was the Flood Comparison Method as described in the 2011 Homeland Security Report *Methods for Estimating Loss of Life Resulting from Dam Failure*. A detailed analysis of using this method is presented in Appendix D. The following states the results for the four potential loss-of-life timing scenarios:

- Night (Summer): 283 people
- Day (Summer): 409 people
- Night (Non-Summer): 208 people
- Day (Non-Summer): 867 people

CHAPTER 3.0

ALTERNATIVES

3.1 Project Scoping

Scoping questions, comments, and concerns were requested from the public and government agencies during the preliminary scoping period, both orally at a public meeting and via written submittal of comments. The primary purpose of the scoping meeting was to gather input and feedback on the Project's purpose and need statement, potential alternatives for consideration, environmental issues to be addressed in the Final Plan-EA, methodologies to be used to evaluate impacts, and the overall public participation process. There were several comments received via letter and e-mail. These comments generally fell into the following categories:

- Archaeology: Concern about the structure's age and the historical town of Silver Lake City.
- Recreation: Recommendation about access to Snowbird Ski Resort, accessibility for four-wheelers and horses; concern about loss of recreational area around the reservoir.
- Fishing: Concern regarding maintaining the conservation pool.
- Dam Design: Recommendation about dredging in the reservoir.
- Contaminants: Concern and recommendations regarding arsenic in the reservoir.
- Power Production: Recommended installation of a power production facility at the dam.

3.2 Formulation Process

The formulation process of alternatives for the rehabilitation of Tibble Fork Dam followed procedures outlined in the USDA-NRCS National Watershed Program Manual (USDA-NRCS 2014b) Parts 501 through 505, USDA-NRCS National Watershed Program Handbook (USDA-NRCS 2014a) Parts 600 through 606, and other USDA-NRCS watershed planning policies. Numerous alternatives were developed by the project team based on the ability of each alternative to address the purpose and need of the project. The scoping comments received during the scoping period were incorporated into the formulation process for the initial alternatives. Some of these initial alternatives were eliminated from further analysis due to high cost or other critical factors. In total, two alternatives were selected by USDA-NRCS and the project team to be analyzed in this Final Plan-EA: No Action Alternative and Dam Rehabilitation.

3.3 Alternatives Considered but Eliminated from Detailed Study

Five alternatives were discussed for the project but were eliminated from further study in this Final Plan-EA. A list of these alternatives is presented below followed by a brief summary of each and the reason(s) for elimination.

- Dam Decommissioning
- Dam Rehabilitation—Straight Crest
- Dam Rehabilitation—Storage Restoration through Sediment Removal
- Dam Rehabilitation—Open-Channel Spillway Replacement
- Dam Rehabilitation—New Open-Channel Abutment Spillway

3.3.1 Dam Decommissioning

The Dam Decommissioning Alternative consists of excavating a breach in the dam through the low point of the valley (210,000 cubic yards) and constructing a new stable channel to allow unobstructed flow through the upstream and downstream reaches of American Fork River. Material excavated from the dam breach and new channel would be disposed of in the drained reservoir area and graded to match existing topographic contours at stable slopes. Sediment in the drained reservoir area would be stabilized using native vegetation (trees, shrubs and forbs) and habitat features (woody debris) to mimic the surrounding environment. Access to the HOA Summer Homes would be cut off under the Dam Decommissioning Alternative. In order to mitigate this impact, an HOA access bridge would be constructed downstream of the dam. The bridge would have two lanes and pedestrian walkways, and would span American Fork River approximately 1000 feet downstream of the existing dam crest. The bridge would connect Highway 144/North American Fork Canyon Road to a paved road improvement accessing the HOA Summer Homes. The bridge would be sized to pass the 100-year flood event.

The sediment retention capacity of the dam would be lost under this alternative which would invalidate the original economic justification for constructing the dam. The elimination of flood and sediment storage does not meet the purpose and need for this federally funded project and supplemental methods would be required to acquire the same flood and sediment volume as allotted in the original Work Plan. The cost estimate for decommissioning the dam and acquiring new flood protection measures would cost \$19,500,000. Therefore, due to the high cost and it does not meet the purpose and need of the project it was eliminated from detailed study.

3.3.2 Dam Rehabilitation—Straight Crest

This alternative would consist of the dam rehabilitation alternatives discussed in 3.4.2 to bring the dam into compliance with USDA-NRCS and Utah State Dam Safety regulations and current engineering standards. Under this alternative, the dam would be raised up to nine feet in order to restore the original capacity of the reservoir to 259 acre-feet and the sediment life to 59 years. The crest of the dam would mimic the existing geometry by being positioned straight across the valley from the left abutment to the right abutment. Due to the existing elevation of North American Fork Canyon Road, the roadway would have to be built up to the new dam height. Also, due to the existing grade of the roadway on its approach to Tibble Fork Dam, the modified roadway would need to extend downstream several thousand feet in order to catch existing grade and to provide a roadway slope less than 15%. The total cost of this alternative is estimated at \$4,500,000. Due to the high cost of this alternative, danger to public safety from the steep road grade, and disapproval of the alternative from the cooperating agency/land management agency (USFS), it was eliminated from detailed study.

3.3.3 Dam Rehabilitation—Storage Restoration through Sediment Removal

This alternative would consist of the dam rehabilitation alternatives discussed in 3.4.2 to bring the dam into compliance with USDA-NRCS and Utah State Dam Safety regulations and current engineering standards. Dredging of the reservoir sediment would be performed to restore all of the design storage capacity and extend the life of the dam for 100 years. Sediment deposits within the limits of the reservoir have elevated levels of some metals, in particular arsenic and lead. Dredging of the reservoir would require that all of the sediment containing contaminants be hauled off-site and disposed of at an appropriate location. The cost estimate for this alternative is \$8,400,000. Due to the high volume of sediment that would be required to haul off-site, the cost associated with this alternative is high and was eliminated from detailed study.

3.3.4 Dam Rehabilitation—Open-Channel Spillway Replacement

This alternative would consist of the dam rehabilitation alternatives discussed in 3.4.2 to bring the dam into compliance with USDA-NRCS and Utah State Dam Safety regulations and current engineering standards. Under this alternative, the dam would be raised up to nine feet in order to restore the original capacity of the reservoir to 259 acre-feet. The existing spillway would be completely removed and the excavated area filled in with the compacted structural fill similar to the fill used on the downstream face of the dam. A spillway similar to the existing open-channel spillway would be constructed along the same streamline but at a higher elevation. The cost estimate for this alternative is \$3,700,000. This alternative was eliminated from detailed study because an open channel spillway increases the maintenance requirements of the channel, creates a public health and safety risk for recreationists, and causes hydraulic instability.

3.3.5 Dam Rehabilitation—New Open-Channel Abutment Spillway

This alternative would consist of the dam rehabilitation alternatives discussed in 3.4.2 to bring the dam into compliance with USDA-NRCS and Utah State Dam Safety regulations and current engineering standards. Under this alternative, the dam would be raised up to nine feet in order to restore the original capacity of the reservoir to 259 acre-feet and the sediment life to 59 years. The existing spillway would be completely removed and the excavated area filled in with the compacted structural fill similar to the fill used on the downstream face of the dam. An open-channel spillway would be constructed along the left abutment of the dam at an elevation higher than the existing spillway. The abutment spillway would bend around the abutment and discharge into a stilling basin located downstream of the existing spillway outlet. The cost estimate for this alternative is \$3,800,000. This alternative was eliminated from detailed study because an open channel spillway increases the maintenance requirements of the channel, creates a public health and safety risk for recreationists, and causes hydraulic instability.

3.3.6 Dam Rehabilitation—Abutment Spillway Alternative (Left)

This alternative would consist of the dam rehabilitation alternatives discussed in 3.4.2 to bring the dam into compliance with USDA-NRCS and Utah State Dam Safety regulations and current engineering standards. Under this alternative, the dam would be raised up to nine feet in order to restore the original capacity of the reservoir to 259 acre-feet. The existing spillway would be completely removed and the excavated area filled in with the compacted structural fill similar to the fill used on the downstream face of the dam.

The new spillway would consist of a closed channel, box-like concrete structure designed to pass the PMP. The spillway would be located along the left abutment of the dam, and would curve in toward the centerline of the American Fork River in order to meet the natural channel near the spillway outfall. The cost estimate for this alternative is \$5,000,000. This alternative was eliminated from detailed study because of the high cost and the impacts to the left abutment area from the installation of the new spillway channel.

3.4 Alternatives Considered for Detailed Study

In total, there were two alternatives considered for the project that were carried forward to further study in this Final Plan-EA. A list of these alternatives is presented below followed by a summary of each.

- No Action
- Dam Rehabilitation – Spillway Replacement Alternative

3.4.1 No Action Alternative

The No Action alternative assumes that with no Federal funds, the NUCWCD would operate the debris basin as is until Utah Dam Safety mandates rehabilitation. The NUCWCD-funded alternative would consist of upgrading the auxiliary spillway in order to pass the Inflow Design Flood (IDF), and constructing dam stability measures as needed to meet current dam safety requirements. These stability measures may include downstream toe improvements (compaction/replacement of foundation materials), repair of toe drains and construction of a downstream stability berm. Material for construction of the downstream stability berm would be obtained from sources outside of forest service property. Auxiliary spillway upgrades may include notching the spillway crest, localized repairs, riprapping for spillway protection, and riprapping the stilling basin. The installation cost estimate for this alternative is \$1,252,000 as detailed in Appendix D.

3.4.2 Dam Rehabilitation – Spillway Replacement Alternative

Rehabilitation of the dam would consist of measures to meet current USDA-NRCS and Utah State Dam Safety regulations, current engineering standards, and to extend the life of the dam for 59 years starting in 2017. Rehabilitation of the dam is depicted in Appendix B-Maps 5 through 9, and would include the following measures:

Raise Dam

Place and compact additional fill (93,000 cubic yards) on the crest and downstream face of the dam to raise the dam crest and ensure slope stability. Similarly, add zoned fill upstream of the existing right embankment to create a dogleg crest and to catch the existing grade of the north American Fork Canyon Road embankment. Place riprap (2,900 cubic yards) on the upstream face of the dam to protect the slope from wave action erosion at varying water surface elevations in the reservoir. Some of the fill material for the dam raise would be excavated from a borrow source (proposed borrow area 1) located at the entrance of American Fork River into the reservoir. The existing Tibble Fork Summer Homes access road on top of the dam would be removed and relocated for mitigation from recreation impacts.

Downstream Improvements

Construct a stability berm on the downstream face of the dam and install a new Tibble Fork Summer Homes access road on top of the stability berm. Install a new toe drain at the proposed new downstream toe of the dam (approximately 100 feet downstream of current toe) to collect and convey seepage water away from the dam infrastructure. Add extensions to the existing piezometer seepage monitoring instrumentation to allow continued piezometer access after the dam surface is raised.

Principal Spillway

The principal spillway is currently located on the north side of the auxiliary spillway and consists of a concrete intake structure that discharges water into the auxiliary spillway through reinforced concrete (RC) pipes. The principal spillway would be demolished and replaced up to approximately 14 feet higher utilizing a similar design. Raising the principal spillway would raise the existing normal water pool surface elevation of the reservoir from approximately 6382.2 feet AMSL to 6396 feet AMSL. This would increase the reservoir size from approximately 9.8 acres to 21.6 acres.

Auxiliary Spillway/Stilling Basin

The auxiliary spillway would be demolished and replaced with a covered, concrete box-type spillway (1,200 cubic yards of reinforced concrete) sufficiently sized to pass the PMP event (worst-case scenario flood event) without overtopping the dam or spillway walls. The spillway would be raised up approximately 13 feet from elevation 6387.3 feet AMSL to 6400.2 feet AMSL to increase the sediment and water storage capacity of the reservoir. The auxiliary spillway would be extended an additional 40

feet downstream. The stilling basin at the base of the auxiliary spillway would be demolished and a new stilling basin would be constructed that would extend approximately 60 feet downstream of the new auxiliary spillway.

Low-Level Outlet

Replace the low-level outlet gate in the reservoir and repair the outlet riser. Extend the low-level outlet pipe approximately 40-feet to connect to the new stilling basin.

Proposed Borrow Areas and Construction Staging

An approximate 4.6-acre area at the northeast side of the reservoir (proposed borrow area 1) would be excavated approximately 13 to 16 feet to increase reservoir storage capacity. Excavated material meeting required standards would be reused as fill to raise the dam and to level the proposed parking area below the dam. Proposed borrow area 1 side slopes would be graded at a 2:1 slope. An approximate 2.6-acre area northwest of the reservoir (proposed borrow area 2) would be excavated as a borrow source. Proposed borrow area 2 is a previously disturbed area that was used as a borrow source during the original construction of the dam. Proposed borrow area 2 will also be used as a construction staging area. An additional 0.7-acre construction staging area is proposed south of the reservoir on the west side of American Fork River.

Clearing and Grubbing

Approximately 13.5 acres of vegetation on the dam and around the reservoir would be permanently cleared and grubbed. Permanent vegetation removal would be performed on the dam for purposes of dam safety and between the existing normal pool and proposed normal pool elevations. Approximately 1.1 acres of vegetation would also be permanently cleared and grubbed for the new gravel parking area (for mitigation of recreation impacts) at the base of the dam. Additionally approximately 2.6 acres of clearing and grubbing would be performed for the staging/borrow area 2, but would be reseeded after construction completion.

Irrigation Water Storage – updated January 2015

USDA-NRCS and the NUCWCD obtained approval for Agricultural Water Management to be added as an authorized purpose of the structure on January 15, 2015. The new authorized purpose allows for an additional 120 ac-ft for irrigation water storage within the reservoir. This 120 ac-ft is an existing water right transfer and does not constitute a new water right. The storage has been incorporated into the Final Plan-EA, however the Conceptual Design attached in Appendix D remains as it was presented to the public in the Draft Plan-EA in July 2014.

Mitigation for Impacts to Recreation

A new approximately 1.1 acre gravel parking area would be constructed at the base of the dam embankment and would encompass the area used for construction staging.

Approximately 1.0 acre of new beach would be added to the west side of the reservoir to mitigate for the inundation of the existing beach. Filling, compacting and grading an area of the reservoir would be performed so that the new normal pool elevation of the reservoir meets the design edge of the new beachfront. Much of the new beachfront would be seeded with native grasses. Sand will be imported to the area immediately adjacent to the normal water line. Approximately 4,600 cubic yards of beachfront fill would be added with an additional approximately 560 cubic yards of sand.

The existing pedestrian bridge over Deer Creek would be demolished and a new pedestrian bridge would be constructed at a higher elevation to account for the pool elevation increase.

The access road to the Tibble Fork summer homes would be realigned and constructed on the new stability berm on the downstream slope of the dam.

To allow more controlled parking around the reservoir, the existing paved parking area layout would be altered to increase parking from 83 spaces to 60 passenger vehicle and 25 truck/trailer spaces. The road adjoining the paved parking area would be realigned to the north of the parking area to provide improved public safety, and a new roundabout would be added at the hairpin turn to allow safe turn around for vehicles pulling trailers.

Wetland Mitigation

Approximately 1.0 acre of reservoir open water, 2.6 acres of stream open water and approximately 500 linear feet of stream open water would be impacted from this alternative. Impacts to these waters of the U.S. would be self-mitigating as the reservoir area would be increased by approximately 11 acres for this alternative. Approximately 0.1 acres of emergent wetland, 0.6 acres of scrub shrub wetland, and 0.6 acres of forested wetland would also be impacted from this alternative (as accounted for in the July 2014 conceptual design). To calculate costs associated with mitigation of impacts to wetlands the following general assumed mitigation ratios were used (as of September 2014):

- Emergent Wetland: 1:1
- Scrub Shrub Wetland 1:1
- Forested Wetland 5:1

Cost Estimate

The construction cost estimate for this alternative is \$6,550,000 as detailed in Appendix D.

Schedule

Construction activities would be expected to be completed in one season during the months of May through November 2016, pending weather conditions. Preliminary estimates indicate that around 20 trucks per day (6 days a week), mostly during daylight hours, would be required at the site during the duration of the project rehabilitation in order to complete the project in the 2016 construction season.

Dam Hazard Classification

Rehabilitating the dam using the prescribed methods above would not modify the dam hazard classification of high hazard since the risk to the PAR, infrastructure and property will not change downstream.

3.5 National Economic Development

The National Economic Development (NED) Alternative is the alternative or combination of alternatives that reasonably maximizes the net economic benefit of the project consistent with protecting the Nation's environment. The net economic benefit is the benefit minus the cost. For the rehabilitation program, when human life is potentially at risk, the NED alternative is defined as the federally assisted alternative with the greatest net economic benefits.

3.6 Summary and Comparison of Alternative Plans

The alternatives proposed for consideration and analyzed in detail in this Final Plan-EA have been compared to discern the merits and disadvantages of each alternative. This comparison of environmental, social, and economic effects is summarized in Table 3-1.

