ENVIRONMENTAL ASSESSMENT

TAINTER GATE CABLE REPLACEMENT
LAKE RED ROCK
MARION COUNTY, IOWA

1. Introduction

A. Purpose and Need. The purpose of this Environmental Assessment (EA), in accordance with the National Environmental Policy Act (NEPA), is to assess the impacts associated with the proposed dewatering of the tainter gate bays, replacement of the tainter gate lifting cables, as well as touch-up painting of the gates, and periodic inspection and maintenance of the dam, scheduled for calendar year 2007. During flood of 1993, several tainter gate cables broke, resulting in a decision to replace them on a 15-year frequency, as part of regularly scheduled operation and maintenance for the facility.

The most recent raise in the elevation of the conservation pool, from 734 feet NGVD to 742 feet National Geodetic Vertical Datum (NGVD) in 1992, resulted in the submergence of a portion of the tainter gate lifting cables and connection brackets. This submergence may accelerate the rate of corrosion to the cables. The expected service life of the tainter gate lifting cables is estimated to be 15 years. Prudent maintenance requires replacement of all cables at or near the end of their expected service life to reduce the potential for a failure to occur. This maintenance requirement has necessitated the creation of a plan to periodically inspect and replace damaged cables. However, in order to maintain the conservation pool at 742 feet NGVD, the tainter gates must be kept down in the closed position, making regular operations and maintenance on the tainter gates and the tainter gate lifting cables virtually impossible without dewatering the tainter gate bays or drawing down the conservation pool below the spillway crest of 736 feet NGVD.

B. Project Location. Lake Red Rock is located primarily in Marion County, Iowa, on the Des Moines River although the flood pool extends into Jasper, Warren, and Polk Counties. The Des Moines River flows in a southeasterly direction, from its headwaters north of Slayton, Minnesota, across central and eastern Iowa to its confluence with the Mississippi River south of Lock & Dam 19, near Keokuk, Iowa. Red Rock Dam is located in Marion County, Iowa, on the Des Moines River, approximately 35 miles southeast of the City of Des Moines; and 142 river miles upstream from its confluence with the Mississippi River. The nearest cities are Pella, four miles to the northeast, and Knoxville, six miles to the southwest. A general location map is shown in Figure 1.

At the conservation pool elevation of 742 feet NGVD, Red Rock Reservoir is Iowa's largest lake with 15,253 surface acres of water. Red Rock Dam and Reservoir serve a variety of functions, including flood control protection, low flow augmentation, recreation, and fish and wildlife management.

C. Project Authority. The Red Rock Dam and Reservoir on the Des Moines River are part of the general comprehensive plan for flood control in the Upper Mississippi River Basin

under the authority of Public Law 761, 75th Congress, third session, approved June 28, 1938, which authorized the project for flood control. Recreation and fish and wildlife facilities were subsequently authorized in Public Law 534, 78th Congress (approved December 22, 1944) and the Water Resources Development Act of 1976 (Public Law 94-587).

The primary project purpose of the Lake Red Rock Project is to provide flood control protection and low-flow augmentation for the lower Des Moines River. Other related and authorized project purposes include recreation, and fish and wildlife management. The Lake Red Rock Project is operated and maintained by the Corps of Engineers, Rock Island District, in accordance with the aforementioned Congressional authorizations.

D. Background. Construction on the dam began in 1960, with completion in May 1969. The dam consists of a rolled earth-fill embankment and a concrete outlet control structure that also functions as an emergency spillway. The dam, with a crest elevation of 797 feet NGVD, is 5,676 feet long and 95 feet above the flood plain. The gated concrete spillway, or outlet structure, is founded on bedrock with a crest elevation of 736 feet. The outlet control structure was designed and constructed with the lake water level at 725 feet NGVD. The outlet structure consists of five cable-operated tainter gates with a gate sill elevation of 735 feet NGVD and fourteen 5-foot by 9-foot sluice gated conduits, which extend through the spillway and discharge into the stilling basin. The spillway's five tainter gates are 45 feet high and 41 feet wide, separated by 9-foot wide piers. There are four 1" diameter-lifting cables located at each side of the tainter gates to be used to raise (open) or lower (close) the tainter gates. The cable connection bracket and the gate sills are at an elevation of 735 feet NGVD. The tops of all tainter gates are at 781.0 feet NGVD when closed. This top elevation is one foot above the full flood-control pool elevation. A single bulkhead, used to dewater the sluice-gated conduits, is stored on the upstream side of the dam and transported by an overhead steel monorail hoist.

The conservation pool level, originally planned at 720 feet NGVD, was set at 725 feet NGVD when the dam was completed. Pool raises were made in 1979 to 728 feet NGVD, in 1988 to 734 feet NGVD, and eventually in 1992 to 742 feet NGVD. The primary reason for the pool raises was to reacquire sufficient conservation storage for low flow augmentation that had been lost due to sedimentation. The annual sedimentation rate was projected through the 100-year project life and added to the storage required to ensure low flows of 300 cubic feet per second (cfs) downstream in Ottumwa. Concern about sedimentation existed during the initial design of the reservoir and the decision to raise the pool elevation eventually to 742 feet NGVD was made in 1988. At the current full flood control elevation of 780 feet NGVD, the pool covers 64,684 acres, and contains approximately 1,624,970 acre-feet of water. The pool of record, 782.67 feet, occurred on July 13, 1993. At the normal conservation pool elevation of 742 feet NGVD, the pool covers 15,253 acres. From mid-September until mid-December, the pool is intentionally raised 2 feet above the conservation pool of 742 feet NGVD for migratory waterfowl habitat and then lowered to 742 feet NGVD in mid-December.

During the Flood of 1993, five of the forty lifting cables failed due to corrosion and added stress caused by the flood, rendering the two outer gates inoperable. After the flood, an emergency deviation to the Lake Red Rock regulation plan was required to allow a 10-foot pool drawdown to replace all the tainter gate cables and brackets. A method needs to be developed to replace the

cables in 2007/2008 and periodically thereafter, or in case of an emergency situation. Secondly, a feasible method is needed to perform periodic tainter gate inspection and maintenance, such as painting.

The tainter gate cables have a service life of 15 years requiring that they be replaced in 2007/2008 and every 15 years thereafter. The vinyl paint system on the tainter gates, applied in 1989, has an expected service life of 25-30 years, indicating that the gates will need total repainting by 2019. The tainter gate cables replacement is planned for the fall of 2007. A periodic inspection in 2002 indicated that the paint system on the tainter gates had failed at some locations, particularly the downstream side. Touch up painting, to ensure the life of the paint coating, could be accomplished at the same time as the dewatering for the cable replacement.

E. Related NEPA Documents.

1. Final Environmental Impact Statement (EIS) on the Operation and Maintenance of the Red Rock Dam and Lake Red Rock, Des Moines River, Iowa, August 1975. This EIS evaluated nine operation and maintenance alternatives, including no action, and the environmental impacts of those alternatives on the resources of the local area and larger region.

2. Red Rock Dam and Lake Red Rock Resource Master Plan, December 1976. This document is to guide the development, management, preservation, and use of project resources in a manner that insures optimum public benefits from those resources over the life of the project. The master plan assessed the land and water resources of the Lake Red Rock project, and established development principles and management guidelines in accordance with Corps of Engineers regulations.

3. Environmental Assessment of Lake Red Rock, Iowa, Change in Conservation Pool Operating Level, September 1981. This EA evaluated the proposal to raise the conservation pool of Lake Red Rock from 728 feet NGVD to 730 feet NGVD for the period from 15 September to 15 December as an interim measure while the Des Moines River Basin Water Demand and Availability Study, which considered the optimum conservation pool, was completed. This raise is primarily for wildlife management purposes and was suggested by the U.S. Fish and Wildlife Service (USFWS) and requested by the Iowa Conservation Commission.

