

2 WICHITA RIVER ONLY PORTION OF THE RRCCP ALTERNATIVES.

Action alternatives to lower chloride concentrations in the Wichita River, as addressed by this section, include continued operation of existing chloride control facilities and completion of facilities under construction. The first portion of this section provides an overview of the sources and means of addressing each source while the second portion discusses, in summary, each of the 27 alternatives. Complete discussions and analyses of each alternative are provided in the referenced documents. Finally, discussion is given to project conditions that would require future environmental review.

Existing chloride control features were addressed in Section 1. The remaining chloride control activities have been organized into 27 alternatives, including the No Action alternative. These alternatives address each source area's brine collection, transfer, and disposal.

a. Source Area Plans. The alternative plan for each source area consists of a collection system and a disposal system. The proposed source areas and stages of development include Area V (constructed), Area VII (not constructed), Area VIII (constructed), and Area X (partially constructed) as described in the 1976 FES. Disposal options analyzed included Truscott Brine Reservoir as well as USFWS/TPWD alternatives to dispose of brine in Beaver Creek, Paradise Creek, or Raggedy Creek in the Red River basin. A summary of the collection and disposal methods is provided below.

1. Collection Systems. One type of collection system was studied in detail: low-flow, deflatable, fabric dams. The low-flow dams would impound flows that would be drained into a sump and pumped to a disposal system. The dams would have a deflatable weir section that would allow flood flows to pass unimpeded. Collected brines would then be pumped to their disposal site using parallel vertical turbine pumps and an underground pipeline.

2. Disposal Systems. Four alternatives were considered for brine disposal:

(a) Brine Impoundment Reservoir. A brine impoundment reservoir would consist of an impervious dam to impound brine water and serve as an evaporation reservoir. Specifically, the constructed features of Truscott Brine Disposal Reservoir would be used with this disposal alternative.

(b) Deep Well Injection. Deep well injection would pump brine down wells drilled into geologic formations known to possess adequate porosity and permeability.

(c) Diversion to Freshwater Streams. The USFWS/TPWD proposed that collected brines be pumped to existing freshwater streams in a different drainage basin. Specifically, the alternatives evaluated would pump collected brine from the upper Wichita River drainage basin to Beaver Creek, Paradise Creek, or Raggedy Creek in the Red River watershed. These alternatives would convert freshwater streams to brine streams.

(d) Volume Reduction. Volume reduction could be used with any of the three previous methods to reduce the amount of brine to be disposed. The method of volume reduction evaluated in this document includes spray fields. Spray fields would be pressure-operated at the pipeline inlet or outlet and would accomplish an overall volume reduction of roughly 25% per spray field.

b. Alternative Scenarios. A total of 27 alternatives, including the No Action alternative, were evaluated as outlined in the following sections.

1. No Action. Indefinitely postponing construction of a chloride control system was considered. This is referred to as the No Action alternative. This alternative would eliminate any adverse social or environmental effects associated with construction and operation of additional control systems; however, it would also forego water quality improvements and resultant economic and social benefits that construction of the project would provide. The No Action alternative does not address the project's purpose and need, but does provide a baseline for evaluating the impacts of other alternatives. The No Action alternative is used to compare all conditions with and without implementing the other alternatives over a 100-year timeframe.

Under the No Action alternative, the remaining chloride control features would not be completed however; brush management would be implemented with or without the proposed project. Due to growing concern in the Wichita River Basin about the availability of water and its effect on economic growth and development, brush control has been evaluated by the State as a means to increase watershed yield. The goal is to restore large areas of brush to native grasses, but leave brush buffers and habitat corridors. The proposed brush control program is expected to provide a net increase in overall watershed yield recognized at Lake Kemp. The brush control program has currently been included in Texas Senate Bill 1 and the Region B (RRA) Water Plan. Implementation is expected to occur regardless of chloride control. The Reevaluation has used a brush management factor of 50% implementation (i.e. brush removal in 50% of the watershed) as its future condition (USACE 2001a).

2. USACE Action Alternatives. Fourteen alternatives were developed by the USACE for achieving lower concentrations of chlorides in the Wichita River. Detailed descriptions of the alternatives to the authorized plan were also included in Section 6 of the 1976 FES. This document is available for review at <http://www.swt.usace.army.mil/LIBRARY/Library.CFM>.

The objective of the 14 USACE action alternatives was to improve water quality in the Wichita River to a point where it may be economically useful for municipal, industrial, and agricultural water supply. A summary of the USACE action alternatives is provided in Table 2-1. Common elements among the original USACE action alternatives include:

- continued operation of the existing ring dike at Area V (Estelline Springs),
- continued operation of the existing Area VIII brine collection area,
- continued operation of the Area VIII pipeline to Truscott Brine Disposal Reservoir, and
- continued operation of the Truscott Brine Disposal Reservoir.