Table 3-1. Summary and Comparison of Alternative Plans

Effects	No Action	Dam Rehabilitation – Spillway Replacement
Soils and Geology		
Soils	Direct impacts in the case of mandated rehabilitation during construction. Construction-related disturbance would be short term in duration and temporary measures would be removed at the end of the project. Indirect impacts may occur during precipitation events. Slopes and stream banks during construction activities could become unstable and erode leading to an increase in sediment accumulation in the reservoir. No impacts to prime and unique farmlands.	Direct impacts during construction. Construction-related disturbance would be short term in duration and temporary measures would be removed at the end of the project. Indirect impacts may occur during precipitation events. Slopes and stream banks during construction activities could become unstable and erode leading to an increase in sediment accumulation in the reservoir. No impacts to prime and unique farmlands.
Geology	The geology in the vicinity of the project would not experience direct, indirect or cumulative effects from dam rehabilitation except for sedimentation and erosion. The sediment storage capacity would remain in its current stage and sediment would continue to indirectly accumulate within the reservoir.	The geology in the vicinity of the project would not experience direct, indirect or cumulative effects from dam rehabilitation except for sedimentation and erosion. Direct and potential indirect impacts from soil disturbance and potential sediment entering American Fork River during construction. BMPs would be implemented to reduce sediments entering waterways during and after construction. Increase sediment storage capacity of reservoir from 24 ac-ft to 175 acre-feet. O&M practices would include operating both outlet gates to remove any accumulated sediment.
Water Resources		
Surface Water and Water Quality	No effect	Sediment would be trapped behind the dam, maintaining the present water quality.
Hydrology	The replacement of the spillway designed to pass the PMP would result in a beneficial impact from the stabilization of the dam during high-volume flood events.	The replacement of the spillway designed to pass the PMP would result in a beneficial impact from the stabilization of the dam during high-volume flood events.
Legal Framework	No effect	No effect
Water Rights	No effect	No effect, existing water rights. An additional 120 ac-ft will provide for irrigation water storage within the reservoir.
Waters of the U.S. Including Wetlands	No effect	Loss of approximately 0.1 acres emergent wetland, 0.6 acres of scrub shrub wetland, 0.6 acres forested wetland. Impacts to 1 acre of open water of reservoir, 2.6 acres of open water of American Fork River above reservoir, 500 feet of river channel impacts (potentially inundated due to reservoir management practices), 100 linear feet of American Fork River below dam, and 80 linear feet of Deer Creek. Project will increase surface area of reservoir to 21.6

Effects	No Action	Dam Rehabilitation – Spillway Replacement
		acres.
Climate	Climate change in Utah is resulting in declining snowpack and an increase in droughts. Direct effects from the reduction in precipitation in the area would result in a lower risk for high volumes of water to flow through the reservoir and over the spillway. Decline of precipitation in the watershed upstream of the basins may result in reduction of vegetative cover causing slopes and stream banks to become unstable and susceptible to erosion during high volume precipitation events. This could lead to an increase in sediment accumulation in the basins decreasing the economic viability of the reservoir.	Climate change in Utah is resulting in declining snowpack and an increase in droughts. Direct effects from the reduction in precipitation in the area would result in a lower risk for high volumes of water to flow through the reservoir and over the spillway. Decline of precipitation in the watershed upstream of the basins may result in reduction of vegetative cover causing slopes and stream banks to become unstable and susceptible to erosion during high volume precipitation events. This could lead to an increase in sediment accumulation in the basins decreasing the economic viability of the reservoir.
Air Quality		
Air Quality	Construction activities would temporarily adversely affect air quality.	Construction activities would temporarily adversely affect air quality. BMPs would be implemented to reduce the release of fugitive dust from the project area.
Plants		
Vegetation Communities	Disturbance to vegetation including any areas altered from construction as well as temporary disturbance from staging and access during construction. Temporary construction-related impacts would be short term in duration and temporary measures would be removed at the end of the project.	Approximately 11.8 acres of vegetation consisting of upland, riparian and wetland vegetation types would be permanently cleared. Approximately 2.7 acres of vegetation would be temporarily cleared for construction staging/proposed borrow area 2. Temporarily disturbed vegetation would be restored using native plant species.
Riparian areas	No effect	Approximately 2.1 acres of permanent riparian vegetation removal which is also located within the USFS designated RHCA. Approximately 100 linear feet of permanent riparian vegetation removal downstream of the dam for extension of the principal spillway and new stilling basin.
Special Status Plant Species	No effect	No effect
Threatened and Endangered Plant Species	No effect	No effect
Noxious Weed and Invasive Plant Species	Would put the project area at risk for future invasion of noxious weeds.	BMPs will be implemented during construction to prevent the spread of noxious weeds.

Effects	No Action	Dam Rehabilitation – Spillway Replacement
Animals		
Fish	This alternative would not have direct or cumulative effects to fish species over the long term for the project. Indirect effects include a continued decrease in available fish habitat as the reservoir continued to fill with sediment.	Direct beneficial impact to fish and associated habitat by increasing the reservoir size to 21.6 acres of available fish habitat. Temporary impacts during construction as the reservoir would not be stocked. Fish present in the reservoir would be salvaged and transplanted downstream of the dam or into Silver Lake Flat Reservoir prior to start of construction. Water in Tibble Fork Reservoir would be pumped/bypassed around the dam during construction so that American Fork River downstream of the dam does not become dry and negatively impact fish. A screen would be placed upstream of the reservoir to prevent fish from swimming downstream to the pump/bypass.
Wildlife	Temporary direct construction effects may cause wildlife dispersal from the area surrounding Tibble Fork Dam. This dispersal is not expected to adversely affect wildlife in the area. Special-status species and MIS would temporarily experience direct and indirect effects during construction.	4.5 acres of potential wildlife habitat permanently cleared and/or inundated. Not expected to impact large amounts of habitat within the UWCNF or to cause a loss of occupancy by special-status species or MIS. Temporary direct construction effects may cause wildlife dispersal from the area surrounding Tibble Fork Dam. This dispersal is not expected to adversely affect wildlife in the area.
Threatened and Endangered Species	No effect	No effect
Migratory Birds/Bald and Golden Eagles	Impacts include construction noise, increased human activity, and heavy equipment operations, all of which may temporarily disrupt wildlife activities.	Approximately 4.5-acres of migratory bird/bald and golden eagle habitat, including riparian, adjacent upland and upland stands of trees would be removed. Measures would be installed to ensure ground-disturbing activities do not result in the “take” of an active nest or migratory bird protected under the MBTA.
Human Environment		
Cultural/Historic	No effect	No effect
Land Use/Recreation	Temporary impacts from increased traffic for approximately 120 days during construction increasing travel to summer homes, Silver Lake Flat and Tibble Fork Reservoir, Timpanogos Cave and campgrounds/day-use sites along American Fork River below and above reservoir. Temporary displacement for approximately 120 days of Tibble Fork Trailhead. Increase in construction traffic in the Tibble Fork parking areas for approximately 120 days.	A portion of Trail No. 237 would be temporarily inaccessible for approximately 60 days. Increase in construction traffic in the Tibble Fork parking areas for 180 days. Limited access and possible displacement of Tibble Fork Trailhead for 120 days. Increased travel time for recreationist for 180 days during construction to summer homes, Silver Lake Flat Reservoir, Timpanogos Cave, and campgrounds/day-use sites along American Fork River below and above reservoir. Tibble Fork Reservoir would be closed to the public for approximately 150 days for construction activities. Enhance

Effects	No Action	Dam Rehabilitation – Spillway Replacement
		recreation after construction completion from increased reservoir surface area and additional available parking.
Noise/ Light	Temporary adverse effect for noise and light in the project area during construction.	Temporary adverse effect for noise and light in the project area during construction.
Transportation/ Infrastructure	Temporary effects from increased traffic on American Fork Canyon Road and North American Fork Canyon Road during construction.	Temporary effects from increased traffic and/or flagging operations on American Fork Canyon Road and North American Fork Canyon Road during construction. Direct impact to Tibble Fork Summer Home access and American Fork Canyon Road through realignment. Indirect impact of increased traffic after construction from increased recreationists visiting the area.
Socioeconomics	Temporary socioeconomic benefits from additional employment during the dam rehabilitation. Reduction to the threat of dam failure and the associated socioeconomic hardships that might occur.	Temporary socioeconomic benefits from additional employment requirements for one year during the dam rehabilitation. Reduction to the threat of dam failure and the associated socioeconomic hardships that might occur.
Demographics	No effect	No effect
Land Rights	A new Special Use Permit(s) or a modification to the existing permit from the USFS would be required for specific rehabilitation actions of this alternative.	A new Special Use Permit(s) or a modification to the existing permit from the USFS would be required for dam rehabilitation construction activities, increased reservoir surface water elevation, road improvements, staging area use outside of the project footprint, and changes in the use of the dam.
Agricultural Lands	No effect	No effect
Natural Areas, Parklands and Forest Resources	No effect	No effect
Visual Quality, Aesthetics and Scenic Beauty	Temporary impact during construction activities from temporarily disturbed areas and equipment parked or operating in the project area.	Temporary impact during construction activities from temporarily disturbed areas and equipment parked or operating in the project area.
Public Health and Safety	Until Utah Dam Safety mandates rehabilitation, indirect impacts from a flood event have a higher probability to occur.	Reduction of loss-of-life potential.
National Economic Development		
Construction Cost	\$1,079,000	\$6,550,000
Project Environmental, Engineering and Administrative Costs	\$173,000	\$785,000
Total Project Cost (Installation Cost)	\$1,252,000	\$7,335,000
Cost Sharing (USDA-NRCS)	\$0	\$5,032,500
Cost Sharing (Sponsor)	\$1,252,000	\$2,032,500

Effects	No Action	Dam Rehabilitation – Spillway Replacement
Annual Installation Cost	\$0	\$296,000
O&M Cost	\$0	\$51,000
Annual Sum Cost	\$0	\$347,000
Annual Benefit	\$18,500	\$260,000
Benefit Cost Ratio	0.00	0.75

CHAPTER 4.0

ENVIRONMENTAL CONSEQUENCES

USDA-NRCS is responsible under NEPA guidelines to identify and address effects on the human environment that may occur as a result of the alternative plans. These alternatives include the No Action Alternative and the Dam Rehabilitation Alternative. The Dam Rehabilitation Alternative would be consistent with the 2003 Uinta National Forest Land and Resource Management Plan (USFS 2003a). The following describes the potential effects of the alternatives within each of the resource categories described in Chapter 2.0.

The following describes the types of effects and impact analyses used in this chapter (USDA-NRCS 2011):

- Direct Effect: Impacts caused by a proposed action and occurring at the same time and place.
- Indirect Effect: Impacts caused by an action that are later in time or farther removed in distance, but are still reasonably foreseeable.
- Cumulative Effect: The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertaking such other action.
 - Past and present actions may involve construction activities at and near the site, soil contamination, downstream sediments, fish and wildlife habitats, and recreation activities. Cumulative effects are related to downstream flooding in the watershed. Foreseeable future actions also include additional commercial and residential development near American Fork Canyon and adjacent low-lands.
 - The assessment of cumulative impacts is not substantially different from the assessment of direct or indirect impacts. The same types of considerations are made to determine the environmental consequences of the alternatives for direct, indirect, or cumulative impacts. Cumulative impact assessment, however, generally entails a broader perspective (or broader scale) such as what else is happening in the area and/or downstream.
 - The spatial definition for the cumulative effects includes the area above and around the Tibble Fork Reservoir, and downstream along American Fork River within the American Fork Canyon as well as residents and businesses in the cities of Alpine, Highland, American Fork, and Lehi near the mouth of the canyon.

4.1 Soil and Geology

4.1.1 Soils

No Action

Soils within the project area would be directly impacted during construction through excavation, placement of fill and grading activities, as well as through movement of equipment and vehicles over the soils during construction. Construction-related disturbance would be short term in duration and temporary measures would be removed at the end of the project. There would be no impacts to prime and unique farmlands as they do not exist within the work area.

Indirect impacts may occur during precipitation events. Slopes, stream banks and areas disturbed during construction activities could become unstable and erode leading to an increase in sediment accumulation in the reservoir.

Lead and arsenic were detected in soils collected during a sediment survey of the reservoir (see Section 2.1.1.3). Lead and arsenic contaminated soils that exceed regulatory detection limits would not be used for structural fill on the dam. The top layer of soil containing heavy metals would be tested and any locations that exceed screening levels would not be disturbed. These contaminated soils are not expected to be transported downstream and would therefore not affect the surrounding environment. Proper use of BMPs and timing of construction would almost eliminate contaminated soils from moving downstream during earth disturbing activities.

Dam Rehabilitation

Soils within the project area would be temporarily directly impacted in the case of mandated rehabilitation during construction through excavation and grading activities, as well as through movement of equipment and vehicles over the soils during construction. Construction-related disturbance would be short term in duration and temporary measures would be removed at the end of the project. Permanent direct impacts to soils would occur from inundation of an additional approximately 12 acres of land, construction of a 1.1 acre paved parking lot, and placement of fill beyond the toe of the downstream slope of the dam embankment. Loss of soil productivity would occur in areas temporarily disturbed and loss of soil and long term soil productivity would occur in areas permanently disturbed. There would be no impacts to prime and unique farmlands as they do not exist within the work area..

Lead and arsenic were detected in soils collected during a sediment survey of the reservoir (see Section 2.1.1.3). Lead and arsenic contaminated soils that exceed regulatory detection limits would not be used for structural fill on the dam. The top layer of soil containing heavy metals would be tested and any locations that exceed screening levels would not be disturbed. These contaminated soils are not expected to be transported downstream and would therefore not affect the surrounding environment. Proper use of BMPs and timing of construction would almost eliminate contaminated soils from moving downstream during earth disturbing activities.

Indirect impacts may occur during precipitation events. Slopes, stream banks and areas disturbed during construction activities could become unstable and erode leading to an increase in sediment accumulation in the reservoir. Proper BMPs would be installed to prevent and control soil erosion.

4.1.2 Geology

No Action

The geology in the vicinity of the project would not experience direct, indirect or cumulative effects from dam rehabilitation except for sedimentation and erosion. The sediment storage capacity would remain in its current stage and sediment would continue to indirectly accumulate within the reservoir.

Dam Rehabilitation

The geology in the vicinity of the project would not experience direct, indirect or cumulative effects from dam rehabilitation except for sedimentation and erosion. This alternative would increase the reservoir sediment storage capacity from 24 ac-ft to 175 acre-feet and extend the life of the dam for 59 years starting in 2017. Additionally O&M practices include operating both low-level outlet gates on an annual basis to remove any accumulated sediment at the entrance and ensure proper performance of the gate. Direct and potential indirect impacts would be related to soil disturbance and potential sediment entering American Fork River during construction. Construction BMPs would be implemented to reduce sediments entering into waterways during and after construction.

There would be no cumulative effects to sedimentation and erosion under the rehabilitation options.

4.2 Water Resources

4.2.1 Surface Water and Water Quality, Hydrology, and Legal Framework

No Action

There would be no direct effects, indirect effects or cumulative effects from Utah Dam Safety mandated rehabilitation.

Erosion control and sediment removal are very important temporary and permanent design considerations because soils within the project area are highly susceptible to erosion in certain locations. Aggressive temporary erosion control and sediment removal measures would need to be implemented during construction until permanent slope stabilization and water quality improvement facilities were constructed. Temporary construction activities should include the implementation of BMPs listed in Dam Rehabilitation below.

Dam Rehabilitation

Rehabilitating the dam would not alter surface water quality or sedimentation from existing conditions at the reservoir. The reservoir would continue to trap sediment (2.8 ac-ft/year) and keep it from flowing downstream. This sediment storage would inhibit sediment transport through Tibble Fork Dam over the 59-year extension of the life of the dam.

Erosion control and sediment removal are very important temporary and permanent design considerations because soils within the project area are highly susceptible to erosion in certain locations. Aggressive temporary erosion control and sediment removal measures would need to be implemented during construction until permanent slope stabilization and water quality improvement facilities were constructed.

Project design elements, including BMPs, would be used and would be implemented to reduce the quantity of sediment (1) entering American Fork River; and (2) flowing downstream and violating any federal or state water quality rules and regulations. The dam rehabilitation would also meet Utah antidegradation requirements. Construction BMPs would include, but are not limited to, the following:

- A Storm Water Pollution Prevention Plan (SWPPP) that contains erosion and sediment control and pollution prevention BMPs, such as, but not limited to, silt fences, fiber wattles, and/or earth berms, would be required and implemented.
- Construction activities impacting irrigation would be coordinated with the managing entity to ensure no interruption of service and to minimize adverse impacts.
- Water bodies adjacent to construction and staging areas would be identified, and such measures as straw bales, silt fences, and other appropriate sediment control BMPs would be implemented to prevent the entry of sediment and other contaminants into waters.
- To ensure that accidental spills do not enter waters, the storage of petroleum-based fuels and other hazardous materials and the refueling of construction machinery would not occur outside of approved designated staging/batch plant areas. Furthermore, the project would comply with state and federal water quality standards and toxic effluent standards to minimize any potential adverse impacts from discharges to waters of the U.S.
- No construction materials shall be stockpiled or deposited in or near any water bodies.