4. Alternatives to the Regulation of Lake Red Rock, Des Moines River, Iowa, March 1985. This report described and evaluated a range of possible alternatives to increase the conservation pool elevation from 728 feet to 742 feet NGVD; however, no plan was selected. Each alternative did include a 2-foot raise in the fall conservation pool (15 September to 15 December) for migratory waterfowl use and better access for waterfowl hunters.

5. Water Control Plan with Final Supplemental Environmental Impact Statement, Lake Red Rock, Iowa, May 1988. This document examined a range of alternatives for the regulation of Lake Red Rock that addresses sedimentation within the pool and maximizes the multiple uses of the lake. The final recommendation was for a one step raise of the conservation pool from 728 feet NGVD to 734 feet NGVD, included a 2-foot fall pool raise for the benefit of migrating waterfowl, and recognized the future need to raise the conservation pool to 742 feet NGVD.

6. Water Control Plan with Supplemental Master Plan and Final Environmental Impact Statement II, Lake Red Rock, Iowa, May 1990. This document evaluated the impact of raising the conservation pool from 734 feet NGVD to 742 feet NGVD and includes a 2-foot pool raise in the fall for the benefit of migrating waterfowl. Elevation 742 feet NGVD represents the conservation pool necessary to store 100 years of sediment accumulation as well as the volume of water required to provide reliable low-flow augmentation to downstream river reaches during severe drought conditions.

2. Project Description

The US Army Corps of Engineers, Rock Island District (Corps) is proposing a temporary 10-foot drawdown, lowering of the Red Rock Pool to elevation 732 feet NGVD, to allow for the inspection and replacement of the tainter gate cables and allow for touch-up painting on the tainter gates as needed. In order for the required operation and maintenance work to proceed, all water must be removed from the tainter gate bays. This action ensures the long-term project purpose of flood control is maintained at the current levels, without any reduction in the life, health, and safety to local and regional human populations.

The proposed drawdown would begin in the fall of calendar year 2007, immediately after Labor Day. In an effort to minimize sloughing of the bank during a drawdown, the level of the lake would be lowered at a rate of 0.5 feet per day so that a 10-foot drawdown would require 20 days to complete. Figure 2 depicts the water depths at maximum drawdown. Figure 3 shows the areas that would be exposed by the drawdown. This action requires a deviation from the Water Control Plan.

The estimated time required for tainter gate cable replacement is about four weeks, based on a 45-hour workweek, or two weeks, based on a 93-hour workweek, using two shifts. Some work could begin before the drawdown elevation of 732 feet NGVD is attained. Replacement of the tainter gate cables would require the removal of the existing cables and installing new cables and associated hardware. During the removal and replacement of the cables, vehicular traffic using the roadway over the Lake Red Rock dam may be stopped or restricted to only one lane for short periods of time. The construction details for tainter gate cable replacement can be found in Appendix C of this document.

Rehabilitation of the vinyl paint system would involve touch-up painting. The process would include sand blasting of the affected areas down to bare metal, applying a primer, and then applying the vinyl paint coating system either by spray or by hand. A containment system would be constructed at each touch-up paint location to collect excess sand and paint. The estimated time for touch-up painting, which could be done in conjunction with cable replacement, is 4 to 7 weeks. The construction details for tainter gate touch up painting can be found in Appendix D of this document.

When the work is completed, the pool would be raised as quickly as possible, while still maintaining outflows of at least 300 cubic feet per second, as required by the Water Control Plan, until the conservation pool elevation of 742 feet NGVD is attained. Based on inflow records since the lake became operational, the average time needed to reach the conservation

pool elevation is approximately 54 days during this time of year. The total time required for the drawdown, cable replacement, touch-up painting, and pool raise under ideal conditions would be approximately 3.4 to 4 months; however, the time to raise the pool is entirely weather dependent.

A traveling bulkhead system that would allow individual tainter gate bays to be dewatered would be installed at the Lake Red Rock Dam at a future date, but is planned before 2022, when cable replacement and total repainting of the tainter gates would be required. This bulkhead system would eliminate the need for periodic drawdown for tainter gate cable replacement, tainter gate painting, or other repair and maintenance for the tainter gates. The construction details for installation of the traveling bulkhead system are located in Appendix E. The site is located entirely on Corps of Engineers (Corps) fee title land, acquired in conjunction with the Lake Red Rock Reservoir Project.

3. Alternatives

Currently, there is no method to dewater the spillway tainter gates at the dam for inspection, testing, maintenance, and repair. Tainter gate cable replacement is necessary every 15 years. Painting of the tainter gates is needed every 25-30 years and could be scheduled to coincide with the 15-year cable replacement cycle. At the times when total repainting is not necessary, the paint on the tainter gates should be touched-up if necessary. A number of methods for dewatering the tainter gate bays are available. Methods that have been considered include temporary drawdown of Lake Red Rock, traditional bulkhead segments or stoplogs, cofferdams, floating bulkheads, and traveling bulkheads. Factors considered include environmental impacts, socioeconomic effects, ease of operation, and cost. Cable replacement, as well as touch-up painting of the tainter gates is included in all of the following alternatives except No Action. A summary comparison of the alternatives considered is provided in Table 3.

A. No Action. Under the No Action alternative, the required tainter gate cable replacement would not occur. If the tainter gate cables fail, an emergency drawdown would be needed to perform repairs. Each drawdown would require a deviation from the operating procedures and, due to the unknown time, such an event could happen at a very inopportune time, adversely affecting the environment and recreational use of the reservoir. If an emergency happens during periods of high water, the control of the gates would be lost until hydrologic conditions changed sufficiently to allow a drawdown. Deferred maintenance of the tainter gates and cables would likely result in catastrophic service disruption in the foreseeable future, leading to lack of operational control of the water level at the dam. This could lead to a structural failure of the dam. Because of these concerns, this alternative was not considered viable.

B. Traveling Bulkheads. The traveling bulkhead system would allow one tainter gate bay to be dewatered at a time for inspection and maintenance. When required, the tainter gate cables could be replaced, one gate at a time with the bulkhead system in place, without the need for a drawdown of the conservation pool, as is needed now. Cable replacement would be accomplished as described in Appendix C, except only one gate would be done at a time. A traveling bulkhead system allows for one bulkhead to be moved from one gate bay to another via a monorail. One or two operators can accomplish installation and removal of the bulkhead. Once the bulkhead is in place, dewatering of each tainter gate can be completed in a matter of

minutes. The bulkhead system would consist of a steel bulkhead that travels via a trolley along two steel rail beams located on the outlet structure above the tainter gate bays. The existing sluice gate bulkhead (smaller than the tainter gate bulkhead) would also run on a trolley on the same rail beams as the tainter gate bulkhead. The bulkhead can be stored on the dam in a secure location and there is relatively low maintenance with this type of system. This system can be installed without the need for a drawdown during construction and would result in little to no ground disturbance.

Installation of the new bulkhead system would involve removal and replacement of pavement on the bridge above the outlet structure, attachment of the trolley beam support girders on the outside of the outlet structure in front of the gate bays, attachment of an access platform, attachment of gate bulkhead hoists and trolley system, electrical work, delivery and attachment of the bulkhead, and reinstallation of the sluice gate bulkhead system. A small amount of the existing riprap on the slope adjacent to the outlet structure may be removed. Painting of some steel structures would also be required. Pavement removal and installation of the support girders would be accomplished such that there is a minimum amount of disruption to any traffic that may be crossing the bridge above the outlet structure. There may be some periods in which traffic would have to be stopped along the bridge or regulated to only one lane. Construction details for the traveling bulkhead system are located in Appendix E.

The cost of this alternative is currently estimated to be approximately $2.3 million. The Corps is actively pursuing funding for this proposed construction, however, funding may not be secured prior to the scheduled tainter gate cable replacement in 2007/2008. **This alternative is the long-term preferred alternative**.