3. USFWS/TPWD Action Alternatives. The 12 alternatives developed by the USFWS with the TPWD are discussed in detail in the “USFWS/TPWD Chloride Control Concept Alternatives Reconnaissance Level Formulation and Evaluation Summary” (USACE 2001b). The objectives of the 12 USFWS/TPWD alternatives were to lower chloride control impacts by reducing brines pumped to Truscott and eliminating potential selenium impacts, as well as replacing stream habitat and lessening the impact of zero flow days on refugia fish populations. A summary of these alternatives is provided in Table 2-2. For the USFWS/TPWD alternatives, the alternative number for this Reevaluation is shown first. The alternative number in parentheses refers to alternative numbering in the “USFWS/TPWD Chloride Control Concept Alternatives Reconnaissance Level Formulation and Evaluation Summary” (USACE 2001b).

TABLE 2-1**USACE WICHITA RIVER PORTION OF THE RED RIVER CHLORIDE CONTROL PROJECT
ALTERNATIVES**

ALTERNATIVE NO.	ALTERNATIVE COMPONENTS
1	Construct low water dam collection facilities at Area VII. Deep well inject Area VII brine. Continue to pump Area VIII brine to Truscott Brine Reservoir (average 5.2 cfs). Deep well inject Area X brine collected from constructed facilities.
2	Construct low water dam collection facilities at Area VII. Deep well inject Area VII brine. Continue to pump Area VIII brine to Truscott Brine Reservoir (average 5.2 cfs). Pump Area X brine to Truscott Brine Reservoir. No changes to Truscott Brine Reservoir embankment.
3	Construct low water dam collection facilities at Area VII. Pump area brine to Truscott Brine Reservoir. Continue to pump Area VIII brine to Truscott Brine reservoir (average 5.2 cfs). Deep well inject Area X brine. Raise Truscott Brine Reservoir embankment by 17.2 feet for needed extra storage.
4	Construct low water dam collection facilities at Area VII. Deep well inject Area VII brine. Continue to pump Area VIII brine to Truscott Brine Reservoir (average 5.2 cfs). Indefinitely defer construction at Area X. No changes to Truscott Brine Reservoir embankment.
5	Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Continue to pump Area VIII brine to Truscott Brine Reservoir (average 5.2 cfs). Pump Area X brine to Truscott Brine Reservoir. Raise Truscott Brine Reservoir embankment by 33.2 feet to account for needed extra storage.
6	Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Continue to pump Area VIII brine to Truscott Brine Reservoir (average 5.2 cfs). Indefinitely defer construction at Area X. Raise Truscott Brine Reservoir embankment by 17.2 feet to account for needed extra storage.
7	Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Continue to pump Area VIII brine to Truscott Brine Reservoir (average 5.2 cfs). Continue operation of the outfall spray field at Truscott Brine Reservoir assuming 25% flow reduction. Pump area X brine to Truscott Brine Reservoir. Raise Truscott Brine Reservoir embankment by 17.2 feet for needed extra storage.

Table 2-1 (Continued)

ALTERNATIVE	ALTERNATIVE COMPONENTS
7a	<p>Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Continue to pump Area VIII brine to Truscott Brine Reservoir. Construct pipeline from Area X to Truscott Brine Reservoir and pump Area X brine to Truscott Brine Reservoir. Construct spray fields at intake and outfall of each pipeline (Area VII, Area VIII (existing) and Area X). Potentially raise top of Truscott Brine Reservoir dam by 2.4 feet using a stemwall. (at a later date)</p>
8	<p>Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Continue to pump Area VIII brine to Truscott Brine Reservoir (average 5.2 cfs). Continue operation of the Area VIII outfall spray field at Truscott Brine Reservoir assuming 25% flow reduction. Indefinitely defer construction at Area X. Raise top of Truscott Brine Reservoir dam by 2.4 feet using stemwall.</p>
8a	<p>Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Construct spray fields at intake and outfall of each pipeline (Area VII, Area VIII (existing) and Area X). Continue pumping Area VIII brine to Truscott Brine Reservoir (flow to 6.2 cfs). Indefinitely defer construction at Area X. No changes to Truscott Brine Reservoir embankment.</p>
9	<p>Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Continue pumping Area VIII brine to Truscott Brine Reservoir (flow to 5.7 cfs). Continue operation of the Area VIII outfall spray field at Truscott Brine Reservoir assuming 25% flow reduction. Indefinitely defer construction at Area X. Raise top of Truscott Brine Reservoir embankment by 4.4 feet for extra storage.</p>
10	<p>Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Continue to pump Area VIII brine to Truscott Brine Reservoir (flow to 5.7 cfs). Continue operation of the Area VIII outfall spray field at Truscott Brine Reservoir assuming 25% flow reduction. Indefinitely defer construction at Area X. Raise top of Truscott Brine Reservoir dam by 4.4 feet for extra storage.</p>
11	<p>Construct low water dam collection facilities at Area VII. Pump Area VII brine to Truscott Brine Reservoir. Continue to pump Area VIII brine to Truscott Brine Reservoir (flow to 5.7 cfs). Indefinitely defer construction at Area X. Raise top of Truscott Brine Reservoir embankment by 19.2 feet for extra storage.</p>
12	<p>Indefinitely defer construction at Area VII. Continue to pump Area VIII brines to Truscott Brine Reservoir (flow to 5.7 cfs). Pump Area X to Truscott Brine Reservoir. No changes to Truscott Brine Reservoir embankment.</p>