There is expected to be a negligible cumulative effect on water quality due to replacement of the spillway.

4.2.2 Hydrology

No Action

This alternative would have a direct impact to area hydrology. The replacement of the spillway designed to pass the PMP would result in a beneficial impact from the stabilization of the dam during high-volume flood events. Cumulative impacts are not anticipated.

Dam Rehabilitation

This alternative would have a direct impact to area hydrology. The replacement of the spillway designed to pass the PMP would result in a beneficial impact from the stabilization of the dam during high-volume flood events. Cumulative impacts are not anticipated.

4.2.3 Legal Framework

No Action

Impacts to legal framework are not anticipated for this alternative.

4.2.4 Water Rights

No Action

There would be no direct, indirect effects or cumulative effects from mandated dam rehabilitation.

Dam Rehabilitation

USDA-NRCS and the NUCWCD are obtaining an additional 120 ac-ft water right for irrigation water storage within the reservoir. This alternative would allow for storage of approximately 120 ac-ft of irrigation water. This water right would be transferred from an existing right that is currently not being used at Silver Lake. This transfer would not result in a new water right within the American Fork watershed. The reservoir would be managed to maintain the existing 166-acre conservation pool.

4.2.5 Waters of the U.S., Including Wetlands

No Action

There would be no direct, indirect effects or cumulative effects from mandated dam rehabilitation.

Dam Rehabilitation

Approximately 100 linear feet of stream in American Fork River below the dam outlet would be lost from the extension of auxiliary spillway and stilling basin. Raising the auxiliary spillway to 21.6 feet would increase the normal pool elevation and increase the area of the reservoir from approximately 9.8 acres to 21.6 acres. This would result in the inundation of wetland habitat, a portion of American Fork River, and a portion of Deer Creek. Additionally a 4.6-acre area would be excavated to increase reservoir storage capacity and would also be a borrow source to use as fill for the proposed dam embankment raise. The area to be excavated includes a portion of the reservoir and American Fork River and associated wetlands. A summary of existing wetlands and waters of the U.S. in the project area, and impacts associated with the rehabilitation are listed in Table 4-1 below. These impacts are also shown in Appendix C-Map 15.

Table 4-1. Wetlands and Waters of the U.S. Impact Summary Table

Classification	Acres (ac) or Linear Feet (LF) in Project Area	ac or LF Impacted from Rehabilitation
Open Water Reservoir (Tibble Fork)	9.8 ac	1 ac
Emergent Wetland	0.1 ac	0.1 ac
Scrub Shrub Wetland	0.6 ac	0.6 ac
Forested Wetland	0.6 ac	0.6 ac
Open Water Streams (American Fork Above Tibble Fork Reservoir)	3.0 ac	3.0 ac*
Open Water Streams (American Fork Below Dam)	300 LF	100 LF
Open Water Streams (Deer Creek)	470 LF	80 LF

**Revised as of January 2015 Final Plan-EA*

Raising the reservoir water elevation would increase the surface area of the reservoir to approximately 21.6 acres and likely result in reestablishment of similar wetlands at a higher elevation. Routine monitoring after construction completion would be performed. Information collected during monitoring would be utilized to develop a Post Construction Site Rehabilitation Plan.

Waters of the U.S. and wetlands would not experience any indirect or cumulative effects from dam rehabilitation.

An official invitation for the USACE to become a Cooperating Agency on the project was sent to them on January 6, 2014. The USACE responded on March 5, 2014 via email that they are not interested in becoming a NEPA Cooperating Agency on the project since there will be minimal impacts to waters of the U.S. and the project is being analyzed as an EA (USACE 2014).

4.2.6 Climate

No Action

Climate change in Utah is resulting in declining snowpack and an increase in droughts. Direct effects from the reduction in precipitation in the area would result in a lower risk for high volumes of water to flow through the reservoir and over the spillway.

The reduction of precipitation in the watershed upstream of the reservoir may result in the decline of vegetation. This decline could indirectly impact the reservoir by causing slopes and stream banks to become unstable and erode during high-volume precipitation events, possibly leading to increases in sediment accumulation in the reservoir and decreases to the economic viability of the dam and reservoir.

There are no cumulative effects from climate change to the Project.

Dam Rehabilitation

Climate change in Utah is resulting in declining snowpack and an increase in droughts. Direct effects from the reduction in precipitation in the area would result in a lower risk for high volumes of water to flow through the reservoir and over the spillway.

The reduction of precipitation in the watershed upstream of the reservoir may result in the decline of vegetation. This decline could indirectly impact the reservoir by causing slopes and stream banks to become unstable and erode during high-volume precipitation events, which could lead to an increase in sediment accumulation in the reservoir and a decrease in the life of the Project.

There are no cumulative effects from climate change to the Project.

4.3 Air Quality

No Action

Air quality would experience temporary direct effects from Sponsor implemented modifications to the dam.

There would be no indirect or cumulative effects to air quality.

Dam Rehabilitation

Construction activities would temporarily emit several air pollutants. PM10 emissions are associated with the dust created from demolition, land clearing, ground excavation, cut-and-fill operations, and road construction. All other pollutants (PM2.5, CO, SOx, NOx, MSAT, and GHG) are generated from heavy-duty diesel engines used by the construction equipment. Construction emissions are greatest during the earthwork phases because of the dust associated with this activity. Fugitive dust can also be produced by winds blowing through the construction site and by trucks carrying uncovered loads. Additionally, mud tracked out onto paved roads leading to and from the construction site creates a source of fugitive dust (i.e., road dust) after it dries.

Emissions from trucks and construction equipment powered by heavy duty diesel engines would be temporary and concentrated around the construction site. Delays associated with travel through construction zones would increase emissions from on-road vehicles. However, these temporary delays would likely only result in a small amount of additional pollutant emissions when compared with the usual traffic experienced around the construction site.

Fugitive dust, MSAT, and GHG emissions increases associated with construction would be minimized by implementation of applicable BMPs. These include the following:

- Spraying the soil on-site with water, or other similar approved dust suppressant/soil binder.
- Wetting materials hauled in trucks, providing adequate freeboard (space from the top of the material to the top of the truck), or covering loads to reduce emissions during material transportation/handling.
- Providing a stabilized construction entrance (track-out pad), wheel washers and/or other similar BMPs at construction site accesses to reduce track-out of site materials onto the adjacent roadway network.
- Removing tracked-out materials deposited onto adjacent roadways.
- Wetting material stockpiles to prevent wind-blown emissions.
- Establishing vegetative cover on bare ground as soon as possible after grading to reduce wind-blown dust.
- Requiring appropriate emission-control devices on all construction equipment.
- Requiring the use of cleaner burning fuels.
- Using only properly operating, well-maintained construction equipment.

There would be no indirect or cumulative effects to air quality.

4.4 Plants

4.4.1 Vegetation Communities

No Action

The No Action Alternative would impact vegetation in the project area. Utah Dam Safety mandated rehabilitation construction activities would disturb vegetation including any areas altered from construction as well as temporary disturbance from staging and access during construction. Temporary construction-related impacts would be short term in duration and temporary measures would be removed at the end of the project.

There are no indirect or cumulative effects anticipated.

Dam Rehabilitation—Spillway Replacement

Approximately 11.8 acres of vegetation consisting of upland, riparian and wetland vegetation types would be permanently cleared to account for the increase in dam size, the safety zone at the base of the dam, the rise in water surface elevation, and the new gravel parking area at the base of the dam (Appendix C-Map 14). Rehabilitation of the dam would require clearing of vegetation at the downstream toe of the dam and around the reservoir in order to allow for additional structural fill placement and to meet dam safety criteria. These trees would be cut and either given to the USFS for use in other UWCNF restoration projects or chipped on-site and spread on the disturbed portions of the site to protect the bare ground from erosion until native vegetation reestablishes. No woody vegetation would be allowed to grow on the dam for dam safety purposes.

Approximately 2.7 acres of vegetation would be temporarily cleared for construction staging/proposed borrow area 2 (Appendix C-Map 14). Temporarily disturbed vegetation would be restored using native plant species. During construction and until the restoration area is fully established, it would be maintained on a regular basis to prevent the establishment of noxious weeds and invasive plant species. Non-desirable plant species would be controlled by cleaning equipment prior to delivery to the project site, eradicating them before the start and during construction as discovered, and routine monitoring after construction completion.

4.4.2 Riparian Areas

No Action

No Action Alternative would not impact riparian communities in the project area.

Dam Rehabilitation—Spillway Replacement

Rehabilitation of the dam would include permanent vegetation in areas between the existing and proposed normal pool elevations. This would include permanent removal of approximately 2.1 acres of riparian vegetation which is also located within the USFS designated RHCA (Appendix C-Map 14). Approximately 100 linear feet of riparian vegetation would also be permanently removed downstream of the dam to allow for extension of the principal spillway and new stilling basin.

4.4.3 Special Status Plant Species

No Action

No Action Alternative would not impact special status plant species as special status plant species were not documented to occur within the project area.

Dam Rehabilitation—Spillway Replacement

Rehabilitation of the dam would not impact special status plant species as special status plant species were not documented to occur within the project area.

4.4.4 Threatened and Endangered Plant SpeciesNo Action

No Action Alternative would not impact threatened and endangered plant species as they are not expected to occur within the project area. A BE has been conducted for the project which concluded that there would be no effect to threatened or endangered species listed for Utah County. A copy of the BE letter has been included in Appendix E. USFWS has indicated that as a federal agency the USDA-NRCS is able to make a no effect determination without their concurrence. An email response from the USFWS has been included in Appendix A.

Dam Rehabilitation—Spillway Replacement

Rehabilitation of the dam would not impact threatened and endangered plant species as they are not expected to occur within the project area. A BE has been conducted for the project which concluded that there would be no effect to threatened or endangered species listed for Utah County. A copy of the BE letter has been included in Appendix E. USFWS has indicated that as a federal agency the USDA-NRCS is able to make a no effect determination without their concurrence. An email response from the USFWS has been included in Appendix A.

4.4.5 Noxious Weeds and Invasive Plant Species

The project area is in a location where invasive plant species, or “noxious weeds”, are known to occur or where risk of an invasion exists. A disturbed area, such as a construction site with access roads, would be considered an area at risk.

No Action

This alternative would put the project area at risk for future invasion of noxious weeds.

Dam Rehabilitation—Spillway Replacement

This alternative would put the project area at risk for future invasion of noxious weeds. Construction BMPs would be implemented to minimize the short-term impacts associated with ground disturbance.

During construction activities, area roads would be utilized by trucks and equipment to access the site; however, implementation of construction BMPs would minimize the potential for transport of invasive plants into the area. During construction and until the restoration area is fully established, it would be maintained on a regular basis to prevent the establishment of noxious weeds and invasive plant species. Non-desirable plant species would be controlled by cleaning equipment prior to delivery to the project site, eradicating them before the start and during construction as discovered, and routine monitoring after construction completion.

That information will be utilized to develop a Post Construction Site Rehabilitation Plan. The Plan will include mechanisms for addressing weed establishment and treatment. Long-term negative impacts will be managed with re-planting, and various methods of weed control.

4.5 Animals

4.5.1 Fish

No Action

This alternative would not have direct or cumulative effects to fish species over the long term for the project. Indirect effects include a continued decrease in available fish habitat as the reservoir continued to fill with sediment.

Dam Rehabilitation—Spillway Replacement

Rehabilitation of the dam would have a direct beneficial impact to fish and associated habitat by increasing the reservoir size adding 11.8 acres of additional available fish habitat. Indirect or cumulative effects to fish species are not anticipated over the long term for the project. During construction in 2016, the reservoir would not be stocked by the Utah Department of Wildlife Resources. Fish present in the reservoir would be salvaged and transplanted downstream of the dam once the water level is lowered to the low-level outlet and prior to the start of the dam rehabilitation. Water in Tibble Fork Reservoir would be pumped/bypassed around the dam during construction so that American Fork River downstream of the dam does not become dry and negatively impact fish. A screen would also be placed upstream of the reservoir to prevent fish from swimming downstream to the pump/bypass system and thus becoming entrained. There would be no effect to special-status fish species.

4.5.2 Wildlife

No Action

Sponsor implemented rehabilitation of the dam would directly and indirectly affect wildlife species during construction. Temporary direct construction effects would include wildlife dispersal from the area surrounding Tibble Fork Dam; however, this dispersal is not expected to adversely affect wildlife in the area. Special-status species and MIS would temporarily experience direct and indirect effects during construction. There would be no permanent direct, indirect or cumulative effects to these wildlife species after construction is complete.

Dam Rehabilitation—Spillway Replacement

Rehabilitation of the dam would directly and indirectly affect wildlife species. Approximately 11.8 acres of vegetation would be permanently and approximately 2.7 acres of vegetation would be temporarily disturbed during construction for this alternative. Of the areas of vegetation being removed, only approximately 4.5 acres consists of suitable habitat for wildlife. This suitable habitat represents only 0.02% of the Tibble Fork Watershed. Thus, construction activities are not expected to impact large amounts of habitat within the UWCNF or to cause a loss of occupancy by special-status species or MIS.

Temporary construction activities may cause wildlife dispersal from the area surrounding Tibble Fork Dam; however, this dispersal is not expected to adversely affect wildlife in the area. Special-status species and MIS would temporarily experience direct and indirect effects during construction. There would be no permanent direct, indirect or cumulative effects to these wildlife species after construction is complete.

4.5.3 Threatened and Endangered Species

No Action

The No Action Alternative would not impact Federally-listed animal species that occur within Utah County as habitat for the listed species does not exist within the project area and/or there is no known occurrence of the species within one mile of the project area. A BE has been conducted for the project which concluded that there would be no effect to threatened or endangered species listed for Utah County.

A copy of the BE letter has been included in Appendix E. USFWS has indicated that as a federal agency the USDA-NRCS is able to make a no effect determination without their concurrence. An email response from the USFWS has been included in Appendix A.

Dam Rehabilitation

The Dam Rehabilitation Alternatives would not impact Federally-listed animal species that occur within Utah County as habitat for the listed species does not exist within the project area and/or there is no known occurrence of the species within one mile of the project area. A BE has been conducted for the project which concluded that there would be no effect to threatened or endangered species listed for Utah County. A copy of the BE letter has been included in Appendix E. USFWS has indicated that as a federal agency the USDA-NRCS is able to make a no effect determination without their concurrence. An email response from the USFWS has been included in Appendix A.

4.5.4 Migratory Birds/Bald and Golden Eagles

No Action

It is unlikely that construction activities would impact the habitat or nest sites of birds protected by the Migratory Bird Treaty Act. Utah Dam Safety mandated rehabilitation activity impacts include construction noise, increased human activity, and heavy equipment operations, all of which may temporarily disrupt wildlife activities.

Dam Rehabilitation—Spillway Replacement

This alternative would not have a direct impact on migratory birds or bald and golden eagles. The rehabilitation alternative would impact the riparian zone of the project area, which may then result in the unintentional “take” to a potential bird, eagle, nest, or egg. Approximately 4.5 acres of habitat consisting of riparian, adjacent upland and upland stands of trees would be removed for this alternative.

It is unlikely that clearing and grubbing activities would impact the nest sites of birds protected by the Migratory Bird Treaty Act. Temporary construction-related effects also include construction noise, increased human activity, and heavy equipment operations, all of which may temporarily disrupt wildlife activities. During construction activities, water quality of the Green River could be impacted due to an accumulation of sediment; however, implementation of construction BMPs would minimize this potential. This could have a temporary impact on the habitat and foraging and nesting capabilities in the short term.

Executive Order 13186, issued on January 11, 2001, affirmed the responsibilities of Federal agencies to comply with the MBTA. To ensure ground-disturbing activities do not result in the “take” of an active nest or migratory bird protected under the MBTA:

- Any groundbreaking activities or vegetation treatments should be performed before migratory birds begin nesting or after all young have fledged to avoid take;
- If activities must be scheduled to start during the migratory bird breeding season, you should take appropriate steps to prevent migratory birds from establishing nests in the potential impact area. These steps could include covering equipment and structures and use of various excluders (e.g., noise). Birds can be harassed to prevent them from nesting on the site.
- If activities must be scheduled during the migratory bird breeding season, a site specific survey for nesting birds should be performed starting at least two weeks prior to vegetation treatments. Established nests with eggs or young cannot be moved, and the birds cannot be harassed, until all young have fledged and are capable of leaving the nest site;

- If nesting birds are found during the survey, appropriate spatial buffers should be established around nests. Vegetation treatments within the buffer areas should be postponed until the birds have left the nest. Confirmation that all young have fledged should be made by a qualified biologist.