C. Periodic Drawdown to Elevation 732 feet NGVD. This alternative would allow inspection and maintenance to be performed on a scheduled, but limited basis. Tainter gate cable replacement is necessary every 15 years. Painting of the tainter gates is needed every 25-30 years and could be scheduled to coincide with the 15-year cable replacement cycle.

In an effort to minimize sloughing of the bank during a drawdown, the level of the lake would be lowered at a rate of 0.5 feet per day, so that a 10-foot drawdown would require 20 days to complete. It will take outflows of about 2,000 to 4,000 cfs over the inflow rate to lower the reservoir 0.5 feet per day for the drawdown. The time required for pool drawdown, tainter gate cable replacement, touch up painting, if needed, and returning to the conservation pool elevation is 3.4 to 4 months, next scheduled for 2007/2008. The time needed for pool drawdown, tainter gate cable replacement, totally repainting the tainter gates, and returning to the conservation pool elevation tainter gate cable replacement and is 3.4 to 8.4 months, next scheduled for 2019. When the work is completed, the pool would be raised as quickly as possible, while still maintaining outflows of at least 300 cubic feet per second, as required by the Water Control Plan, until the conservation pool elevation of 742 feet NGVD is attained. Based on inflow records since the lake became operational, the average time needed to reach the conservation pool elevation is approximately 54 days during the late fall/early winter months; however, the time to raise the pool is entirely weather dependent.

Table 1. Estimated Times for Scheduled Repair Components

Action	2007	2019
	Time (in months)*	
Drawdown	0.7	0.7
Cable replacement + touch up painting	1.0-1.6	
Cable replacement + total gate painting		3.0-6.0
Raise pool	1.7	1.7
TOTAL (time in months)	**3.4-4.0**	**4.4-8.4**

*Note: time estimate assumes ideal conditions

A drawdown requires considerable planning, documentation and coordination between all affected agencies and approval for a variance from the normal operating plan. During the year, there is only a limited timeframe in which a drawdown can be accomplished due to environmental, hydrological, and operational constraints. The timing of a drawdown is further complicated by the recreational use of the lake. Boaters, anglers, and hunters all use the lake extensively, particularly in the summer and fall. As indicated by Figure 3, a drawdown of 10 feet would decrease the available surface area of the reservoir to nearly half of what is normally available. Natural resource impacts by season are summarized in Table 2.

1. Winter (December-February). A late fall or winter drawdown may increase fish stress and the possibility for fish kills during periods of low dissolved oxygen, a time fish are already stressed by low temperatures. This effect is further increased in years with a heavy snowfall. Some maintenance procedures, such as painting, cannot be performed without significant measures to mitigate for temperatures at or below freezing, limiting the potential for a drawdown in the winter. Adverse weather conditions may increase the length of time necessary to complete the required work. Ice formation during the drawdown period could create unsafe conditions for lake users. However, waterfowl hunting and recreation impacts would be reduced compared to the other seasons evaluated. Therefore, a drawdown during the winter was carried forward for more consideration.

2. Spring (March-May). A drawdown in the spring is not feasible due to spring flooding probability (Figure 4) and volatile weather affecting hydrological conditions. In addition, a spring drawdown may adversely affect the fish populations in the lake by reducing spawning habitat. A drawdown during the spring months was dropped from further consideration.

3. Summer (June-August). A drawdown during the summer months is not feasible due to high inflows, particularly during the early summer months. On average, water levels in Lake Red Rock remain above the conservation pool elevation through the month of July (Figure 4). In addition, low dissolved oxygen concentrations throughout the water column frequently occur during the later summer months when inflows are very low (see Table 4). Hypoxic conditions that may occur during summer months will be exacerbated under lower volumes of water, resulting in an increased possibility for fish kills. In addition, the impacts to recreation are significant (Table 5). A summer drawdown may help to consolidate sediments, but the benefits to aquatic plants may be minimal since water levels vary widely during the growing season. Therefore, a summer drawdown was dropped from further consideration.

4. Fall (September-November). A drawdown in the fall would reduce the habitat area available for migratory wildlife, impacting waterfowl hunting, but without impacting waterfowl species. Potential impacts to fish populations include some increased release of fish through the gates as the pool area decreases, and trapping of fish in isolated pools of water; both actions could result in increased fish mortality. These potential fisheries impacts would result regardless of the drawdown season. While dissolved oxygen concentrations can be problematic during the early fall, during the drawdown period, flows through the lake would be greater than normal, replenishing the dissolved oxygen in the lake. **Fall was identified as the preferred season for a drawdown.**

Table 2. Summary of Relative Impacts[1] by Season

	Winter	Spring	Summer	Fall
Fish species	minimal	minor	yes	minimal
Bird species	no	no	no	no
Waterfowl species	no	no	no	no
Amphibian/Reptile species	yes	no	no	minimal
Low dissolved O2	minimal	no	yes	minimal
Feasible[2]	yes	no	no	yes

[1] no<minimal<minor<yes
[2] see Figure 4

When considering the operating constraints of the reservoir, as well as the social, economic, and environmental effects of a drawdown, the optimal time for a drawdown becomes extremely complex. Due to the possible negative impacts to the habitats and species found in the reservoir, as well as costly socio-economic concerns, a reoccurring drawdown of every 15 years is not the optimum alternative. Additionally, a drawdown undertaken before the onset of drought conditions may result in an extended timeframe to replenish conservation pool levels. Due to the environmental, hydrological, and recreational demands at the lake, it would be very difficult, but still feasible, to find an acceptable timeframe in which to schedule a drawdown for longer than 3 months on a recurring basis. A periodic drawdown was carried forward for more consideration.

D. One Time Drawdown + Future Installation of Traveling Bulkhead System. A one time, temporary 10-foot drawdown would begin in calendar year 2007, immediately after Labor Day. In an effort to minimize sloughing of the bank during a drawdown, the level of the lake would be lowered at a rate of 0.5 feet per day so that a 10-foot drawdown would require 20 days to complete. Figure 2 depicts the water depths at maximum drawdown. Figure 3 shows the areas that would be exposed by the drawdown. The estimated time required for tainter gate cable replacement is about four weeks based on a 45-hour workweek or two weeks based on a 93-hour workweek, utilizing two shifts. The estimated time for touch-up painting, which could be done in conjunction with cable replacement, is 4 to 7 weeks. Some work could begin before the drawdown elevation of 732 feet NGVD is attained. When the work is completed, the pool would be raised as quickly as possible, while still maintaining outflows of at least 300 cubic feet per second, as required by the Water Control Plan, until the conservation pool elevation of 742 feet NGVD is attained. Based on inflow records since the lake became operational, the average time needed to reach the conservation pool elevation is approximately 54 days during this time of

year. The total time required for the drawdown, cable replacement, touch-up painting, and pool raise under ideal conditions would be approximately 3.4 to 4 months; however, the time to raise the pool is entirely weather dependent. Under this alternative, the future installation of the traveling bulkhead system would eliminate the need for any future drawdowns after 2007 as well as all-future maintenance work could be performed with the bulkhead in place. **This is the preferred alternative.**

However, if funding is not secured in a timely manner for installation of the traveling bulkhead system prior to the next scheduled tainter gate cable replacement and total gate painting in 2019, another drawdown may be necessary. Since this maintenance work would require a longer timeframe (see Table 1) than evaluated in this EA, it would require a thorough impact evaluation and NEPA coordination prior to that activity.

E. Traditional Bulkheads. Traditional bulkhead sections or stoplogs could be used to dewater the tainter gate bays. Installation could be accomplished by using a crane located on the bridge above the dam or a barge below the dam. Bulkhead slots would have to be cut in the concrete piers at the sides of the tainter gates. Modifications to the piers may also be required. The location of the slots for these bulkheads would have to be upstream of the spillway crest, but back and under the bridge above, making access to the slots for installation and removal of the bulkheads very difficult, particularly in emergency situations. A large crew and considerable equipment would be required for installation and removal of theses bulkheads.

An inflatable rubber dam could be used as a bulkhead but would be a permanent installation and so one would need to be installed at every gate bay. These dams have relatively low maintenance requirements, but are susceptible to damage from debris and impacts. In addition, these dams are limited in size such that they would not be of sufficient height to completely dewater the tainter gate bay without a partial drawdown of the conservation pool. Repairs would be difficult and costly. Because of potential difficulty in operation and high maintenance costs of these traditional bulkhead systems, this alternative was dropped from further consideration.

F. Cofferdams. Installation of localized temporary or permanent cofferdams around the tainter gate cables would allow access to the bottom section and connection brackets of the cables, which are currently submerged. It was determined that permanent cofferdams would increase the loading on the tainter gate structural supports, adversely affecting the original design of the tainter gates, and reducing the safety factor of the cables. Two temporary cofferdams could be used, and moved from location to location, to accomplish the desired work and then stored on site for future use. The temporary cofferdams would have to be installed from a floating plant because of the lack of overhead clearance. Although these methods would provide for cable inspection and replacement, they do not address the inspection and maintenance requirements of the tainter gates or allow for touch-up painting of the tainter gates. Site constraints and high water present many safety and constructability concerns for this alternative; therefore, this alternative was dropped from further consideration.

G. Additional Alternatives Evaluated but Dropped From Further Consideration. Additional alternatives were investigated during the course of this investigation. These include increasing cable life, cable connection modification, and modifying the spillway.

1. Increasing cable life. Potential solutions have been examined to increase the cable life. These have included replacing the plow steel cables with different materials including: improved plow steel cables; stainless steel cables of the same diameter; stainless steel cables of a larger diameter; fully plastic encapsulated wire rope; and replacement of wire rope and hoisting drum with chain pocket wheel and chain. The use of stainless steel cables should increase the life of the cables by about 30-40% compared to non-stainless cables, however, replacing the existing cables with stainless steel would slightly reduce the factor of safety on the cables. This modification is being considered for implementation when the cables are replaced, however, it does not address the inspection and maintenance requirements of the tainter gates. Other methods of modifying the cables were found not to be feasible or incompatible with the existing structure.

2. Cable connection modification. The connection of the cables to the tainter gates could be raised above the current pool elevation with the use of extension brackets. The extension brackets would be more resistant to corrosion than the cables and the cables could be replaced under dry conditions. Installation of extension brackets would alter the original design of the tainter gates, considerable alterations would be needed on the cables, and the extension brackets could easily be damaged when the tainter gates were lifted to the open position. In addition, this modification would not address the inspection and maintenance requirements of the tainter gates.

3. Modify spillway. The existing reinforced concrete crest of the spillway could be raised above the current conservation pool elevation. The spillway would have to be raised 8 feet, significantly modifying the existing structure. This modification could cause stability problems to the dam. It may also adversely affect the hydraulic conditions of the spillway. Raising the spillway 8 feet would also impact the discharge capacity of the spillway during the design event resulting in insufficient flow capacity.

Table 3. Comparison of Alternatives

	No Action	Traveling Bulkhead	Drawdown	Traditional Bulkheads	Cofferdam
Periodic Inspection and Maintenance	no	yes	yes	yes	no
Cable Replacement	no	yes	yes	yes	yes
Touch-up Paint	no	yes	yes	yes	no
Total repaint	no	yes	yes	yes	no
Feasible	yes	yes	yes	no	yes

4. Affected Environment.

A. Physical Environment.

1. Topography. The topography of the project area varies throughout segments of the lake, falling into three major segments: the deeper main body of the lake (downstream of Highway14); the more shallow wildlife area (upstream of Highway 14); and the Whitebreast Creek embayment. The topography of the main lake is characteristic of a large manmade lake, with less than half of its shoreline being steep and rocky. The terrain throughout the wildlife

area, upstream of Highway 14, is relatively flat, with significant areas of wetlands. The Whitebreast Creek embayment areas consist of a wide, shallow lake that abruptly changes to a bottomland environment. The terrain throughout this segment varies from steep, rocky bluffs to moderately sloping hills.

2. Water Quality. A water quality-monitoring program is currently in place at Lake Red Rock. Poor water quality often occurs when extremely high flows carry large amounts of suspended materials into the lake. However, a review of historical water quality data revealed that most instances of poor water quality occurred during the late summer when flows are very low (Table 4). Of particular concern is the occurrence of low dissolved oxygen (DO) concentrations that have been observed throughout the water column during the summer. This situation occasionally is associated with excessive algal growth, and high nutrient concentrations, all of which can stress fish and other aquatic organisms.

The fall and winter months are typically when the best water quality is observed within the lake. Dissolved oxygen concentrations are usually near 100% saturation and nutrient concentrations are low compared to those observed during the spring and summer months. Even when thick ice and heavy snow cover conditions exist, water quality is usually acceptable.

Table 4. Lake Red Rock Dissolved Oxygen Analysis, 1974-2002

	Instances when [DO] near the bottom of the lake fell below 5.0 mg/l		Instances when DO throughout the majority of the lake fell below 5.0 mg/l	
Time Period	**Number of times**	**Percent of time**	**Number of times**	**Percent of time**
1974 - 2002	223	33.4%	77	11.5%
Jan	0	0.0%	0	0.0%
Feb	2	0.3%	0	0.0%
Mar	0	0.0%	0	0.0%
Apr	1	0.1%	0	0.0%
May	7	1.0%	0	0.0%
Jun	51	7.6%	8	1.2%
Jul	82	12.3%	30	4.5%
Aug	65	9.7%	34	5.1%
Sep	15	2.2%	5	0.7%
Oct	0	0.0%	0	0.0%
Nov	0	0.0%	0	0.0%
Dec	0	0.0%	0	0.0%

3. Sediment Quality. Little data exist to evaluate sediment at Lake Red Rock. Any contaminants present are probably related to agricultural practices.

B. Water/Hydrologic Resources. At conservation pool, Lake Red Rock covers approximately 15,253 acres and contains 188,381 acre-feet of water. At the full flood control elevation of 780 feet NGVD, the pool covers 64,680 acres, and contains approximately 1,624,970 acre-feet of water. The pool of record, 782.67 feet NGVD, occurred on July 13, 1993. The operation of water levels at Lake Red Rock is set out in the Water Control Plan. This plan

was last altered in May 1990 when the conservation pool was raised to 742 feet NGVD. Included in the Water Control Plan is the provision for a 2-foot pool raise in the fall to provide migratory waterfowl habitat.

The maximum outflows at the dam, as prescribed in the 2003 Water Control Plan, are as follows:

December 16-April 30	30,000 cfs
May 1-December 15	
Pool below 760 feet NGVD	18,000 cfs
Pool above 760 feet NGVD	22,000 cfs

During periods of downstream flooding, the outflows can be slightly higher at Keosauqua, Iowa.

C. Natural Resources.

1. Terrestrial Resources. The natural vegetation of the project areas can be characterized in terms of four general associations related primarily to moisture availability. The bottomlands along the Des Moines River and the larger tributaries support a typical cottonwood-maple-elm-willow association. However, these forests have been impacted by period inundation, altering the species composition in favor of more flood-tolerant species. Northerly slopes support oak-hickory forests while southern slopes, with more clayey soils, historically supported bluestem prairie. The crests of the exposed sandstone bluffs have a more xeric forest cover of dogwood, spicebush, red cedar, and scrub oaks. The terrestrial project lands support populations of white-tailed deer, ring-necked pheasant, bobwhite quail, and other non-game mammalian and avian species. The Iowa Department of Natural Resources (IDNR) manages 28,481 acres for wildlife purposes within the upper reaches of the Red Rock Reservoir on the floodplain of the Des Moines River in Polk, Marion, Jasper and Warren counties.