4.6 Human Environment

4.6.1 Cultural/Historic Resources

To comply with Section 106 of the NHPA, a Cultural Resources Survey was completed for the Tibble Fork Dam Rehabilitation and submitted to the SHPO in October 2013. The report concluded that the proposed project activities would have no effect on any significant cultural resources located within the Area of Potential Effect (APE). A concurrence letter from the SHPO, dated October 31, 2013, concurred with the determination and effect for the proposed undertaking. A copy of the SHPO concurrence has been included as an attachment in Appendix A.

No Action

There are no observed cultural/historical resources located in the project area. Mandated dam rehabilitation would have no effect on historical structures, places or sites, or potentially eligible archeological sites. In the event that cultural/archeological resources are found during construction activities, construction would stop, and the appropriate agencies would be notified.

Dam Rehabilitation—Spillway Replacement

There are no observed cultural/historical resources located in the project area. Dam rehabilitation would have no effect on historical structures, places or sites, or potentially eligible archeological sites. In the event that cultural/archeological resources are found during construction activities, construction would stop, and the appropriate agencies would be notified.

4.6.2 Land Use and Recreation

No Action

Sponsor implemented rehabilitation of the dam would consist of temporary direct impacts during construction. There would be no direct, indirect, or cumulative effects to land use from dam rehabilitation. Overall, recreationists would not be allowed to use the areas listed in this chapter during construction because they would be closed or have restricted access during construction. Recreationists would be displaced primarily to the Silver Lake Flat Reservoir area or would not recreate in the North American Fork watershed basin. Access to Silver Lake Flat Reservoir may also have associated delays due to construction.

Trails: There would be no direct, indirect or cumulative impacts to the trails located in the vicinity of the project.

Trailheads: Direct impacts to trailheads in the project vicinity include limited access to the Tibble Fork Trailhead during construction activities. Depending on the access required by construction equipment, this trailhead may also be temporarily displaced further upland in order to maintain access to the trailhead during construction. Impacts are anticipated to last through the duration of construction at the dam approximated at 120 days.

Campgrounds: There would be cumulative impacts to Granite Flat Campground. Direct effects would include increased travel time for campers to the campground from Tibble Fork Reservoir due to construction vehicle flaggers regulating the flow of traffic. The campgrounds along American Fork Canyon Road would experience increases in construction traffic during the day, possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in these areas. Impacts from increased traffic is anticipated to last through the duration of construction at the dam estimated to be 120 days.

Summer Homes: The private residences in the Tibble Fork Summer Homes area would not experience indirect or cumulative impacts from dam rehabilitation. Direct effects would include increased travel time for residents to their homes from Tibble Fork Reservoir due to construction vehicle flaggers regulating the flow of traffic. Impacts from increased traffic is anticipated to last through the duration of construction at the dam estimated to be 120 days.

Parking Areas: The Tibble Fork parking area would experience an increase in traffic from construction vehicles and dump trucks during construction. However, this increase in traffic might be offset by public awareness of the construction activities and a consequent reduction in recreationists visiting the area. Impacts from increased traffic is anticipated to last through the duration of construction at the dam estimated at 120 days.

There would be no indirect or cumulative impacts to parking areas.

Reservoirs: The reservoir would remain open to the public during construction. This area would experience indirect effects from the increase in construction traffic during the day, possibly elevating the level of traffic congestion. Impacts from increased traffic is anticipated to last through the duration of construction at the dam estimated at 120 days.

There would be no cumulative impacts to reservoirs.

Parklands and National Monuments: The Timpanogos Cave is located on the American Fork Canyon Road approximately three miles down the road from Tibble Fork Dam. This area would experience

indirect effects from the increase in construction traffic during the day, possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in this area and would also be prohibited to use noise making compression brakes within ½ mile of the monument.

There would be no direct or cumulative impacts to national monuments.

Day-Use Sites: These picnic areas would experience increases in construction traffic during the day possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in these areas. There may be increased use of these sites during the reservoir drawdown.

There would be no direct or cumulative impacts to day-use sites.

Recreation Opportunity Spectrum: There would be no direct effects to the ROS parameters outlined by the UWCNF (USFS 2002a and 2002c).

There would be no indirect or cumulative impacts to the ROS.

Visual Quality Objectives: There would be no direct effects to the VQO parameters outlined by the UWCNF (USFS 2002b).

There would be no indirect or cumulative impacts to VQO.

Holidays: The UWCNF experiences increased numbers of recreationists during holidays and weekends. Construction would limit direct effects by not occurring during official holidays including Memorial Day, 4th of July, Pioneer Day, and Labor Day.

There would be no indirect or cumulative impacts to holidays.

Dam Rehabilitation—Spillway Replacement

Rehabilitation of the dam would consist of temporary direct temporary impacts from May through November in 2016. There would be no direct, indirect, or cumulative effects to land use from dam rehabilitation. Overall, recreationists would not be allowed to use the areas listed in this chapter during construction because they would be closed or have restricted access during construction. Recreationists would be displaced primarily to the Silver Lake Flat Reservoir area or would not recreate in the North American Fork watershed basin. Access to Silver Lake Flat Reservoir may also have associated delays due to construction. There would be a beneficial impact to recreation after construction completion from the increase in recreational fishing area of the reservoir and additional parking spaces.

Trails: A portion of Trail No. 237 adjoining the new roundabout would be temporarily inaccessible for approximately 60 days during construction of the roundabout. There would be no direct, indirect or cumulative impacts to any other trails located in the vicinity of the project.

Trailheads: Direct impacts to trailheads in the project vicinity include limited access to the Tibble Fork Trailhead during construction activities. Depending on the access required by construction equipment, this trailhead may also be temporarily displaced further upland in order to maintain access to the trailhead during construction. Temporary limited access and displacement upland is anticipated for approximately 120 days during construction.

Campgrounds: There would be cumulative impacts to Granite Flat Campground. Direct effects would include increased travel time for campers to the campground from Tibble Fork Reservoir due to construction vehicle flaggers regulating the flow of traffic. The campgrounds along American Fork

Canyon Road would experience increases in construction traffic during the day, possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in these areas. Impacts from construction traffic is anticipated to last through the duration of construction at the dam (180 days).

Summer Homes: The private residences in the Tibble Fork Summer Homes area would not experience indirect or cumulative impacts from dam rehabilitation. Direct effects would include increased travel time for residents to their homes from Tibble Fork Reservoir due to construction vehicle flaggers regulating the flow of traffic. Impacts from construction vehicle flagging delays is anticipated to last through the duration of construction at the dam (180 days).

Parking Areas: The Tibble Fork parking areas would experience an increase in traffic from construction vehicles and dump trucks during construction. However, this increase in traffic might be offset by public awareness of the construction activities and a consequent reduction in recreationists visiting the area. Impacts from increase traffic is anticipated to last through the duration of construction at the dam (180 days). After construction completion the available parking stalls for recreationists would be increased. Additionally a new gravel parking area would allow for additional parking for recreationists below the dam.

There would be no indirect or cumulative impacts to parking areas.

Reservoirs: Tibble Fork Reservoir would be partially drained during construction and water would be pumped around the dam in order to maintain flows within American Fork River. The public would not be allowed to enter the reservoir area during construction. It is anticipate that the reservoir would be temporarily closed for approximately 150 days for construction activities. The temporary draining of the reservoir may indirectly cause an increase in public use at Silver Lake Flat Reservoir. This alternative proposes to increase the reservoir size by 8.3 acres increasing the recreational fishing area of the reservoir.

There would be no cumulative impacts to reservoirs.

Parklands and National Monuments: The Timpanogos Cave is located on the American Fork Canyon Road approximately three miles down the road from Tibble Fork Dam. This area would experience indirect effects from the increase in construction traffic during the day, possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in this area and would also be prohibited to use noise making compression brakes within ½ mile of the monument. Increased construction traffic is anticipated for the duration of project construction or approximately 180 days.

There would be no direct or cumulative impacts to national monuments.

Day-Use Sites: These picnic areas would experience increases in construction traffic during the day possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in these areas. Increased construction traffic is anticipated for the duration of project construction or approximately 180 days. Anticipate increased use of these areas during the reservoir drawdown.

There would be no direct or cumulative impacts to day-use sites.

Recreation Opportunity Spectrum: There would be no direct effects to the ROS parameters outlined by the UWCNF (USFS 2002a and 2002c).

There would be no indirect or cumulative impacts to the ROS.

Visual Quality Objectives: There would be no direct effects to the VQO parameters outlined by the UWCNF (USFS 2002b).

There would be no indirect or cumulative impacts to VQO.

Holidays: The UWCNF experiences increased numbers of recreationists during holidays and weekends. Construction would limit direct effects by not occurring during official holidays including Memorial Day, 4th of July, Pioneer Day, and Labor Day.

There would be no indirect or cumulative impacts to holidays.

4.6.3 Noise/Light

No Action

Sponsor implemented dam rehabilitation would involve the direct use of heavy construction equipment and would require trucks for hauling and disposal of material. These activities would temporarily adversely affect noise and light in the project area.

There would be no indirect or cumulative effects to air quality, noise or light.

Dam Rehabilitation—Spillway Replacement

Dam rehabilitation would involve the direct use of heavy construction equipment and would require trucks for hauling and disposal of material. These activities would temporarily adversely affect noise and light in the project area.

There would be no indirect or cumulative effects to air quality, noise or light.

4.6.4 Transportation/Infrastructure

No Action

Direct short-term temporary impacts are expected from vehicular traffic increases due to construction equipment transportation vehicles and dump trucks that travel on the American Fork Canyon Road and North American Fork Canyon Road. This increase in construction traffic would be temporary, but may deter the general public from traveling on these roads during days of construction operation. Any necessary upgrades to roads to allow for construction equipment access to Tibble Fork Dam would be left in-place upon construction completion.

Dam Rehabilitation—Spillway Replacement

Rehabilitation of the dam would be performed starting in May and ending in November of 2016, weather permitting. Preliminary estimates indicate that around 20 trucks per day (6 days a week), mostly during daylight hours, would be required at the site during construction of the rehabilitation project in order to complete the project in the 2016 construction season. Allowing construction and truck travel 6 days per week would allow the project to be constructed in one season instead of two, reducing the impacts to transportation and recreation in the vicinity of Tibble Fork Dam.

Direct short-term temporary impacts are expected from vehicular traffic increases due to construction equipment transportation vehicles and dump trucks that travel on the American Fork Canyon Road and North American Fork Canyon Road. This increase in construction traffic would be temporary, but may deter the general public from traveling on these roads during days of construction operation. Any necessary upgrades to roads to allow for construction equipment access to Tibble Fork Dam would be left

in-place upon construction completion. Upon project completion, vehicle traffic may increase to the Tibble Fork area, resulting in indirect effects to the surrounding UWCNF.

Flaggers would be utilized to control construction traffic, as well as traffic from the general public. A Traffic Control Plan would be prepared in coordination with the USFS to address construction related traffic within the UWCNF.

4.6.4.1 Roadless Area

No Action

There would be no direct, indirect or cumulative effects to roadless areas from Sponsor implemented dam rehabilitation.

Dam Rehabilitation—Spillway Replacement

Depending on access available to construction vehicles, there may be a direct impact to roadless areas due to the need for temporary access roads. The construction of a temporary road is allowed in a Roaded Modified Area of the UWCNF (USFS 2003a and 2003b). This road would require clearing vegetation and establishing a stable surface upon which to drive equipment. The general public would not be allowed to travel on this temporary road. Upon construction completion, this road would be decommissioned and would be classified as an area without any “improved road maintained for travel by standard passenger type vehicles”, in order to maintain compliance with the Uinta National Forest Land and Resource Management Plan (USFS 2003a).

The existing Summer Home access road on top of the dam would be relocated to the stability berm which is located in the roadless area.

Impacts to roadless areas must be analyzed using nine characteristics according to the Uinta National Forest Land and Resource Management Plan (USFS 2003a). This analysis is presented below and is a summary of other sections of this chapter.

- **Soil, Water, and Air:** Soil on the face of the existing dam would be disturbed insofar as new compacted fill lifts would be placed on the dam in order to affect a dam raise. Temporary improvements to allow construction traffic would be made to the ground surface. Impacts to these resources are identified in Chapters 4.2 and 4.4. There would be no disturbance to air.
- **Sources of Public Drinking Water:** There are no sources of public drinking water within the roadless modification area.
- **Diversity of Plant and Animal Communities:** Impacts to plant and animal communities would be negligible and modifications to the roadless area would not impact their diversity.
- **Primitive, Semi-Primitive Non-Motorized, and Semi-Primitive Motorized Classes of Recreation Opportunities:** The creation of a road in the roadless area would be temporary and not be open to the general public. The road would be decommissioned upon construction completion.
- **Reference Landscapes:** There would be no impact to reference landscapes within the roadless area from the creation of a temporary road.
- **Landscape Character and Scenic Integrity:** There would be visible alteration to the landscape character and scenic integrity of the area from the creation of a temporary road. However, upon project completion, every effort would be made to restore the disturbed area to its natural condition upon decommissioning (e.g., revegetation).
- **Traditional Cultural Properties, Sacred Sites, and National Register Areas:** There would be no impacts to cultural sites because there are none located within the project boundary.
- **Other Locally Identified Unique Characteristics:** This project would not affect the Lone Peak Wilderness Area.

- Adjacency, Content, Size, and Shape: Impacts to the roadless area would be temporary and the general public would not be allowed to use this area. There would be no noticeable long-term impacts to the adjacency, content, size, and shape of the overall roadless area.

There are no indirect or cumulative effects to this roadless area from the installation of the temporary access road or a new road on the stability berm.

4.6.5 Socioeconomics

No Action

Sponsor implemented dam rehabilitation would continue to provide direct and indirect socioeconomic benefits due to continued flood protection. Socioeconomic benefits would also be incurred due to additional employment requirements for one year during the dam rehabilitation. Rehabilitation of the dam would reduce the threat of dam failure and the associated socioeconomic hardships that might occur.

There are no cumulative effects to socioeconomics from dam rehabilitation.

Dam Rehabilitation—Spillway Replacement

Dam rehabilitation would continue to provide direct and indirect socioeconomic benefits due to continued flood protection, and sediment retention. Socioeconomic benefits would also be incurred due to additional employment requirements for one year during the dam rehabilitation. Rehabilitation of the dam would reduce the threat of dam failure and the associated socioeconomic hardships that might occur.

There are no cumulative effects to socioeconomics from dam rehabilitation.

4.6.6 Demographics

No Action

There would be no direct, indirect or cumulative impacts to demographics from Sponsor implemented dam rehabilitation.

Dam Rehabilitation—Spillway Replacement

There would be no direct, indirect or cumulative impacts to demographics from dam rehabilitation.

4.6.7 Land Rights

No Action

A new Special Use Permit(s) or a modification to the existing permit from the USFS would be required for specific rehabilitation actions of this alternative.

Land rights would not experience indirect or cumulative effects from dam rehabilitation.

Dam Rehabilitation—Spillway Replacement

A new Special Use Permit(s) or a modification to the existing permit from the USFS would be required for dam rehabilitation construction activities, increased reservoir surface water elevation, road improvements, and staging area use outside of the project footprint.

Land rights would not experience indirect or cumulative effects from dam rehabilitation.

4.6.8 Agricultural Lands

No Action

Agricultural lands would continue to receive the same level of flood protection and would not experience direct, indirect or cumulative effects from Sponsor dam rehabilitation.

Dam Rehabilitation—Spillway Replacement

Agricultural lands would continue to receive the same level of flood protection and would not experience direct, indirect or cumulative effects from dam rehabilitation.

4.6.9 Natural Areas, Parklands and Forest Resources

No Action

The closest natural area to the project area is the Lone Peak Wilderness, located approximately 1,300 feet to the west. The project area is located within the Uinta National Forest. Impacts to natural areas, parklands or forest resources are not anticipated.

Dam Rehabilitation—Spillway Replacement

The closest natural area to the project area is the Lone Peak Wilderness, located approximately 1,300 feet to the west. Impacts to the natural area are not anticipated for this alternative as construction activities or staging would not be performed in the natural area.

The project area is located within the Uinta National Forest and the dam rehabilitation would adhere to the 2003 Uinta National Forest Land and Resource Management Plan (USFS 2003a). Impacts to Parklands and Forest Resources are not anticipated.

4.6.10 Visual Quality, Aesthetics and Scenic Beauty

No Action

Sponsor implement rehabilitation of the dam would consist of modifying the dam in its general location. There would be temporary direct effects to visual quality, aesthetics and scenic beauty from the construction on the dam and equipment. Upon construction completion, the changes in the dam and reservoir would be negligible and would likely not impact the visible character of the area.

There are no indirect or cumulative impacts to aesthetic resources from dam rehabilitation.

Dam Rehabilitation—Spillway Replacement

Rehabilitation of the dam would consist of adding additional riprap of varying shapes (angular and round) and color (gray and whitish) to the upstream embankment, raising the dam by up to 12 feet, clearing of vegetation downstream of the dam to accommodate for the additional fill, and inundating previously unwetted area around the reservoir. There would be temporary direct effects to visual quality, aesthetics and scenic beauty from the construction on the dam and equipment from May through November in 2016. Upon construction completion, the changes in the existing dam and reservoir would be negligible and would likely not impact the visible character of the area.