2. Aquatic Resources. The relatively new lacustrine environment resulting from the impoundment influences the aquatic resources of Lake Red Rock. In addition, the aquatic resources are subject to rapid eutrophication from siltation and agricultural runoff, high turbidity, and low oxygenation during the late summer months. The fish population is comprised of black and white crappie, largemouth bass, bluegill, yellow bass, channel catfish, black bullhead, carp, river carpsucker, and bigmouth buffalo.

Three turtle species, snapping, spiny soft-shell, and painted, have been documented at Lake Red Rock. This is a lower than expected diversity, due in part to the fluctuations of the lake levels and lack of suitable nest sites.

D. Threatened and Endangered Species. Coordination with the IDNR and the U.S. Fish and Wildlife Service (USFWS) resulted in the identification of two threatened or endangered species within or near the project area. The bald eagle (*Haliaeetus leucocephalus*) is federally protected, and Indiana bat (*Myotis sodalis*) is endangered at both the federal and state level.

The bald eagle is known to winter, and may potentially be found to breed, in Marion County. During the winter, this species feeds on fish in open water areas created by the dam tailwaters. They roost at night in large trees adjacent to the river in areas protected from the harsh winter elements. They also perch in large shoreline trees.

The Indiana bat frequents small streams with well-developed riparian woods and mature upland forests during the summer. It roosts and rears its young beneath the loose bark of large dead or dying trees. It winters in caves and abandoned mines.

E. Socioeconomic Resources. Red Rock is Iowa's largest expanse of public land offering almost 35,000 acres of habitat, shoreline, and bluffs adjoining the lake. The area provides vast opportunities for boating, waterfowl hunting, fishing, swimming, wildlife observation, photography, plus activities that are enhanced by proximity to water such as hiking, picnicking, bird watching, camping, and water sports. There are ten Corps of Engineers recreation areas, two State of Iowa areas, and one county park at Lake Red Rock. Most of these facilities are located above elevation 760 feet NGVD. Those facilities requiring direct water contact include boat ramps, the marina, and beaches. Though these areas were originally designed to be functional at elevation 728 feet NGVD, they have been modified to function at elevation 742 feet NGVD or have been impacted by the increase in lake sediments.

The major facilities and activities[1] at Lake Red Rock include the following:

1. Water-based recreation – 2 beaches, 7 boat ramps, 1 marina
2. Trails – 8 trails, 1 equestrian trail
3. Cabins – Cordova County Park
4. Picnic shelters – 5 locations
5. Camping – 8 campgrounds
6. Fishing
7. Hunting
8. Special events – Bald Eagle Days, campfire programs (Memorial Day through Labor Day), church services (Memorial Day through Labor Day), and Red Rock Yacht Club sailing events.

[1] Information from "LakeExplorer, the Official Guide to Lake Red Rock, Red Rock Lake Association.

Recreation use and activities at Lake Red Rock, displayed in Table 5, shows visitor usage, seasonal availability, facility closures, waterfowl hunting periods, as well as special activities and other considerations, on a monthly basis.

Table 5. Recreation use and activities a Lake Red Rock

RED ROCK LAKE	MONTH[1]											
ACTIVITY	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Visitor Hours[2]	38,598	27,664	107,857	190,202	353,197	1,082,782	1,352,390	1,016,720	509,930	59,926	27,443	13,685
Water Recreation (beaches)	closed	closed	closed	closed	open	open	open	open	open	closed	closed	closed
Marina:					slip rental (start 5/15)					slip rental (end 10/15)		
# visitors (peak season)[3]					480	1500	1860	1200	600	360		
# visitors (non-peak)[3]	150	250	300	350							500	350
Boat Ramps	open	open	open	open	open	open	open	open	open	open	open	open
Campgrounds (counts[4])	closed	closed	closed	1270	5525	6671	7721	8907	4153	1583	closed	closed
Fishing												
Trails	open	open	open	open	open	open	open	open	open	open	open	open
Picnic Shelters	closed	closed	closed	open	open	open	open	open	open	open	closed	closed
Waterfowl hunting	open	open	open									
light geese												
snipe, rail									open	open	open	
waterfowl										open	open	open
Special Activities		Bald Eagle Days			campfire programs; church services	campfire programs; church services	campfire programs; regattas; church services	campfire programs; church services	campfire programs; church services			
Other Considerations	ice	ice	flood season	flood; begin peak season	peak season	peak season	peak season	peak season	end peak season			ice

[1] Information from "LakeExplorer, the Official Guide to Lake Red Rock, Red Rock Lake Association.

[2] actual counts (2003)

[3] estimated numbers (2003)

[4] actual count of number of campers (2003)

F. Historic Properties. The most recent conservation pool raise from elevation 734 feet NGVD to elevation 742 feet NGVD was coordinated with the State Historical Society of Iowa (SHSI) and the Advisory Council on Historic Preservation (Council). This consultation defined the Area of Potential Effect (APE) as land between elevation 728 and 760 feet NGVD and included results from inventory, evaluation of 92 archeological sites, and data recovery at 11 archeological sites. By letter dated April 12, 1988, the council concurred with the Corps' determination that the pool raise would have No Adverse Effect to historic properties. By letter date June 23, 1988, the SHSI concurred with data recovery plans to mitigate impact to the 11 historic properties identified within the APE. By letter dated May 16, 1989, the SHSI notified the Corps that all obligations regarding the Conditional No Adverse Effect determination for these sites had been fulfilled. Full disclosure of the undertaking and results of coordination were included in the *Draft Water Control Plan with Supplemental Master Plan and Final Environmental Impact Statement Supplement II*, for a 45-day public review and comment the SHSI concurred with the finding of the report by letter dated January 2, 1989.

G. Hazardous, Toxic, and Radioactive Waste (HTRW). All lead paint was removed from the tainter gates during the most recent complete painting of the gates in 1989. No other occurrences of HTRW are known within the proposed project area.

5. Environmental Impacts of the Preferred Alternative

The cable replacement, and any associated painting of the tainter gates, must be done under dry conditions; however, this work would result in little to no ground disturbance. Environmental impacts of the completion for this work would be minimal. However, in the absence of a dewatering system, such as bulkheads, Lake Red Rock must be drawn down 10 feet, to elevation 732 feet NGVD to accomplish this proposed maintenance work.

The traveling bulkhead system, to be installed when funding becomes available, would allow one gate bay to be dewatered at a time for inspection and maintenance. When required, the tainter gate cables could be replaced one gate with the bulkhead system in place without the need for a drawdown of the conservation pool. Cable replacement would be accomplished in a manner similar to that previously described for cable replacement during a drawdown. The bulkhead can be stored on the dam in a secure location and there is relatively low maintenance with this type of system. This system can be installed without the need for a drawdown during construction and would result in little to no ground disturbance. Environmental impacts of the installation for this system would be minimal. Detailed construction information for the tainter gate cable replacement, tainter gate touch up painting, and installation of the traveling bulkhead system can be found in Appendices C, D, and E, respectively.

The proposed 10-foot drawdown of Lake Red Rock for the purpose of performing required structural maintenance would result in the temporary loss of approximately 116,200 acre-feet of water volume and the exposure of approximately 11 square miles of land. This will impact water quality, sediment quality and associated biologic components. Fish will be confined to a volume of water that is less than 40% of what is available at elevation 742 feet NGVD. Exposed bottom-dwelling, or benthic, organisms would probably not survive. Also of concern is the fact that flow conditions during certain times of the year may make it difficult to restore the conservation

pool as quickly as is proposed. The impacts of the proposed drawdown are discussed in detail below.

A. Physical Environment.

1. Water Quality. A review of historical water quality data revealed that most instances of poor water quality occurred during the late summer when flows are very low and temperatures are high (Table 4). While dissolved oxygen concentrations can be problematic during the early fall, during the beginning of the drawdown period, flows through the lake would be greater then normal, replenishing the dissolved oxygen in the lake, reducing the potential for fisheries impacts from low dissolved oxygen. The fall and winter months are typically when the best water quality is observed within the lake. Dissolved oxygen concentrations are usually near 100% saturation and nutrient concentrations are low, compared to those observed during the spring and summer months. Even when thick ice and heavy snow cover conditions exist, water quality is almost always acceptable at normal pool elevations. No impacts to water quality are anticipated during the proposed fall drawdown. If raising the water levels back to elevation 742 feet NGVD is delayed due to low inflows, only a minimal risk exists for low dissolved oxygen conditions, and subsequent fisheries impacts, such as fish kills, to occur.

2. Sediment Quality. Little data exist to evaluate sediment at Lake Red Rock. Any potential contaminants are probably related to agricultural practices. Exposing sediments to the air by drawing the lake level down could result in some sediment consolidation and oxidation of chemical constituents, making some chemicals less available for biological uptake. Exposing sediments may also result in increased volatilization of other contaminants, making them more biologically available through inhalation or increase bioavailability through ingestion. However, sediment contaminants are not believed to exist in significant quantities and no adverse impacts should result from sediment exposure. The most benefit to sediments would occur from an extended period of exposure that would allow the sediment to thoroughly dry. The exact length of time required would depend on variables not available for this analysis but it is believed that warm temperatures would speed this process. Summer or early fall would be the best time to realize benefits from sediment exposure. No impacts to the sedimentation rate of the reservoir would result from the implementation of the preferred alternative.

B. Water/Hydrologic Resources.

1. Hydrology. In order to accomplish the drawdown in the manner currently proposed (lower pool to elevation 732 feet NGVD over a 20 day period, hold lower pool for approximately 28-48 days, restore conservation pool to elevation 742 feet NGVD over an estimated 54 days), stream flows must fall within a range that would permit this operation. Of particular concern is the fact that over the period from 1970 – 2003, inflows to Lake Red Rock have generally been low during the months of September through February. The proposed project was simulated, using this period of record, to estimate the potential success for accomplishing the drawdown and refilling the lake to the conservation pool elevation. Based on the period of record average flows for these months, it is estimated that the conservation pool could be restored to elevation 742 feet NGVD in 54 days.

Potentially delaying flow conditions include:

- Low river flows that prevent refilling of the reservoir within 54 days
- High flows that prohibit releasing sufficient water to allow for a 0.5 foot per day drawdown (maximum outflow is 18,000 cfs)
- High reservoir elevations that prevent initiating the drawdown from occurring immediately after Labor Day (such as in 1987 and 1993).
- High reservoir inflows that prevent maintaining elevation 732 feet NGVD during the drawdown period.

Based on an analysis of this data, low river flows preventing refilling of the reservoir is the most common condition that could be encountered, with the average time of 52 to 54 days to return to the conservation pool elevation of 742 feet NGVD. The period of record data reveals an average time to refill of 54 days, with a range of 20-318 days for a 4-week construction timeframe, and a range of 20-298 days for a 7-week timeframe. The analysis also revealed that a shorter construction window (utilizing two shifts) increases the likelihood of a return to the conservation pool by January 1st to 70%. If a normal construction work schedule is followed, the probability to return to the conservation pool elevation by January 1st is 64%. Under all except the most extreme drought conditions, the pool would be refilled by the high spring inflows.

2. Downstream Effects. Once the decision to have a drawdown is made, deviation from normal operating procedures to achieve the drawdown must be requested. The deviation must be approved prior to the drawdown. An additional amount of water, above what would be normal for that particular time of year, would be released through the sluice gates in order to attain the required drawdown elevation. This additional amount would not be much more than normal flows. At 0.5 foot per day, the additional outflow would probably be noticeable compared to what is seen typically in the fall but not unusual. The rate would differ from the typical spring release, when flows are much higher. The exact volume of the release would depend on the time of year, weather, and the status of the reservoir elevation. No downstream impacts of the release are anticipated. The dam and the outflow structure are designed to handle significantly larger volumes of water, and, downstream, the additional outflow could be handled, as during other times of the year.

During the drawdown procedure, water released from the reservoir will exceed the inflows, but will be within the levels of the approved regulation plan. After the pool is lowered to elevation 732 feet NGVD, the water released from the reservoir will be the same as the inflows. This is consistent with the schedule for releases in the approved regulation plan. No modifications will be required to the water control plan at the Saylorville Reservoir for the drawdown at Lake Red Rock. The water supply for downstream of Lake Red Rock is stored in Saylorville Reservoir, not Red Rock, so a drawdown at Lake Red Rock will not affect the downstream water supply.

C. Natural Resources. While no impact to downstream natural resources is expected, the drawdown in pool elevation from 742 to 732 feet NGVD will expose approximately 7,221 acres of land around the lake. The majority of these dewatered areas will be in the Whitebreast Creek area and upstream of Highway 14 (Figures 2 and 3). These exposed mudflats will serve as habitat for numerous wildlife species, especially resident and migratory shorebirds, benefiting these species. Exposure of the sediments would also allow vegetation to recolonize these areas.

However, the benefit to vegetation would be very limited. Sediments would be exposed for only a few months before being permanently reflooded, restricting any vegetation benefits to months of September and October during the drawdown period.

The volume of the lake will be reduced by approximately 62%, from 188,381 to 72,169 acre-feet of water. Any exposed benthic organisms would probably not survive this exposure. This reduction in volume will also concentrate the lake's fishes in a smaller area. The drawdown will also result in isolated pockets of water, trapping some fish in these areas. Depending on the depth of these isolated areas, some fish mortality can be expected. This impact to fisheries would occur regardless of the season in which the drawdown would occur. Some of these isolated areas can be seen in Figure 2. The primary fisheries concern during the fall is that a larger number of fish would escape the reservoir through the gates, with a minor increase in mortality from the larger than average numbers passing through the gates. This potential fisheries impact would result regardless of the drawdown season. A late fall or winter drawdown may increase fish stress and the possibility for fish kills during periods of low flow and reduced depth, at a time fish are already stressed by low temperatures. If low inflows increase the length of time needed to return to elevation 742 feet NGVD, the possibility for fish kills may increase. However, no significant impacts to the fishery are anticipated.

The primary impact of a fall drawdown would be on waterfowl management, especially on waterfowl hunting. The annual 2-foot raise in the conservation pool to accommodate hunter access would not occur. The areas of the lake utilized by waterfowl would be reduced. However, no adverse impacts to migratory waterfowl are anticipated. The birds would move to other suitable areas during their migration southward. The waterfowl species hunted during this fall period include mergansers, coots, pintail and canvasback ducks, and Canada, brant, and white-fronted geese. The hunting seasons for woodcock, snipe and rail would also be impacted. No additional impacts to waterfowl are anticipated if the return to elevation 742 feet NGVD is extended beyond 54 days.

D. Threatened and Endangered Species. Two federally listed species are known at Lake Red Rock: the bald eagle and the Indiana bat. No large trees are expected to be disturbed as a result of the proposed drawdown; therefore, the propose action will not affect either of these species.

E. Social and Economic Resources.

1. Community and Regional Growth. The focus of the proposed project is a one-time 10-foot drawdown of the conservation pool, and future installation of the traveling bulkhead system, that would permit the performance of routine maintenance items consisting of cable replacement and painting on the tainter gates at Red Rock Dam. No significant adverse impacts to the growth of the community or region would be realized as a direct result of the proposed project.

2. Community Cohesion. The proposed project would not affect community cohesion.

3. Displacement of People. No residential relocations would be required as a result of the pool drawdown.

4. Property Values and Tax Revenues. The project site and all lands impacted by the one-time drawdown are in Federal ownership. No change in property values or tax revenues would occur. Some minor loss of tax revenues would result for businesses in the vicinity that supply good and services for recreationists visiting the lake area. Also, the recreation use of the lake provides the IDNR with an income source in addition to helping to provide a stable wildlife population that is one of the main attractions for visitors. The extent of loss would depend on the seasonal timing of the project, but would be of short duration during the estimated 3.4- to 4-month period for project completion.