There are no indirect or cumulative impacts to aesthetic resources from dam rehabilitation.

4.6.11 Public Health and Safety

No Action

This alternative would have no direct impact on public health and safety. NUCWCD would operate the debris basin “as is” until Utah Dam Safety mandates rehabilitation for this alternative. Until Utah Dam Safety mandates rehabilitation, indirect impacts from a flood event have a higher probability to occur as the current dam “as is” does not meet current USDA-NRCS and Utah State Dam Safety regulations (UDWRt 2014) and current engineering standards (USDA-NRCS 2005). Indirect impacts including loss-of-life or property have a higher probability of occurring for this alternative.

Dam Rehabilitation

Rehabilitating the dam would reduce the hazard potential for the loss-of-life hazard to the public located in the breach inundation zone. The dam would be capable of passing the PMP event safely and would also help temporarily reduce the flood effects from the PMP event in the watershed.

There are no indirect or cumulative effects to public health and safety from rehabilitating the dam.

4.7 Past, Present, and Reasonably Foreseeable Actions

Past: Silver Lake Dam upstream of Tibble Fork Dam was rehabilitated in summer 2012. Rehabilitation actions included stabilizing the dam structure to keep a constant water surface elevation year-round. Construction was performed by hand since Silver Lake Dam is located within the Lone Peak Wilderness area and motorized vehicles are not allowed. Equipment was transported to and from the site via helicopter for one day at the beginning and one day at the end of construction. This project did not have any impacts to resources of concern within the Tibble Fork Dam project area.

Present: There are no projects presently occurring within the vicinity of Tibble Fork Dam that could impact to resources of concern within the Tibble Fork Dam project area.

Future: Silver Lake Flat Dam upstream of Tibble Fork Dam has been identified as not meeting current USDA-NRCS and Utah State Dam Safety regulations (UDWRi 2014) and engineering standards (USDA-NRCS 2005) associated with a high hazard dam. USDA-NRCS is in the process of developing the final design for the project and construction is expected to occur in summer 2015. This project is not anticipated to have any impacts to resources of concern within the Tibble Fork Dam project area.

4.8 Risk and Uncertainty

A variety of factors contribute to the potential for dam failure, including the intensity of a storm event, construction materials and techniques, and operation and maintenance (O&M) activities. Tibble Fork Dam has operated for 47 years with few problems and the NUCWCD has a great record in performing maintenance as needed and operating the dam as designed. There is no unusual risk or uncertainty related to the operation of Tibble Fork Dam, and operation and maintenance for the dam is expected to continue as intended whether the dam is rehabilitated or not. Dams are inherently hazardous structures, but with rehabilitation and continued maintenance Tibble Fork Dam should continue to provide flood protection, sediment storage and recreation with an incidental benefits to irrigation for 59 years starting in 2017.

Estimating project costs and benefits involves a certain degree of risk and uncertainty. Since the project is located in the UWCNF, land use is not expected to change from existing conditions as described in the Uinta National Forest Land and Resource Management Plan (USFS 2003a). During the aging dam rehabilitation planning process, decisions are made with information that is uncertain, including errors in

measurements and climatic changes that could alter rainfall storm events. Assumptions made during the planning process are based on the best available science, technology, and information. Extended delays between the planning process and construction increase the degree of risk and uncertainty. Estimated project costs are based on computed work quantities multiplied by the appropriate unit cost for that type of work. Unit costs are based on current market prices from similar projects. Costs can be influenced by economic factors that cannot be predicted between the planning process and construction, which could increase the actual cost and decrease the availability of materials.

Economic benefits from projects are based on material values of floodplain property, infrastructure, and agricultural land. Such property is expected to become more valuable in the future, but it can be difficult to predict future economic conditions. There is also uncertainty in estimating the social and environmental costs associated with each alternative because interested party values, judgments and opinions may shift over time.

CHAPTER 5.0

CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

5.1 Consultation

USFWS

The USFWS was invited to comment on the project during the Scoping and Draft Plan-EA comment periods but no comments were received for the project. USDA-NRCS submitted a No Effect Biological Evaluation letter to USFWS on July 21, 2014. USFWS responded via email on July 25, 2014 (Appendix A) stating that USDA-NRCS does not need a concurrence for No Effect determinations. A response was not received regarding the No Effect Biological Evaluation letter and this completes USDA-NRCS informal Section 7 consultation with the USFWS.

Since there are no ESA listed species anticipated to be impacted by project activities, the USFWS was not invited to become a NEPA Cooperating Agency on the project.

UDWR

The UDWR was invited to comment on the project during the Scoping and Draft Plan-EA comment period. Comments were received during the Draft Plan-EA comment period regarding water rights and the conservation pool for the permanent fishery in the reservoir. UDWR also recommended that a gate or maintained road be included in the project to allow maintenance truck access to the reservoir for fish stocking. They also commented that the planned parking spaces are inadequate and should be readdressed. Consultation with UDWR will be on-going throughout the final design process.

Utah SHPO

USDA-NRCS has coordinated with Utah SHPO regarding the project under Section 106 formal consultation (Utah State Antiquities Project Number: U-12-XN-1052f). The report prepared for the project (Native-X 2013) describing the results of the literature review and pedestrian survey concluded that there are no cultural or historical sites within the Preferred Alternative Work Area. The report was submitted to Utah SHPO and other consulting parties in October 2013 for a concurrence on the determination of no effect to historic properties or cultural resources. Utah SHPO issued a formal concurrence letter on October 31, 2013 (Utah Division of State History 2013) and this letter is presented in Appendix A. A formal comment letter was sent to the Ute Indian Tribe of the Uintah & Ouray Reservation requesting concurrence on October 31, 2013. No comments were received from the Tribes. Section 106 Consultation with SHPO has been completed for the project.

USACE

The USACE has jurisdiction over work in waters of the U.S. under Section 404 of the Clean Water Act. The Preferred Alternative would require work within jurisdictional waters of the U.S. Precursory discussions with USACE regarding project impacts to jurisdictional waters of the U.S. have identified that there will be impacts associated with the Preferred Alternative described in this Final Plan-EA. Further coordination with the USACE will be performed as the project progresses.

An official invitation for the USACE to become a Cooperating Agency on the project was sent to them on January 6, 2014. The USACE responded on March 5, 2014 (Appendix A) via email that they are not interested in becoming a NEPA Cooperating Agency on the project since there will be minimal impacts to waters of the U.S. and the project is being analyzed as an EA (USACE 2014).

5.2 Coordination

The NUCWCD requested financial assistance from the USDA-NRCS through Standard Form 424—Application for Federal Assistance in September 2009. Initial coordination was conducted between the NUCWCD, USDA-NRCS, and the USFS regarding the project and the proposed rehabilitation activities. Meetings were conducted with the USFS NEPA and resource specialists to discuss the project and identify potential concerns related to the project and the results of these meetings and discussion have been incorporated into this Final Plan-EA.

5.3 Public Participation

5.3.1 Scoping

Project scoping questions, comments and concerns were requested from the public and government agencies during the preliminary scoping period, both orally at public meetings and via written submittal of comments. The main goal of public participation during the scoping period was to involve a diverse group of public and government agency participants to solicit input and provide timely information regarding their concerns for the project. Outreach to all members of the public included the following as outlined in the Scoping Report attached in Appendix E:

- Notice published in the Daily Herald Newspaper
- Notice posted on the USDA-NRCS project website
- 123 mailings of Notice were sent to government agencies
- 52 mailings of Notice were sent to the public

In addition to the outreach outlined in the Scoping Report and listed above, a notice was also posted on the USFS website and at Tibble Fork Reservoir.

A scoping notice was prepared and sent to interested parties and regulatory agencies on April 11, 2012. The list of recipients, as presented in Chapter 9.0, was prepared by both the USDA-NRCS and USFS. The scoping notice gave a description of the project, location and overview, purpose and need, identified preliminary scoping issues, and requested public participation. The scoping notice also identified the location of the public meeting, contact information to submit written comments, and the scoping period closure date. Two public notices were posted in the Utah County Daily Herald newspaper on January 10 and January 13, 2013 announcing the project and public meeting. The scoping notices were also posted to the USDA-NRCS website (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/ut/programs/planning/wr/>) to make it available for public review on the internet. One combined agency and public scoping meeting was conducted on January 17, 2013 and there was ten (10) non-project staff attendance at the meeting.

The scoping period officially opened on December 31, 2012 and ended on January 31, 2013 for a total of 31 days. Written comments could have been submitted via mail, e-mail, facsimile, or comment card, and oral comments could have been submitted at the scoping meeting. There were 7 written comments and 0 oral comments received for Tibble Fork Flat Dam Rehabilitation project during the scoping period and these comments are located in Appendix E-Scoping Report.

5.3.2 Public Outreach Activities

Table 5-1 lists the project's public outreach activities. The public was notified of each activity listed below and provided with opportunities to comment on the project.

Table 5-1. Public Outreach Activities

Date	Purpose	Type
December 31, 2012	Scoping – Public Comment Period Open	Scoping Notice Mailed and Posted to Website, Posters Displayed at the project site
January 10, 2013 & January 13, 2013	Scoping Notice Published	Notice Published in the Provo Daily Herald Newspaper
January 17, 2013	Scoping Meeting	Public Meeting Held
January 31, 2013	Scoping Period Closed	
July 24 – August 22, 2014	Draft Plan-EA Public Comment Period	Mailed, published in local newspapers, posted at library, posted at project site
July 31, 2014	Draft Plan-EA Public Meeting	Public Meeting Held at the Pleasant Grove Recreation Center
January 2015	Final Plan-EA	Posted to website

5.3.3 Draft Plan-EA Public Comment

A public notice of availability of the Draft Plan-EA was mailed to interested parties on July 22, 2014, published in the local newspaper (The Provo Daily Herald) and posted to the NRCS project website on July 24, 2014. The Draft Plan-EA was released for public review and comment via the website and hard copies of the Draft Plan-EA were sent to Alpine City Hall for viewing on July 24, 2014. One public Draft Plan-EA meeting was conducted on July 31, 2014 at Pleasant Grove Recreation Center. There were 2 non-project staff in attendance at the meeting.

The public comment period was open for a total of 30 days. Comments received by the close of the comment period were considered in preparing this Final Plan-EA for NRCS's Preferred Alternative. Official comments received are included in Appendix A. A summary of comments received and how they were addressed is included in Table 5-2 below.

Table 5-2. Draft Plan-EA Comment Summary

Commenter	Comment	NRCS Response
NPS Timpanogos Cave National Monument	<p>I note the proposed mitigation includes appropriate signage and public notice in nearby communities, and suggest that this is the minimum necessary.</p> <p>As a contractor is selected and more detailed planning and scheduling is developed, we encourage you to do everything possible to schedule construction related traffic, especially haul trucks, early or late in the day to avoid peak mid-day hours. Saturdays, our peak traffic day, will be particularly difficult under a six-day work week.</p> <p>Secondarily, please work closely with our public information staff and their counterparts at the Uinta-Wasatch-Cache National Forest to develop a robust communications plan well ahead of this effort.</p>	<p>USDA-NRCS and the NUCWCD will notify the local communities of the construction activities. Coordination will also occur with the NPS prior to construction regarding traffic impacts.</p>

Commenter	Comment	NRCS Response
NPS Timpanogos Cave National Monument	Since this document calls for a revision of the Emergency Action Plan (EAP) for the dam, we suggest that this would be an ideal opportunity for the agencies with jurisdiction to further develop a plan for flood detection, notification, and evacuation within the canyon. While this may be outside of the formal scope of this project, we would support and participate in such an effort and the revision of the EAP would be a logical place to begin.	Noted.
NPS Timpanogos Cave National Monument	We plan to remove our existing visitor center and concession facility and replace it with a new building slightly east of the current location and closer to S.R. 92. Along with this construction, the traffic lanes of S.R. 92 within the Monument will be realigned slightly north (closer to the river), while the current parking spaces are moved to the south side of the road. The end result will be a new parking lot with the same capacity but all on the south side of the road, and a new, smaller visitor contact station at the east end. The schedule for this project is very tentative, but we hope to receive funding in GY 17 and depending on the time required for contracting, seasonality, weather, etc., begin work in FY 18. There is always a possibility that funding could be obtained earlier than planned, which would move up this schedule and result in overlap with your project. I mention this only for your general information at this point, and I will try to keep you updated as we move forward.	Coordination will occur with the NPS regarding the construction schedule for this project as well as NPS construction projects in the upcoming years.
Tibble Fork Recreational Residence Owners Association	The primary concern of the Association relates to continued access to the summer home area just to the east of the dam. Map 6 in Appendix B of the Draft Supplemental Watershed Plan-Environmental Assessment, shows the proposed gate to control access to the summer home area located on the left or east side of the dam. The Association Board has reviewed and agrees with the proposed gate location on the left or east side of the dam. We do request that the new gate be similar to the existing Association gate with the sides blocking any vehicular traffic including motorcycles. We would like the bottom of the gate to be approximately 18" from the ground to facilitate opening when it has snowed.	USDA-NRCS acknowledges the Association's approval of the gate location. Further coordination will be performed, if the project is approved, during final design regarding the location of the access gate.
State of Utah UDWR	UDWR water rights and conservation pool should be mentioned in the Plan-EA. The Plan-EA should specify that the permanent fishery conservation pool should contain not less than 166 acre-feet of water. Sediment enters the system annually and may reduce water storage associated with various rights, including a 1963 agreement between the Department of Fish and Game and the State of Utah. In the agreement these acre-feet are listed as being for "fish culture and recreation purposes." This agreement can be provided upon request. The Plan-EA should make clear that this conservation pool of 166 acre-feet of water will be maintained and accounted for in the future.	The Final Plan-EA has been updated to discuss the 166 ac-ft conservation pool for fish culture and recreation purposes.
State of Utah UDWR	<p>In order to facilitate fish stocking and effective recreation use, UDWR recommends that a gate or a maintained road be included in the Plan-EA to allow maintenance truck access to the wet shoreline throughout the summer.</p> <p>Contractors should use suitable material for new shoreline and fishing areas to improve angler use as water recedes through use for irrigation rather than allowing for a muddy silty shoreline.</p> <p>And given the anticipated usage, parking, as planned, is inadequate. Parking should be addressed in conjunction with the project while funds</p>	<p>A fish stocking gate and access road have been discussed and may be included in the final design of the project.</p> <p>Imported sand material will be installed on the shoreline to facilitate recreation use.</p>

Commenter	Comment	NRCS Response
	are available and could be scaled to meet the need.	The parking spaces have been coordinated with the USFS. The number of spaces has been identified by the USFS as the maximum number of desired spaces for this facility.
State of Utah UDWR	In Tibble Fork the only fish currently being stocked are brown trout and rainbow trout, not brook trout. Brook trout might possibly be found in the reservoir, however, as they are stocked into Silver Lake Flat Reservoir. Grayling have not been stocked in Silver Lake Flat Reservoir, and have not been observed in either that reservoir or Tibble Fork. They are only stocked in Silver Lake in the Lone Peak Wilderness Area, above both Silver Lake Flat Reservoir and Tibble Fork.	The Final Plan-EA has been updated to discuss the fish stocking regime for Tibble Fork, Silver Lake Flat, and Silver Lake.
State of Utah UDWR	Silver Lake is aerially stocked only once annually with brook trout and Arctic grayling, not "numerous times per year."	The Final Plan-EA has been updated to discuss the fish stocking regime for Silver Lake.
State of Utah	Fish will not be transplanted in Silver Lake Flat Reservoir. Typically the way to remove fish would be to change the regulation and encourage people to harvest more fish prior to draining. Transplanting of fish downstream, although difficult, could be allowed.	The Final Plan-EA has been updated to discuss fish removal and salvage.
State of Utah UDWR	Remove "sediment storage" field, and add 166 acre-feet to "recreation storage" field.	The Final Plan-EA has been modified to reflect the difference between the sediment storage and recreation storage fields.
State of Utah UDWR	Add row for 166 acre-feet for fish culture/recreation purposes. Point of diversion: Tibble Fork; Notes: "Based on June 21, 1963 agreement to use 166 acre-feet initially to fill reservoir; 12 acre-feet diverted annually to replace losses due to evaporation, transpiration, and seepage."	The Final Plan-EA has been updated to include the fish culture/recreation purpose.
State of Utah UDWR	Please consider the attached file, showing our 1963 agreement with the Lehi Irrigation Company, the Pleasant Grove Irrigation Company, and the American Fork Irrigation Company. We entered this agreement to ensure that our shares in those irrigation companies were used for fish culture and recreation purposes. We would appreciate a clarification of relevant property rights, relating to water use, in the environmental review of the Tibble Fork dam rehabilitation project.	The Final Plan-EA has been updated to discuss this agreement and water use rights.