5. Public Facilities and Services. Red Rock is Iowa's largest expanse of public land offering almost 35,000 acres of habitat, shoreline, and bluffs adjoining the lake. The area provides vast opportunities for boating, hunting, fishing, swimming, wildlife observation, photography, plus activities that are enhanced by proximity to water such as hiking, picnicking, bird watching, camping, and water sports.

The drawdown approach was evaluated according to seasonal timing and duration to assess the potential impacts to public facilities and services. The peak-season months are May through September and a drawdown at this time would have the greatest potential for negative impacts to activities in the Lake area. During these months, the Visitor Center is open seven days per week, all water recreation beaches, boat ramps, campgrounds, picnic shelters, recreational trails, and the marinas are open. This period is also when the highest numbers of visitors use the facilities.

The remaining months of September, October and November provide the most viable option for conducting the drawdown. During this time, visitations are about one-third of the yearly total, the Visitor Center is open weekend days only, the beaches, picnic shelters and concession areas are closed or have reduced use, special activities have ended, and the campgrounds are at about one-fifth capacity. The fall drawdown would decrease waterfowl habitat, adversely impacting recreational opportunities in the area through diminished sites for wildlife observation, waterfowl hunting, and fishing. Anglers and waterfowl hunters use the lake extensively in the fall and would likely not welcome the loss of that particular recreational activity which would be adversely impacted by a fall drawdown. Information provided by the IDNR estimates that the total number of hunters that could be impacted during the approximate 3-month drawdown period would range from 4,500-6,000. However, since there are many other areas available that could provide a similar recreation experience and that are within a reasonable distance, this activity would merely shift to another location for the hunting season.

Preliminary investigations have determined that the lake will be accessible by boat ramp at elevation 732 feet NGVD. However, some ramp options may be limited by siltation, water depth, and boat draft. Availability of the boat ramps for public use would be reassessed prior to and during the drawdown.

Red Rock Reservoir also provides flood protection for the city of Ottumwa and many small river communities, and helps reduce flood crests on the Des Moines and Mississippi Rivers.

Conducting the drawdown to perform the proposed maintenance items would keep the reservoir gates operating and would, in turn, benefit the publics that live in these areas.

6. Life, Health, and Safety. The drawdown itself poses no threat to the life, health, or safety of persons in the vicinity. However, the dam was built to protect property, lives, and crops from flood damage. Conducting the drawdown to perform needed maintenance would minimize the risk of gate failure and the need for executing emergency procedures. The road over the dam is a major thoroughfare for passenger and emergency vehicles in and around the lake area. There may be some periods in which the traffic would be reduced to one-lane while the replacement work is underway; however, the work would need to be accomplished with a minimal amount of disruption to any traffic. No HTRW impacts due to implementation of the proposed project would occur.

7. Business and Industrial Growth. Impacts to the small retail establishments that provide services for lake visitors would be dependent on seasonal timing of the drawdown. Based upon the analysis of lake activities and visitations, the recommended timeframe of mid-September to November would 1ikely have minimal negative impacts on the small retail establishments bordering the lake that serve the site users. No long-term adverse impacts to business or industrial activity would result from the proposed project, and no business or industrial relocations would be required.

8. Employment and Labor Force. A short-term increase in employment opportunities could occur during the estimated 3.4- to 4-month period needed for cable replacement and touch-up painting. No long-term impacts on employment or labor force in Marion County, Iowa would result from the proposed project.

9. Farm Displacement. None of the land affected by the drawdown is used for agriculture or farming, therefore no farms would be displaced.

10. Noise Levels. The proposed drawdown itself would not impact noise levels. Heavy machinery used to replace the gate cables and other maintenance operations would temporarily increase noise levels. No long-term permanent impacts would result.

11. Aesthetics. The proposed drawdown would create a change in the viewscape, as more of the shoreline would be exposed. Also, a change in aquatic habitats along the shoreline could occur which would reduce the scenic sites available for wildlife observation. Once the drawdown is over, the pool would return to normal and the shoreline and habitat areas would regenerate. The proposed project would have no long-term adverse impacts to the aesthetic resources of the area.

F. Historic Properties. The APE includes construction, staging, and access areas associated with tainter gate repair and the exposed shoreline and ground surface resulting from the drawdown. It is the opinion of the Corps that the 7,221 acres to be exposed by the proposed drawdown from elevation 742 feet NGVD to elevation 732 feet have been fully evaluated for historic properties and that additional archeological evaluation is not warranted. The Lake Red Rock Dam was constructed between 1960 and 1969 and, consequently, does not meet the age

criterion of 50 years for individual resources that are not linked to a larger historic district. Consequently, the Lake Red Rock Dam is ineligible for inclusion on the National Register of Historic Places. In addition, impacts associated with tainter gate cable replacement, gate repair, and touch-up painting will be confined to the footprint of the dam. Therefore, the Corps has determined that no historic properties will be affected by this proposed project and that additional investigation of the APE is not warranted. This determination and supporting documentation were provided to the SHSI, relevant federally recognized Tribes, and the interested public for review and comment by letter dated June 14, 2004. No comments were received, so the Corps may assume concurrence with the determination and proceed with the undertaking without further evaluation of cultural resources in full compliance with the Nation Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR Part 800 "Protection of Historic Properties."

G. Hazardous, Toxic, and Radioactive Waste (HTRW). No HTRW impacts due to implementation of the proposed project would occur. No HTRW is known to occur in the project area. In 1989, the gates were painted using a vinyl paint system; Systems 5-F-Z and 21-A-Z, and any touch-up paint would also contain these systems.

6. Indirect and Cumulative Impacts of the Preferred Alternative.

Indirect and cumulative impacts of the proposed action are not expected to be significant. Because some biotic elements of the system, such as fish or birds, may move out of the affected area, the implementation of a 10-foot drawdown at Lake Red Rock on a short-term basis may potentially have a temporary effect on aquatic resources and waterfowl concentrations. The potential for significant cumulative effects is lessened by the limited scope of the drawdown, and the limited areas impacted by tainter gate cable replacement, touch-up painting, and installation of the traveling bulkhead system. The installation of the traveling bulkhead system would reduce cumulative impacts by negating the need for future drawdowns to perform inspection and maintenance activities at the dam. During the time the pool at Lake Red Rock is drawn-down, there will be an opportunity for additional work to existing recreational facilities to occur. These projects would all add to the overall recreational facilities at Lake Red Rock and are not anticipated to have measurable environmental impacts, individually or cumulatively.

7. Environmental Impacts of Non-Preferred Alternatives.

A. No Action. Under the No Action alternative, the required tainter gate cable replacement would not occur. This alternative is the most cost effective in the short term, but could result in higher repair and replacement costs in the future, since scheduled inspection and maintenance of the tainter cables and gates below pool level is not currently possible. Failure of critical components such as the cables would result in the need for an emergency drawdown of the conservation pool. Deferred maintenance of the base condition would likely result in catastrophic service disruption in the foreseeable future, leading to no operational control of the water level at the dam. This could lead to a structural failure of the dam. The No Action alternative would prevent the Corps from accomplishing its mission to operate and maintain the facility in a safe and healthful manner for the public benefit.

B. Periodic Drawdown. When considering the operating constraints of the reservoir, as well as the social, economic, and environmental effects of a drawdown, the optimal time for a drawdown becomes extremely complex. Due to the possible impacts to the habitats and species found in the reservoir, as well as costly socio-economic concerns, a reoccurring drawdown of every 15 years is not the optimum alternative. Additionally, a drawdown undertaken before the onset of drought conditions may result in an extended timeframe to replenish conservation pool levels. Due to the environmental, hydrological, and recreational demands at the lake, it would be very difficult to find an acceptable timeframe in which to schedule a drawdown for longer than 4 months on a recurring basis.