CHAPTER 6.0

PREFERRED ALTERNATIVE

6.1 Purpose and Summary

The Preferred Alternative for the project is the Dam Rehabilitation Alternative and is based on the ability of the alternative to meet the purpose and need for the project, impose the least impact to environmental and social resources, and provide the greatest net economic benefits of all the alternatives. Several items need to be addressed in order for Tibble Fork Dam to meet current USDA-NRCS and Utah State Dam Safety regulations (UDWRi 2014) and engineering standards (USDA-NRCS 2005) associated with a high dam and to ensure the useful life of the site for 59 years starting in 2017. The rehabilitated dam structure would reduce the risk of a catastrophic failure, and would continue to provide flood protection to properties and structures downstream, sediment retention, and recreational opportunities for visitors to the area.

6.2 Rationale for Preferred Alternative Selection

The Preferred Alternative consists of rehabilitating the dam to protect the existing dam structure, restoring the original flood storage and sediment retention capacity, adding additional irrigation water storage capacity, eliminating the liability to the NUCWCD of operating a dam in non-compliance, and continuing to provide incidental benefits to recreation. Through the analysis of environmental and social resources in the Environmental Consequences (Chapter 4.0), it was determined that the Preferred Alternative for the rehabilitation of the dam would provide the least negative and most beneficial effects for the project. The Preferred Alternative is also the NED Alternative because it has the highest net economic benefits and benefit-to-cost ratio. The annualized benefit for the dam would be \$260,000 and the annualized cost would be \$347,000 resulting in a benefit-cost ratio of 0.75.

6.3 Measures to be Installed

The measures proposed for the rehabilitation of Tibble Fork Dam would be designed to USDA-NRCS, USFS, and UDWRt Dam Safety standards. The design for the items listed below, as well as construction practices, will be submitted to USFS for review and will adhere to the 2003 Uinta National Forest Land and Resource Management Plan (USFS 2003a) prior to the start of construction. The rehabilitation features of the Preferred Alternative are shown in Appendix B-Maps 5 through 9, and are summarized below:

Raise Dam

Place and compact additional fill (93,000 cubic yards) on the crest and downstream face of the dam to raise dam crest up to 13 feet and ensure slope stability. Similarly, add zoned fill upstream of the existing right embankment to create a dogleg crest and to catch the existing grade of the north American Fork Canyon Road embankment. Place riprap (2,900 cubic yards) on the upstream face of the dam to protect the slope from wave action erosion at varying water surface elevations in the reservoir. Some of the fill material for the dam raise would be excavated from a borrow source (proposed borrow area 1) located at the entrance of American Fork River into the reservoir. The existing Tibble Fork Summer Homes access road on top of the dam would be removed and relocated for mitigation of recreation impacts.

Downstream Improvements

Construct a stability berm on the downstream face of the dam and install a new Tibble Fork Summer Homes access road on top of the stability berm. Install a new toe drain at the proposed new downstream toe of the dam (approximately 100 feet downstream of current toe) to collect and convey seepage water away from the dam infrastructure. Add extensions to the existing piezometer seepage monitoring instrumentation to allow continued piezometer access after the dam surface is raised.

Principal Spillway

The principal spillway is currently located on the north side of the auxiliary spillway and consists of a concrete intake structure that discharges water into the auxiliary spillway through reinforced concrete (RC) pipes. The principal spillway would be demolished and replaced up to approximately 14 feet higher utilizing a similar design. Raising the principal spillway would raise the existing normal water pool surface elevation of the reservoir from approximately 6382.2 feet AMSL to 6396 feet AMSL. This would increase the reservoir size from approximately 9.8 acres to 21.6 acres.

Auxiliary Spillway/Stilling Basin

The auxiliary spillway would be demolished and replaced with a covered, concrete box-type spillway (1,200 cubic yards of reinforced concrete) sufficiently sized to pass the PMP event (worst-case scenario flood event) without overtopping the dam or spillway walls. The spillway would be raised up approximately 13 feet from elevation 6387.3 feet AMSL to 6400.2 feet AMSL to increase the sediment and water storage capacity of the reservoir. The auxiliary spillway would be extended an additional 40 feet downstream. The stilling basin at the base of the auxiliary spillway would be demolished and a new stilling basin would be constructed that would extend approximately 60 feet downstream of the new auxiliary spillway.

Low-Level Outlet

Replace the low-level outlet gate in the reservoir and repair the outlet riser. Extend the low-level outlet pipe approximately 40-feet to connect to the new stilling basin.

Proposed Borrow Areas and Construction Staging

An approximate 4.6-acre area at the northeast side of the reservoir (proposed borrow area 1) would be excavated approximately 13 to 16 feet to increase reservoir storage capacity. Excavated material meeting required standards would be reused as fill to raise the dam and to level the proposed parking area below the dam. Proposed borrow area 1 side slopes would be graded at a 2:1 slope. An approximate 2.6-acre area northwest of the reservoir (proposed borrow area 2) would be excavated as a borrow source. Proposed borrow area 2 is a previously disturbed area that was used as a borrow source during the original construction of the dam. Proposed borrow area 2 will also be used as a construction staging area. An additional 0.7-acre construction staging area is proposed south of the reservoir on the west side of American Fork River.

Clearing and Grubbing

Approximately 13.5 acres of vegetation on the dam and around the reservoir would be permanently cleared and grubbed. Permanent vegetation removal would be performed on the dam for purposes of dam safety and between the existing normal pool and proposed normal pool elevations. Approximately 1.1 acres of vegetation would also be permanently cleared and grubbed for the new gravel parking area (for mitigation of recreation impacts) at the base of the dam. Additionally approximately 2.6 acres of clearing and grubbing would be performed for the staging/borrow area 2, but would be reseeded after construction completion.

Irrigation Water Storage – updated January 2015

USDA-NRCS and the NUCWCD obtained approval for Agricultural Water Management to be added as an authorized purpose of the structure on January 15, 2015 (memo dated November 12, 2014; see Appendix A). The new authorized purpose allows for an additional 120 ac-ft for irrigation water storage within the reservoir. This 120 ac-ft is an existing water right transfer and does not constitute a new water right. The storage has been incorporated into the Final Plan-EA, however the Conceptual Design attached in Appendix D remains as it was presented to the public in the Draft Plan-EA in July 2014.

Mitigation for Impacts to Recreation

A new approximately 1.1 acre gravel parking area would be constructed at the base of the dam embankment and would encompass the area used for construction staging.

Approximately 1.0 acre of new beach would be added to the west side of the reservoir to mitigate for the inundation of the existing beach. Filling, compacting and grading an area of the reservoir would be performed so that the new normal pool elevation of the reservoir meets the design edge of the new beachfront. Much of the new beachfront would be seeded with native grasses. Sand will be imported to the area immediately adjacent to the normal water line. Approximately 4,600 cubic yards of beachfront fill would be added with an additional approximately 560 cubic yards of sand.

The existing pedestrian bridge over Deer Creek would be demolished and a new pedestrian bridge would be constructed at a higher elevation.

The access road to the Tibble Fork summer homes would be realigned and constructed on the new stability berm on the downstream slope of the dam.

To allow more controlled parking around the reservoir, the existing paved parking area layout would be altered to increase parking from 83 spaces to 60 passenger vehicle and 25 truck/trailer spaces. The road adjoining the paved parking area would be realigned to the north of the parking area to provide improved public safety, and a new roundabout would be added at the hairpin turn to allow safe turn around for vehicles pulling trailers.

Wetland Mitigation

Approximately 1.0 acre of reservoir open water, 2.6 acres of stream open water and 180 linear feet of stream open water would be impacted from this alternative. Impacts to these waters of the U.S. would be self-mitigating as the reservoir area would be increased by approximately 8.3 acres for this alternative. Approximately 0.1 acres of emergent wetland, 0.6 acres of scrub shrub wetland, and 0.6 acres of forested wetland would also be impacted from this alternative. To calculate costs associated with mitigation of impacts to wetlands the following general assumed mitigation ratios were used:

- Emergent Wetland: 1:1
- Scrub Shrub Wetland 1:1
- Forest Wetland 5:1

Table 6-1 compares the existing dam features with the Preferred Alternative features.

Table 6-1. Comparison of Existing Dam and Preferred Alternative

Description	Existing Conditions	Preferred Alternative
Principal Spillway Crest	6382.2' AMSL	6396' AMSL
Auxiliary Spillway Crest	6387.3' AMSL	6400.2' AMSL

Description	Existing Conditions	Preferred Alternative
Elevation		
Auxiliary Spillway Dimensions	30' Wide x 12'9" Tall at Entrance x 232' Long	30' Wide x 12' Tall at Entrance x 331' Long
Top of Dam (feet)	6394.5' AMSL	6409.5' AMSL
Top Width of Dam (feet)	18	18
Downstream Embankment Slope	2.5:1	2.5:1
Low-level Outlet	352 feet long, 30-inch reinforced concrete pipe	452 feet long, 30-inch reinforced concrete pipe
Reservoir Storage Capacity	108 ac-ft	384 ac-ft

6.4 Mitigation

Mitigation includes all measures undertaken to avoid, minimize, or compensate for potential adverse environmental impacts. This chapter briefly discusses the mitigation for impacts to jurisdictional waters of the U.S., but does not include specific compensatory mitigation requirements for impacts to these waters. Much of what is summarized here can also be found in the section Environmental Consequences (Chapter 4.0).

Soils: Erosion may occur on disturbed and cleared areas within the project boundary during precipitation events. Under Section 402 of the Clean Water Act, a Utah Pollutant Discharge Elimination System (UPDES) Storm Water General Permit for Construction Activities is required for construction activities that disturb more than 1 acre and discharge pollutants to surface waters. Proper BMPs would be installed to prevent and control soil erosion and a Storm Water Pollution Prevention Plan (SWPPP) will be developed, including submitting a Notice of Intent (NOI) to the Utah Division of Water Quality.

Soil used for dam fill that is borrowed from the reservoir would be separated and filtered for appropriate size and composition of material. Sediment containing high densities of elevated metals would not be disturbed.

Vegetation: Herbaceous vegetation would be removed on the face and at the downstream toe of the dam during dam rehabilitation. Woody vegetation including trees and shrubs would be removed around the edge of the reservoir in areas that would be inundated from the spillway raise. Vegetation removal would be limited to the smallest extent practicable within this area. An herbaceous plant seed mixture, as approved by USFS, would be used in these areas cleared of trees and shrubs. All temporary disturbed areas not associated with direct dam rehabilitation would be revegetated with approved USFS plant species to match the surrounding plant community. There is no compensatory mitigation proposed for vegetation clearing associated with the project.

Waters of the U.S. and Wetlands: Dam rehabilitation would impact open waters of American Fork River, Deer Creek and Tibble Fork Reservoir as well as upstream emergent, scrub shrub and forested wetlands. The project has been designed to impact the smallest footprint in each of these jurisdictional waters. Coordination with the USACE will be performed to determine compensatory mitigation for impacts to jurisdictional waters of the U.S. Permanent impacts to waters of the U.S. and wetlands upstream of the reservoir will be largely dependent on the management of the reservoir. Discussion of Operation and Maintenance of the reservoir is on-going and will be finalized and agreed upon prior to construction.

Routine monitoring after construction completion would be performed. Information collected during monitoring would be utilized to develop a Post Construction Site Rehabilitation Plan.

Fish: Tibble Fork Reservoir would be partially drained in order to excavate fill material for the dam raise and to access the dam for rehabilitation. As part of this alternative, water in the American Fork River would continue to flow through the outlet pipe during construction. Fish present in the reservoir would be salvaged and transplanted downstream of the dam once the water level is lowered to the low-level outlet and prior to the start of the dam rehabilitation. Fish would not be stocked in Tibble Fork Reservoir in 2016 and partially draining the reservoir would result in the decrease in the use of the fishery for anglers and recreationists during the summer of 2016. After construction is complete, the fish stocking regime in Tibble Fork Reservoir would resume. Mitigation for displacement of recreationists is anticipated and includes the items listed in the Recreation item below.

Cultural/Historical Resources: There are no cultural/historical sites known in the project area. A cultural resources monitor will be present during proposed soil testing and construction work when it is located above the dam in the projected vicinity of the Silver Lake City townsite. If unknown cultural resources are encountered during excavation activities, construction would stop, and the USFS UWCNF and USDA-NRCS cultural resource specialists would be notified.

Recreation: Certain areas would be used as staging areas during construction and would be completely closed to public use. High-use and/or limited access parking areas would be left open so that the public is not completely displaced from using the Tibble Fork area. Notifications will be made to the public informing them about the reduced recreational access to Tibble Fork Reservoir and surrounding area prior to the start of construction.

Permanent impacts to recreation will include the loss of existing beachfront around the reservoir. Additional beachfront would be created to replace the lost recreation components from the raising of the reservoir water level. The existing pedestrian bridge over Deer Creek near the beach area would be demolished and a new pedestrian bridge would be constructed at a higher elevation. Additional parking and realignment of a portion of American Fork Canyon Road is also proposed to add smoother vehicle travel/parking flow and increase the number of available parking spaces at the recreation site.

The summer home access road along the dam crest would be impacted from the project. Access to the summer homes would remain open during construction, but the road would be realigned downslope of its current location to mitigate for impacts.

Increase of traffic from construction activities is anticipated along Highway 144 from the mouth of the canyon to Tibble Fork Reservoir increasing commute time to Timpanogos Cave National Monument, day-use sites, campgrounds, summer homes, Tibble Fork and Silver Lake Flat Reservoir, and trails during the months of May through November 2016. Mitigation measures include posting signs at the monument informing visitors and publishing notices in the local community about the increase in construction traffic.

Transportation/Infrastructure: The public would be allowed to access the Tibble Fork area during construction. Flaggers would be utilized to control construction traffic up and down North American Fork Canyon Road. The general public would experience minor delays at the top and bottom of the road while construction traffic is traveling to and from the project area.

6.5 Permits and Compliance

The following permits and compliance actions will be required for construction of the Preferred Alternative:

- Federal
 - *USFS*: A new Special Use Permit(s) or modification to the existing permit will be required for dam rehabilitation construction activities, increased reservoir surface water elevation, road improvements, staging area use outside of the project footprint, and changes in use of the dam.
 - *USACE*: Under Section 404 of the Clean Water Act, a USACE permit will be required for discharge of dredged or fill materials in waters of the U.S., including wetlands.
 - *USFWS*: There are no endangered species documented to occur within the vicinity of the project area. Informal consultation will be performed with USFWS during the NEPA Plan-EA review process and no further consultation will be required for the project unless there are unforeseen impacts expected to ESA listed species.
- State
 - *Utah Division of Water Rights Dam Safety*: Approval will be required for the final design report, construction drawings, and specifications by the Utah State Assistant Engineer.
 - *Utah Division of Water Quality*: Under Section 401 of the Clean Water Act, an approval will be required so that the project does not violate state water quality standards. Certification is obtained as part of the USACE Section 404 Permit review process.
 - *Utah Division of Water Quality*: Under Section 402 of the Clean Water Act, a Utah Pollutant Discharge Elimination System (UPDES) Storm Water General Permit for Construction Activities is required for construction activities that disturb more than 1 acre and discharge pollutants to surface waters. A Storm Water Pollution Prevention Plan (SWPPP) will be developed, including submitting a Notice of Intent (NOI) to the Utah Division of Water Quality.
 - *Utah SHPO*: There are no cultural sites documented to occur within the immediate vicinity of the project area. Consultation has been performed with Utah SHPO during this NEPA Plan-EA review process and the results are documented in this Final Plan-EA. If, during construction, previously unevaluated cultural resources are discovered, then the area of discovery would be given adequate protection, work would be stopped, and USFS, USDA-NRCS and SHPO would be notified. Procedures for discoveries outlined in the cultural resources USDA-NRCS State Level Agreement would be followed.
 - *Utah Division of Oil, Gas and Mining*: If riprap for dam rehabilitation will be obtained from a source that does not have an existing mining permit, a mining operations permit will be required in order to mine the riprap.
- Local: There are no local permits anticipated for this project since the dam is located within the boundaries of the USFS UWCNF.

A Watershed Agreement and a Memorandum of Understanding shall be completed and signed by the USDA-NRCS and the NUCWCD prior to the obligation of construction funds for the Preferred Alternative.

6.6 Installation and Financing

The following sub-sections describe the installation and financing of the Preferred Alternative. These include descriptions of the planned sequence of installation, responsibilities, contracting, real property and relocations, the emergency action plan, and project financing.

6.6.1 Planned Sequence of Installation

The NUCWCD will complete all approvals and permits for the project prior to the start of construction, which may take up to one year to obtain. The major construction elements for the Preferred Alternative would be sequenced to complete the critical path items first, which include the dam raise and spillway replacement, as well as placement of riprap on the upstream face of the dam and extending toe drains downstream. These activities would be completed first in the summer of 2016.

6.6.2 Responsibilities

The original Watershed Work Plan (Alpine Soil Conservation District *et al.* 1958) set forth the responsibilities of the USDA-NRCS (formerly SCS) and the NUCWCD. The roles and responsibilities for the USDA-NRCS and the NUCWCD would continue in accordance with this Final Plan-EA, the Watershed Agreement, and the Memorandum of Understanding. The USDA-NRCS is responsible for leading the planning efforts and providing engineering design, and the NUCWCD is responsible for environmental permits and construction implementation. USDA-NRCS would assist the NUCWCD during construction by providing oversight and certify completion of the project.

6.6.3 Contracting

Dam rehabilitation improvements installed from USDA-NRCS funding mechanisms would be procured using contracts awarded. The NUCWCD would oversee and administer the construction of the project in coordination with the USDA-NRCS.

6.6.4 Real Property and Relocations

All construction activities would occur on lands owned and managed by the USFS UWCNF. No real property transactions or relocations would be required for the Preferred Alternative to rehabilitate Tibble Fork Dam. A new or modified Special Use Permit(s) would be issued by the UWCNF for the rehabilitated dam and long-term operation on USFS land.

6.6.5 Emergency Action Plan

The NUCWCD has prepared an Emergency Action Plan (EAP) for Tibble Fork Dam (NUCWCD 2011) in accordance with 1) 210- USDA-NRCS National Engineering Manual, Part 520, Subpart B, Section 520.27, 2) 180- USDA-NRCS National Operations and Maintenance Manual, Part 500, Subpart F, Section 500.52, and 3) meet applicable Utah State Dam Safety requirements. A new EAP must be completed by the NUCWCD to address the rehabilitation changes to the dam and must be prepared as a standalone document. The USDA-NRCS would determine that an EAP is prepared prior to the execution of fund-obligating documents for construction of the dam. EAPs shall be reviewed and updated by the NUCWCD annually for consistency with the project and to include all local points of contact necessary for an emergency response. The EAP should include: a notification flowchart; determination of responsibility for EAP-related tasks; emergency identification, evaluation and classification; notification procedures; preventative action; inundation map; and appendices, as outlined in the Utah Dam Safety Guide to Emergency Action Plans Development and Implementation (Lindon 2003).

6.6.6 Financing

The USDA-NRCS will provide 65% of the total construction rehabilitation cost for the Preferred Alternative with funding from the Small Watershed Rehabilitation Program (PL 83-566, as amended by PL 106-472). The NUCWCD is responsible for providing the remaining 35% funding of the rehabilitation costs of the project. USDA-NRCS will provide 100% of design engineering and project administration costs for the project.

Funding for O&M of the dam after construction will be derived from normal revenues of the NUCWCD. This O&M cost will be budgeted annually so that the dam is kept in good condition and meets current USDA-NRCS and Utah State Dam Safety regulations. The NUCWCD may also request financial assistance through the UDWRi to help with the 35% cost share of the project.

6.7 Operation and Maintenance

Operation of the dam includes the administration, management and performance of non-maintenance actions needed to keep the dam structure safe and functioning as designed. Maintenance includes performance of work, measuring the recording instrumentation data, preventing deterioration of structures, and repairing damage or replacement of the structure as needed to prevent failure. Damages to completed structures caused by normal deterioration, droughts, flooding, or vandalism are considered maintenance. Maintenance includes both routine and as-needed measures, including:

- Annual control of woody species on or near the dam and spillway. Chemical control would only be used after determining there would be no ill effect on human, fish or wildlife health and as approved by the USFS.
- Operating both low-level outlet gates on an annual basis to remove any accumulated sediment at the entrance and ensure proper performance of the gate.
- Other specific items that will be identified during design.

Inspection of the dam is necessary to verify that the structures are safe and functioning properly. The NUCWCD and UDWRi Dam Safety are responsible for inspecting the dam on an annual basis as well as after major events such as floods and earthquakes. Inspection reports will be supplied to the USDA-NRCS following each inspection. Inspections and the associated reports will:

- Assess the adequacy of O&M activities,
- Identify needed O&M work,
- Identify unsafe conditions, including changes in the use of the floodplain below the dams,
- Specify ways of relieving unsafe work or performing other needed work, and
- Set dates for performing corrective actions.

NUCWCD will continue to be responsible for the operation, maintenance, rehabilitation and future modifications to the dam and will cover the estimated annual O&M cost of \$51,000 as stated in Table 6-5. A specific O&M Plan will be prepared by the USDA-NRCS and the NUCWCD in accordance with the USDA-NRCS National Operation and Maintenance Manual (USDA-NRCS 2003). This plan and agreement will be entered into prior to the start of construction activities and will be in place for the life of the project (59 years starting in 2017). The agreement will provide for inspections, reports, and procedures for performing the maintenance items. The agreement will include specific provisions for retention, use, and property improved with PL 83-566, as amended by PL 106-472, assistance.

6.8 Costs

The planning level cost estimate (including environmental and design) for the Preferred Alternative (Dam Rehabilitation) is \$7,335,000 as identified in Table 6-2. Economic tables have been included to present information relevant to the costs and benefits of the Preferred Alternative and the NED Alternative. Structural tables have been included to present the relevant structural information pertinent to the design of the Preferred Alternative. The planning-level costs for the Preferred Alternative are conceptual-level cost estimates only, with an estimated range of accuracy at $\pm 30\%$ and are intended to reflect the maximum level of cost that could be associated with the rehabilitation of Tibble Fork Dam. Detailed structural designs and construction cost estimates will be prepared for the project during the final design phase and prior to the start of the competitive bidding process. The final cost of the project will be the price received from the winning construction bid plus or minus the amount of contract modifications. Assessments, considerations, and calculations are based on a 59-year evaluation period and a discount rate of 3.5 percent.

The Estimated Installation Cost table documents land status upon which the project structures reside, as well as federal and non-federal funding sources respectively.

Table 6-2. Estimated Installation Cost

Works of Improvement	PL83-566 Funds			Other Funds	Total
	Unit	Federal Land	Federal Land	Federal Land	
Tibble Fork Dam Rehabilitation	Each	1	\$5,032,500	\$2,302,500	\$7,335,000

Notes: Prices based in June 2013.

All Works of Improvement will be on USFS land (federal land).

The Estimated Cost Distribution table shows the estimated costs to be charged to the PL 83-566, as amended by PL 106-472, funds and the costs borne by the NUCWCD.

Table 6-3. Estimated Cost Distribution – Water Resource Project Measures

Works of Improvement	Construction	Design Engineering ¹	Real Property Rights	Relocation Payments	Road and Utility Modifications	Permits	Project Admin	Total
Planned Improvements Dam Rehabilitation (PL83-566)	Installation Cost - PL83-566 Funds							
	\$4,257,500	\$750,000	\$0	\$0	\$0	\$0	\$25,000	\$5,032,500
Planned Improvements Dam Rehabilitation (Other)	Installation Cost - Other Funds							
	\$2,292,500	\$0	\$0	\$0	\$0	\$10,000	\$0	\$2,302,500
Total Estimated Rehabilitation Cost	\$6,550,000	\$750,000	\$0	\$0	\$0	\$10,000	\$25,000	\$7,335,000

Notes: Prices based in June 2013.

¹ Design engineering, and project admin costs are not cost-shared by the sponsor.

The Structural Data table shows important physical characteristics for Tibble Fork Dam after the Preferred Alternative has been constructed.

Table 6-4. Structural Data – Dams with Planned Storage Capacity

Item	Unit	Tibble Fork Dam Preferred Alternative
Dam Number	N/A	UT00299
Hazard Class of Structure	N/A	High
Seismic Zone	N/A	3
Uncontrolled Drainage Area	sq mi	30.7
Controlled Drainage Area (Silver Lake Flat Drainage)	sq mi	4.3
Total Drainage Area	sq mi	35
Basinwide Average Curve Number, AMC II (Good)	N/A	44
Basinwide Average Time of Concentration (Tc), General	hrs	3.95
Elevation top dam	ft	6,409.5
Elevation crest auxiliary spillway (spillway)	ft	6400.2
Elevation crest low stage inlet	ft	6384.25
Auxiliary spillway (spillway) type	N/A	Rectangular Concrete Closed Channel
Auxiliary spillway (spillway) bottom width	ft	30
Maximum Height of Dam	ft	75
Volume of Fill Existing/to Raise Dam Crest	cy	129,000 / 93,000
Total Capacity (at auxiliary spillway crest)	ac-ft	384
Sediment Submerged	ac-ft	175
Sediment Aerated	ac-ft	175
Beneficial Use (irrigation/recreation)	ac-ft	120
Floodwater Retarding Pool at aux spillway crest	ac-ft	85
Surface Area		
Sediment Pool	ac	16.2
Beneficial Use Pool (Irrigation, recreation)	ac	21.8
Floodwater Retarding Pool	ac	23.9
Principal Spillway (low-level outlet) Design		
Rainfall Volume (1-day)	in	1.77
Rainfall Volume (10-day)	in	3.94
Runoff Volume (10-day)	in	2.67
Capacity of Low Stage Outlet (max.)	cfs	110
Capacity of High Stage Outlet (max.)	cfs	300
Dimension of Conduit (low-level outlet)	in	30
Type of Conduit (low-level outlet)	N/A	RC pipe
Frequency of Operation Auxiliary Spillway (spillway)	% chance	1%
Auxiliary Spillway (spillway) Hydrograph		
Rainfall Volume (100 yr)	in	4.86
Runoff Volume (100 yr)	in	3.54
Storm Duration	hr	24
Velocity of Flow (Vc)	cfs	4,673
Maximum Aux. Spillway Discharge	ft	5.5
100-year Max. Reservoir Water Surface Elevation	ft	6,401.3
Freeboard Hydrograph		
Rainfall Volume	in	0.14
Runoff Volume	in	0.01
Storm Duration	hr	6
Velocity of Flow (Vc)	ft/s	1,063
Max. Reservoir Water Surface Elevation	ft	5,069

Item	Unit	Tibble Fork Dam Preferred Alternative
Capacity Equivalents		
Sediment Volume	in	0.09
Floodwater Retarding Volume	in	0.05
Beneficial Volume (irrigation & recreation)	in	0.08
Sediment aerated	in	0.09

Table 6-5 shows the anticipated installation costs of the Preferred Alternative and summarizes the total annual cost based on the upfront cost of installation, amortized over 59 years, and the average annual cost for operations and maintenance. The original annual O&M costs for Tibble Fork Dam were \$1,590 (Alpine Soil Conservation District *et al.* 1958).

Table 6-5. Average Annual NED Costs

Improvements	Project Outlays Installation (Plan Year \$)	Project Outlays Amortization of Installation Cost ¹	Project Outlays, Operation, Maintenance, and Replacement Cost ²	Total Average Annual NED Cost
Tibble Fork Dam Rehabilitation	\$7,335,000	\$296,000	\$51,000	\$347,000

Notes: Prices based in June 2013. ¹ Amortized at 3.5% annually for 59 years; ² Estimated to be 0.7% of project cost.

Table 6-6 below summarizes the results of the watershed protection damage reduction benefit analysis conducted for this project. It includes a summary of the non-agricultural and agricultural benefits which the Preferred Alternative is expected to provide.

Table 6-6. Estimated Average Annual Watershed Protection Damage Reduction Benefits

Item	Estimated Average Annual Damage Reduction Benefits				Damage Reduction
	Without Project		With Project		
	(Amounts shown in Dollars)				
	Non-agriculture Related	Agriculture Related	Non-agriculture Related	Agriculture Related	
Irrigation	0	0	0	18,700	18,700
Sediment Deposition	18,500	0	18,500	0	0
Erosion	0	0	0	0	0
Recreation	0	0	200	0	200
Total	18,500	0	18,700	18,700	18,900

Notes: Prices based in June 2013. Average annual benefits are in 2013 dollars.

Table 6-7 below summarizes the results of the watershed protection damage reduction benefit analysis conducted for this project (cost avoidance summary).

Table 6-7. Estimated Average Annual Watershed Protection Damage Reduction Benefits

Item	Estimated Damage Reduction Benefit		Total
	Agriculture-Related	Non-Agriculture Related	
Cost Avoidance	\$27,600	\$0	\$27,600
Total	\$27,600	\$0	\$27,600

Notes: Prices based in June 2013.

The Comparison of NED Benefits and Costs table (Table 6-8) below summarizes the benefits and costs of each analysis unit within the project and documents the overall benefit to cost ratio of the proposed rehabilitation improvements.

Table 6-8. Comparison of Annual NED Benefits and Costs

Item	Average Annual Benefits	Average Annual Costs	Benefit Cost Ratio
Tibble Fork Dam Rehabilitation	\$260,000	\$347,000	0.75

Notes: Prices based in June 2013.

CHAPTER 7.0

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CHAPTER 8.0

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CHAPTER 9.0

DISTRIBUTION LIST

A notice of availability for the scoping period and Draft Plan-EA was distributed to the following government agencies/staff and organizations.

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- North Fork Special Service District, Dave Boshard, RR 3 Box 1, Provo, UT 84604
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- Rock Canyon Preservation Alliance, Francine R. Bennion, 1745 North 1550 East, Provo, UT 84604
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- Save Our Canyons, P.O. Box 112017, Salt Lake City, UT 84147-2017
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- Slate Canyon Neighborhood Trails, Kerry Strauss, 1425 East 800 South, Provo, UT 84606
- SNOWBIRD, Bob Bonar, P.O. Box 929000, Snowbird, UT 84092
- Sportsman For Habitat, Inc., 626 Cottonwood Drive, South Weber, UT 84405
- Star Trails ATV Riders Association, Gary & Kathy Harding, P.O. Box 273, American Fork, UT 84003
- Sundance Resort, RR 3 Box A-1, Sundance, UT 84604
- Trout Unlimited, Paul Dremann, 2348 Lynwood Dr., Salt Lake City, UT 84109
- Utah Four Wheel Drive Association, P.O. Box 65545, Salt Lake City, UT 84165-0545
- Utah National Parks Council, Tom Powell, 748 North 1340 West, Orem, UT 84057
- Utah Snowmobile Association, Curt Kennedy, 302 South Maryfield Dr., Salt Lake City, UT 84108
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- Utah Wildlife Federation, Gerald Gordon, 120 North 5th Street, Tooele, UT 84704
- Wasatch Co. Public Lands Committee, Robert Riddle, 333 East 100 North, Midway, UT 84049
- Wasatch Mountain Club, 1390 South 1100 East, Salt Lake City, UT 84105
- Western Land Exchange Project, Janine Blaeloch, P.O. Box 95545, Seattle, WA 98145
- Wild Utah Project, James Catlin, 68 South Main Street Ste. 400, Salt Lake City, UT 84101

9.6 Private Parties

The names and addresses of private parties who received notice of the scoping period and Draft Plan-EA are not listed in this chapter for privacy.