C. Winter Drawdown. A late fall or winter drawdown may increase fish stress and the possibility for fish kills during periods of low flow, reduced depth, and a reduced pool volume, at a time fish are already stressed by low temperatures. This effect is further increased in years with a heavy snowfall. In addition, any hibernating amphibians and reptiles could be exposed if the drawdown occurs after these animals have begun hibernation. This exposure, and subsequent desiccation, would result in potentially significant mortality of these species. Some maintenance procedures, such as painting, cannot be performed without significant measures to mitigate for temperatures at or below freezing, limiting the potential for a drawdown in the winter. Adverse weather conditions would increase safety concerns for construction personnel and may increase the length of time necessary to complete the required work. If the lake were to freeze over during the drawdown period, ice shelving could create safety concerns to winter recreational users of the lake. A late fall or winter drawdown would have the smallest socioeconomic impact of any of the drawdown seasons evaluated.

8. Adverse Environmental Effects That Cannot be Avoided.

Dewatering and exposure of the areas around Lake Red Rock that are less than 10 feet deep may result in the loss of some benthic organisms that currently utilize these areas. Some fish may become stranded in isolated pools. Impact to these organisms would be an unavoidable consequence of the drawdown. Any adverse effects on the benthic and fish communities are expected to be minor and limited in duration to the actual drawdown period.

9. Relationship Between Short-Term Use and Long-Term Productivity.

During the drawdown period, short-term productivity of many biological resources is expected to be reduced, while the productivity of some of the others may be improved. However, the overall productivity of the biological resources in Lake Red Rock is expected to be unaffected over the long-term. Construction activities, concentrated at the dam, and the drawdown itself would temporarily disrupt wildlife and human use of the project lands. This action ensures the long-term project purpose of flood control is improved over the current levels, without any reduction in the life, health, and safety to local and regional human populations.

10. Irreversible or Irretrievable Commitments of Project Implementation.

For the cable replacement and future construction of the bulkhead system, the purchase of materials, commitment of man-hours, fuel, and machinery to perform the project are

irretrievable. The increase work efforts by the Corps water control staff to monitor lake levels and discharge during the drawdown period may be considered an irretrievable commitment of manpower resources. The proposed drawdown action is not considered to be irreversible.

11. Relationship to Land-Use Plans.

The project is located on federally owned land. No impacts or changes to land-use plans would result from the preferred alternative. If implemented, the project will not significantly alter or conflict with authorized Corps projects at Lake Red Rock. The temporary nature of the drawdown will reduce the full recreational use of the project; however, this action will only be of a short duration. No long lasting effects will occur. The proposed cable replacement and touch-up pointing will ensure that Lake Red Rock will continue to provide flood control benefits, along with all associated recreation benefits for the life of the project.

12. Compliance with Environmental Statutes.

A. Endangered Species Act of 1973, as amended. The proposed action has been coordinated with the USFWS and the IDNR. Responses are discussed in the Public Involvement and Coordination section of this EA. Correspondence is included in Appendix A. No threatened or endangered species will be affected by the proposed action.

B. National Historic Preservation Act of 1966, as amended. The Corps determined that the preferred alternative will have no effect on historic properties and provided that determination with project plans to the SHSI and the interested public for review and comment. No comments were received and in accordance with 36 CFR 800.4(d)(1) the Corps has fulfilled its responsibilities under the National Historic Preservation Act of 1966, as amended.

C. Federal Water Project Recreation Act. During the time the pool at Lake Red Rock is drawn down, there will be an opportunity for additional work to existing recreational facilities to occur. The Corps, Marion County Conservation Board, and IDNR have all identified potential projects (Corps' letters dated August 19, 2002, and December 3, 2003, Appendix A). This tentative list primarily includes work to existing boat ramps, adding fisheries habitat structures, and removing old concrete. These projects would all add to the overall recreational facilities at Lake Red Rock and will be evaluated under NEPA, Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act individually prior to any construction. These activities were not evaluated at this time due to their tentative nature and future uncertainty.

D. Fish and Wildlife Coordination Act. Project plans have been coordinated with the U.S. Environmental Protection Agency (USEPA), the USFWS, and the IDNR. Responses are discussed in the Public Involvement and Coordination section of this EA and Appendix A.

E. Executive Order 11988 (Flood Plain Management). The project would not directly or indirectly induce growth (construction of structures and/or facilities) in the floodplain.

F. Executive Order 11990 (Protection of Wetlands). The project would temporarily impact all shallow water wetlands around Lake Red Rock. This action may allow for limited

sediment compaction and would provide mud flat habitat for resident and migrating shorebirds. This impact would only be limited for the duration of the drawdown and will not cause any long-term impacts to wetlands.

G. Clean Water Act (Section 401 and 404), as amended. The proposed project does not involve placement of fill into waters of the United States. Therefore, the project, as proposed, should be in full compliance. However, during the time the pool at Lake Red Rock is drawn-down, there will be an opportunity for additional work to existing recreational facilities to occur. These activities were not evaluated at this time due to their tentative nature and future uncertainty. These projects would all add to the overall recreational facilities at Lake Red Rock and will be evaluated individually prior to any construction under NEPA, Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act.

H. Clean Air Act, as amended. No aspects of the proposed project have been identified that would result in violations to air quality standards.

I. Farmland Protection Policy Act of 1981. The proposed project would not result in the conversion of any prime, unique, state, or locally important farmland to nonagricultural uses.

J. National Environmental Policy Act of 1969, as amended. The compilation of this EA fulfills National Environmental Policy Act compliance.

K. National Economic Development (NED) Plan. The NED Plan is the plan which best satisfies the Federal planning objectives of increasing the Nation's output of goods and services and produces the most improvement to the national economic efficiency. The proposed project will have no effect on the NED outputs. The project would fulfill the operation and maintenance requirements to ensure the continued full working order of the Lake Red Rock Dam. The proposed project would ensure the continuation of the long-term project purposes of flood control protection, low-flow augmentation, wildlife management, and recreation at Lake Red Rock.

13. Public Involvement and Coordination.

Coordination for the project has been and will be maintained with the following state and Federal agencies:

U.S. Environmental Protection Agency (EPA)
U.S. Fish and Wildlife Service (USFWS)
Federal Emergency Management Agency (FEMA)
U.S. Coast Guard
Iowa Department of Natural Resources (IDNR)
State Historical Society of Iowa (SHSI)

Comment letters are contained in Appendix A. Comments received from the various agencies have been incorporated into this EA.

The IDNR, in a letter dated September 26, 2003, finds no records of rare species or natural areas in the immediate vicinity of the project area. However, Indiana bat may occur in the area of this project. The IDNR would prefer the drawdown of Lake Red Rock to only occur during the months of January to March in order prevent impact to fish and wildlife resources and recreational activities. The IDNR is concerned about fisheries impacts in the spring and summer, and waterfowl impacts during the late summer and fall. However, the IDNR is willing to work with the Corps to identify a time period that minimizes their concerns.

In a letter dated December 17, 2003, the IDNR reiterated their concerns for a drawdown in the September to December timeframe from a waterfowl management perspective. This timeframe occurs during the prime waterfowl-hunting period. The IDNR requested that the impacts to seasonal activities should be evaluated to ensure that the least environmental and economic impacts result.

After evaluating the potential impacts for the proposed fall drawdown period, the IDNR, in a letter dated August 18, 2004, concurred with the Corps with the selection of the preferred alternative. The IDNR believes that this is the best alternative and would result in the least impacts to fish, wildlife, and recreational resources at Lake Red Rock. The drawdown would also provide an excellent opportunity to enhance fisheries habitat, remove navigation hazards, and protect critical eroding shoreline areas at Lake Red Rock.

The USFWS, in a letter dated September 25, 2003, identified the Indiana bat (endangered) and bald eagle (protected) listed as breeding and wintering, and within the project area.

Deanne Bahr, of the Sac and Fox Nation, expressed concern about any human remains that may surface at the project area and what would happen should such remains be found.