CHAPTER 10.0

ACRONYMS, ABBREVIATIONS, AND SHORT FORMS

ac-ft	acre-feet
AMSL	Above Mean Sea Level
BMPs	Best Management Practices
DAQ	Division of Air Quality
Draft Plan-EA	Draft Supplemental Watershed Plan No. 10 and Environmental Assessment
CFR	Code of Federal Regulations
cfs	cubic feet per second
EA	Environmental Assessment
EAP	Emergency Action Plan
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
Final Plan-EA	Final Supplemental Watershed Plan No. 10 and Environmental Assessment
NAAQS	National Ambient Air Quality Standards
ORV	Off Road Vehicles
PAR	Population-At-Risk
PMP	Probable Maximum Precipitation
MCL	Maximum Contaminant Level
MIS	Management Indicator Species
NED	National Economic Development
NEPA	National Environmental Policy Act
NOI	Notice of Intent
USDA-NRCS	Natural Resources Conservation Service
NUCWCD	North Utah County Water Conservancy District
O&M	Operations and Maintenance
PL	Public Law
RHCA	Riparian Habitat Conservation Area
RMO	Road Management Objective
ROS	Recreation Opportunity Spectrum
SCS	Soil Conservation Service
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
UDEQ	Utah Department of Environmental Quality
UDWR	Utah Division of Wildlife Resources
UDWRe	Utah Division of Water Resources
UDWRi	Utah Division of Water Rights
UPDES	Utah Pollutant Discharge Elimination System
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UWCNF	Uinta-Wasatch-Cache National Forest
VQO	Visual Quality Objectives
WSEL	Water Surface Elevation

CHAPTER 11.0

INDEX

- Aesthetics, 9, 1-3, 2-26, 3-10, 4-18
 Agricultural Lands, 1-3, 2-25, 3-10, 4-18
 Air Quality, 7, 1-3, 2-9, 3-8, 4-6, 9-3
 Alternatives, 5, 1-2, 3-1, 3-3, 4-10
 Animals, 8, 1-3, 2-12, 3-9, 4-9
 Annual Benefit, 6, 3-11, 6-11, 6-12
 APE, 4-11
 Area of Potential Effect, 2-18, 4-11
 Auxiliary Spillway, 2, 1-5, 1-6, 3-4, 6-2
 Bald and Golden Eagles, 8, 1-3, 2-17, 3-9, 4-10
 Benefit Cost Ratio, 6, 3-11, 6-12
 Best Management Practices, 10-1
 Biological Evaluation, 2-11, 2-17, 5-1
 BMPs, 6, 7, 8, 9, 2-3, 3-7, 3-8, 4-2, 4-3, 4-6, 4-8, 4-10, 6-4, 10-1
 Bureau of Land Management, 9-1
 CEQ, 1-1, 1-3
 CFR, 1-1, 2-18, 10-1
 Clean Water Act, 2-6, 5-1, 6-4, 6-6
 Climate Change, 7-3
 CO, 4-6, 9-1
 Code of Federal Regulations, 10-1
 Comments, ii, vi
 Compliance, 6-6
 Consultation, 1-2, 2-18, 5-1, 6-6
 Contracting, 6-7
 Coordination, 1-2, 5-1, 5-2, 6-4, 9-1
 Costs, 6, 3-10, 4-20, 6-9, 6-11, 6-12
 Council on Environmental Quality, 1-1
 Cultural Resources, 4-11
 Cultural/Historical Resources, 1-3, 2-18, 6-5
 Cumulative Effect, 4-1
 Dam, 1, ii, vi, 1, 2, 4, 5, 6, 8, 9, 10, 1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 2-2, 2-3, 2-4, 2-5, 2-6, 2-9, 2-10, 2-12, 2-14, 2-15, 2-16, 2-18, 2-19, 2-20, 2-21, 2-22, 2-23, 2-24, 2-25, 2-26, 2-27, 2-28, 3-1, 3-2, 3-3, 3-4, 3-6, 3-7, 3-9, 3-10, 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, 4-9, 4-10, 4-11, 4-12, 4-13, 4-14, 4-15, 4-16, 4-17, 4-18, 4-19, 5-2, 6-1, 6-3, 6-4, 6-6, 6-7, 6-8, 6-9, 6-10, 6-11, 6-12, 7-2, 7-3, 7-5, 5, 6
 Dam Decommissioning, 3-1, 3-2
 Dam Rehabilitation, vi, 1, 5, 6, 9, 1-2, 1-3, 3-1, 3-2, 3-3, 3-4, 3-7, 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, 4-9, 4-10, 4-11, 4-13, 4-15, 4-16, 4-17, 4-18, 4-19, 5-2, 6-1, 6-9, 6-11, 6-12, 7-2, 7-5, 5
 DAQ, 2-9, 10-1
 Decision Matrix, 1-4
 Designated Critical Habitat, 2-15
 Direct Effect, 4-1
 Distribution List, 1-2, 9-1
 Division of Air Quality, 2-9, 10-1
 Draft Plan-EA, ii, 1, 5, 1-1, 1-2, 1-3, 2-12, 3-1, 3-3, 3-6, 5-1, 5-2, 5-3, 6-6, 6-7, 8-1, 9-1, 9-4, 10-1
 Draft Plan-EA Public Comment, 5-3
 Draft Supplemental Watershed Plan and Environmental Assessment, 5-3
 EA, 1-1, 1-3, 4-5, 5-1, 5-3, 6-6, 10-1
 EAP, 6-7, 10-1
 Economic Benefits, 5, 6
 Embankment, 6-4
 Emergency Action Plan, 6-7, 7-2, 7-3, 10-1
 Emissions, 4-6
 Endangered Species Act, 2-6, 2-11, 2-13, 2-17, 10-1
 Environmental Assessment, 1, ii, 1, 5-3, 10-1
 Environmental Consequences, 1-2, 4-1, 6-1, 6-4
 EPA, 2-1, 2-2, 2-9, 9-1, 10-1
 ESA, 2-13, 2-15, 2-17, 5-1, 6-6, 10-1
 Federal Government, 9-1
 Federal Register, 5-3, 7-1, 10-1
 Final Plan-EA, 5-1, 5-3
 Final Supplemental Watershed Plan and Environmental Assessment, 5-3
 Financing, 6-7, 6-8
 Fish Habitat, 1-3, 2-12
 Fish Species, 2-12
 Forest Resources, 2-26, 3-10, 4-18
 Formulation Process, 3-1
 FR, 2-16, 2-17, 7-1, 10-1
 Geology, 6, 1-3, 2-1, 2-2, 3-7, 4-1, 4-2, 8-1
 GHG, 2-8, 4-6
 Habitat, 2-7, 2-10, 2-12, 2-14, 2-15, 2-17, 7-1, 7-3, 9-4
 Hazard Classification, 2-28, 3-6, 7-3
 Human Environment, 8, 1-3, 2-18, 3-9, 4-11
 Hydrology, 1-3, 2-4, 3-7, 4-3, 4-4, 7-4
 Impacts, 6, 4-1, 4-16, 4-17, 4-18

Indirect Effect, 4-1
 Infrastructure, 9, 1-3, 2-23, 3-10, 4-15, 6-5
 Installation, 3-10, 3-11, 6-7, 6-9, 6-11
 Installation Cost, 3-10, 3-11, 6-9, 6-11
 Introduction, 1-1, 1-2
 Inundation, vi, 2-28, 6
 Investigation and Analysis Report, vi, 2-3
 Land Rights, 9, 1-3, 2-25, 3-10, 4-17
 Land Use, 4, 8, 1-3, 2-18, 3-9, 4-12, 7-1, 6
 Local Government, 9-2, 9-3
 Low-Level Outlet, 2, 1-4, 1-6, 3-5, 6-2
 Maintenance, 6-8, 6-11, 7-2, 7-4
 Maps, vi, 1, 1-5, 2-28, 3-4, 6-1
 MBTA, 2-17, 3-9, 4-10
 Migratory Bird Treaty Act, 2-17, 4-10
 Migratory Birds, 8, 1-3, 2-17, 3-9, 4-10
 Mitigation, 6-4, 6-5, 9-1
 MSAT, 4-6
 NAAQS, 2-9, 10-1
 National Ambient Air Quality Standards, 2-9, 7-4, 10-1
 National Economic Development, 5, 6, 1-2, 1-4, 3-6, 3-10, 10-1
 National Environmental Policy Act, ii, 1-1, 10-1
 National Historic Preservation Act, 2-18
 National Register of Historic Places, 2-18
 National Watershed Program Handbook, 1-1, 3-1, 7-2
 National Watershed Program Manual, 1-1, 3-1, 7-2
 National Wetland Inventory, 2-8
 Natural Areas, 1-3, 2-26, 3-10, 4-18
 Natural Resources Conservation Service, 1, ii, 1, 5-3, 7-2, 7-3, 10-1
 NED, 5, 6, 9, 1-2, 1-4, 3-6, 6-1, 6-9, 6-11, 6-12, 10-1
 NEPA, ii, 1-1, 1-2, 1-3, 2-25, 4-1, 4-5, 5-1, 5-2, 6-6, 7-3, 10-1
 NHPA, 4-11
 No Action Alternative, 5, 3-1, 3-4, 4-1, 4-7, 4-8, 4-9
 NOI, 6-4, 6-6, 10-1
 Noise, 9, 1-3, 2-23, 3-10, 4-15
 North Utah County Water Conservancy District, 1, ii, 1, 7-1, 7-3, 10-1
 Notice of Intent, 6-4, 6-6, 10-1
 NO_x, 4-6
 Noxious Weed, 8, 1-3, 2-11, 3-8, 4-8, 7-4
 NRCS, ii, 1, 5, 1-1, 1-2, 1-3, 1-4, 2-1, 2-2, 2-3, 2-18, 2-25, 2-28, 3-1, 3-2, 3-3, 3-4, 3-10, 4-1, 4-19, 5-1, 5-2, 6-1, 6-5, 6-6, 6-7, 6-8, 7-1, 7-2, 7-3, 8-1, 9-1, 10-1
 NRHP, 2-18
 NUCWCD, ii, 1, 5, 1-3, 1-4, 1-5, 2-3, 2-11, 2-12, 2-25, 3-4, 4-19, 5-2, 6-1, 6-6, 6-7, 6-8, 6-9, 7-3, 10-1
 NWI, 2-8
 O&M, 7, 1-5, 3-7, 3-11, 4-2, 4-19, 6-8, 6-11, 10-1
 Operation, 6-8, 6-11, 7-2
 Operations and Maintenance, 6-7, 10-1
 Organizations, 9-4
 Outlet, 1-7, 6-4
 PAR, 2-28, 3-6, 10-1
 Parklands, 1-3, 2-26, 3-10, 4-12, 4-14, 4-18
 particulate matter, 2-9
 Permits, 2-17, 6-6
 PL, ii, 5, 6, 1-1, 1-4, 6-8, 6-9, 10-1
 Planning, 1-1, 1-3, 2-16, 7-2, 7-3, 7-4
 Plants, 7, 1-3, 2-9, 2-10, 3-8, 4-7, 7-1
 PMP, 2, 1-4, 2-5, 2-28, 3-3, 3-4, 3-7, 4-4, 4-19, 6-2, 10-1
 Population, 4, 2-25, 7-1, 10-1
 Preferred Alternative, ii, 1, 5, 9, 1-2, 1-4, 2-18, 5-1, 6-1, 6-3, 6-6, 6-7, 6-8, 6-9, 6-10, 6-11
 Preparers, 1-2, 8-1
 Prime and Unique Farmlands, 2-1
 Principal Spillway, 2, 1-5, 1-6, 3-4, 6-2
 Probable Maximum Precipitation, 1-4, 2-5, 10-1
 Project Background, 1-4
 Project Costs, 5
 Project Scoping, 3-1
 Public Comment, 5-3
 Public Health and Safety, 9, 1-3, 2-28, 3-10, 4-19
 Public Outreach, 5-3
 Public Participation, 1-2, 5-1, 5-2
 Purpose and Need, 1, 1-1
 Real Property, 6-7, 6-9
 Recreation, vi, 4, 8, 1-3, 1-5, 1-8, 2-18, 2-19, 2-22, 2-23, 3-1, 3-9, 4-12, 4-13, 4-14, 4-16, 5-3, 6-5, 7-4, 9-3, 10-1, 6
 Rehabilitation, 1, ii, 1, 5, 1-1, 1-2, 3-4, 4-1, 4-5, 4-7, 4-8, 4-9, 4-13, 4-15, 4-17, 4-18, 4-19, 6-5, 6-8, 6-9
 Relocations, 6-7
 Reservoir, 4, 8, 10, 1-4, 1-5, 1-8, 1-9, 1-10, 2-1, 2-3, 2-4, 2-5, 2-6, 2-8, 2-9, 2-10, 2-11, 2-12, 2-13, 2-14, 2-18, 2-19, 2-20, 2-21, 2-22, 2-23, 2-24, 2-25, 2-26, 2-27, 3-9, 4-1, 4-9, 4-12, 4-13, 4-14, 4-19, 6-4, 6-5, 7-1, 7-2, 7-3, 7-5

- Resource Concerns, 6
 Resource Issues, 1-3
 Responses, vi
 Responsibilities, 6-7
 RHCA, 2-10, 10-1
 Riparian Areas, 1-3, 2-10, 4-7
 Riparian Habitat Conservation Area, 2-10, 10-1
 Risk and Uncertainty, 4-19
 Scenic Beauty, 9, 1-3, 2-26, 3-10, 4-18
 Schedule, 3-6
 Scope, 1-2
 Sedimentation, 2-3, 7-2
 SHPO, vi, 2-18, 4-11, 5-1, 6-6, 10-1, 4
 Socioeconomics, 9, 1-3, 2-24, 3-10, 4-17
 Soils, vi, 6, 1-3, 2-1, 3-7, 4-1, 4-2, 6-4, 6
 Special Status Plant Species, 1-3, 2-10, 2-11, 3-8, 4-7, 4-8
Staging, 2, 3-5, 6-2
 State Government, 9-1
 State Historic Preservation Office, 10-1
 Storm Water Pollution Prevention Plan, 4-3, 6-4, 6-6, 10-1
 Summary Office of Management and Budget Fact Sheet, 1
 Supplemental Watershed Plan, 1, ii, iv, 1, 1-1, 10-1
 Support Maps, vi
 Supporting Information, vi
 Surface Water, 1-3, 2-4, 3-7, 4-3
 SWPPP, 4-3, 6-4, 6-6, 10-1
 Trailhead, 2-19, 2-20, 4-12, 4-13
 Trails, 2-19, 4-12, 4-13, 9-4
 Transportation, 9, 1-3, 2-23, 3-10, 4-15, 6-5, 9-2
 Tribal Government, 9-1
 U.S. Army Corps of Engineers, 7-3, 10-1
 U.S. Department of Agriculture, 1, ii, iii, 1, 10-1
 U.S. Environmental Protection Agency, 10-1
 U.S. Fish and Wildlife Service, 2-11, 7-3, 10-1
 U.S. Forest Service, 1, 7-4, 10-1
 U.S. Geological Survey, 7-2
 U.S.C., 1, 2-17
 UAC, 2-6
 UCDC, 2-17
 UDEQ, 2-6, 2-9, 7-4, 7-5, 10-1
 UDWR, ii, 1, 2-10, 2-12, 2-13, 2-14, 2-17, 5-1, 7-5, 10-1
 UDWRe, 2-3, 2-5, 2-28, 7-5, 10-1
 UDWRt, 1-1, 1-3, 4-19, 6-1, 7-5
 Uinta-Wasatch-Cache National Forest, 1, ii, 1, 7-4, 10-1
 UPDES, 6-4, 6-6, 10-1
 USACE, 9, 4-5, 5-1, 6-4, 6-6, 7-3, 9-1, 10-1
 USDA, ii, iii, 1, 1-1, 4-19, 7-2, 7-3, 10-1
 USDA-NRCS, ii, 1-1, 4-19, 7-2
 USFS, ii, 1, 4, 9, 1-1, 1-4, 2-1, 2-3, 2-4, 2-6, 2-7, 2-8, 2-9, 2-10, 2-11, 2-12, 2-13, 2-14, 2-15, 2-18, 2-19, 2-21, 2-22, 2-23, 2-24, 2-26, 2-27, 3-10, 4-1, 4-7, 4-13, 4-14, 4-15, 4-16, 4-17, 4-18, 4-19, 5-2, 6-1, 6-4, 6-5, 6-6, 6-7, 6-8, 6-9, 7-4, 8-1, 10-1
 USFWS, 2-8, 2-11, 2-12, 2-13, 2-14, 2-15, 2-16, 2-17, 5-1, 6-6, 7-3, 7-4, 10-1
 USGS, 2-4, 7-4
 Utah Administrative Code, 7-5
 Utah Conservation Data Center, 2-12, 2-14, 7-5
 Utah County, 1, ii, 1, 4, 1-1, 1-4, 2-4, 2-9, 2-10, 2-11, 2-12, 2-14, 2-15, 2-24, 2-25, 4-9, 4-10, 5-2, 7-1, 7-2, 7-3, 7-4, 7-5, 9-3
 Utah County, Utah, 2-11
 Utah Department of Environmental Quality, 2-6, 7-4, 7-5, 9-2, 10-1
 Utah Department of Natural Resources, 7-5, 9-2
 Utah Division of Water Resources, 10-1
 Utah Division of Water Rights, ii, 6-6, 7-5, 10-1
 Utah Division of Wildlife Resources, 1, ii, 1, 2-13, 7-5, 10-1
 Utah Geological Survey, 7-2
 Utah Pollutant Discharge Elimination System, 6-4, 6-6, 10-1
 UWCNF, ii, 1, 4, 8, 1-1, 2-4, 2-11, 2-15, 2-18, 2-19, 2-23, 2-24, 2-25, 2-26, 3-9, 4-7, 4-9, 4-13, 4-14, 4-15, 4-16, 4-19, 6-5, 6-6, 6-7, 10-1
 Vegetation, vi, 7, 1-3, 2-7, 2-9, 2-10, 2-14, 3-8, 4-7, 4-11, 6-4, 6
 Visual Quality, 9, 1-3, 2-23, 2-26, 2-27, 3-10, 4-13, 4-15, 4-18, 7-4, 10-1
 Water Quality, 1-3, 2-5, 2-6, 3-7, 4-3, 6-4, 6-6, 7-4, 7-5
 Water Resources, 7, 1-1, 1-3, 2-4, 3-7, 4-3, 7-3, 7-5, 8-1, 9-3
 Water Rights, 7-2, 7-5
 Waters of the U.S., 7, 1-3, 2-8, 3-7, 4-4, 4-5
 Watershed, 1, ii, vi, 1, 4, 1-1, 1-4, 2-4, 2-6, 2-7, 4-9, 6-6, 6-7, 6-8, 7-1, 7-2, 5, 8
 Wetlands, vi, 7, 1-3, 2-6, 2-8, 3-7, 4-4, 6-4, 7-3, 6
 Wildlife Habitat, 2-14
 Wildlife Species, 2-13, 2-14, 2-15