TABLE 2-2

USFWS/TPWD WICHITA RIVER PORTION OF THE RED RIVER CHLORIDE CONTROL PROJECT ALTERNATIVES

ALTERNATIVE NO.	ALTERNATIVE COMPONENTS
13 (4a1)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII to Raggedy Creek. Continue to pump Area VIII brines to Truscott Brine Reservoir. Defer construction at Area X indefinitely.
14 (4a2)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII to Paradise Creek. Continue to pump Area VIII brines to Truscott Brine Reservoir. Defer construction at Area X indefinitely.
15 (4a3)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII to Beaver Creek. Continue to pump Area VIII brines to Truscott Brine Reservoir. Defer construction at Area X indefinitely.
16 (4b1)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Raggedy Creek. Continue to pump Area VIII brine to Truscott Brine Reservoir. Construct pipeline and pump Area X brines to Raggedy Creek.
17 (4b2)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Paradise Creek. Continue to pump Area VIII brine to Truscott Brine Reservoir. Construct pipeline and pump Area X brines to Paradise Creek.
18 (4b3)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Beaver Creek. Continue to pump Area VIII brine to Truscott Brine Reservoir. Construct pipeline and pump Area X brines to Beaver Creek.
19 (4c1)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Raggedy Creek. Construct new pipeline from Area VIII to Raggedy Creek. Abandon existing Area VIII pipeline to Truscott Reservoir. Defer construction at Area X indefinitely. Drain Truscott Brine Reservoir.
20 (4c2)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Paradise Creek. Construct new pipeline from Area VIII to Paradise Creek. Abandon existing Area VIII pipeline to Truscott Reservoir. Defer construction at Area X indefinitely. Drain Truscott Brine Reservoir.

Table 2-2 (Continued)

ALTERNATIVE NO.	ALTERNATIVE COMPONENTS
21 (4c3)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Beaver Creek. Construct new pipeline from Area VIII to Beaver Creek. Abandon existing Area VIII pipeline to Truscott Reservoir. Defer construction at Area X indefinitely. Drain Truscott Brine Reservoir.
22 (4d1)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Raggedy Creek. Construct new pipeline and pump brines from Area VIII to Raggedy Creek. Abandon existing Area VIII pipeline to Truscott Reservoir. Construct new pipeline and pump brines from Area X to Raggedy Creek. Drain Truscott Brine Reservoir.
23 (4d2)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Paradise Creek. Construct new pipeline and pump brines from Area VIII to Paradise Creek. Abandon existing Area VIII pipeline to Truscott Reservoir. Construct new pipeline and pump brines from Area X to Paradise Creek. Drain Truscott Brine Reservoir.
24 (4d3)	Construct low water dam collection facilities at Area VII. Construct pipeline and pump Area VII brine to Beaver Creek. Construct new pipeline and pump brines from Area VIII to Beaver Creek. Abandon existing Area VIII pipeline to Truscott Reservoir. Construct new pipeline and pump brines from Area X to Beaver Creek. Drain Truscott Brine Reservoir.

c. Alternative Analysis. The economic base condition used in evaluation of the alternatives was 2001. Completed features, including mitigation features, have been accounted for as sunk costs for the purpose of this Reevaluation. Sunk costs are costs that have already been incurred and therefore do not affect current decisions. A discussion of completed features (sunk costs) was presented in Section 1.

From the USFWS/TPWD alternatives, Number 13 (4a1) was identified as having the greatest economic potential. The BCR for this alternative was calculated to be 1.23 to 1. While this alternative is economically viable, net NED benefits for the alternative are less than the proposed plan. In addition, implementation issues, as described below, would potentially preclude this alternative from further consideration. These issues, which are common to all the USFWS/TPWD alternatives, include:

- Technical viability of proposed alternatives to create new salt-tolerant species habitat (i.e., can suitable new habitat be created in a short time period);
- Regulatory viability in light of potential TNRCC opposition to degradation of usable freshwater streams from brine and selenium introduction;
- Destruction of fresh water streams and riparian (wetland) habitat;
- Public and municipal objections to stream conversion;
- Land use and land value impacts to landowners, farmers, and ranchers from converting freshwater streams to brine streams;
- Flooding and erosion risks from increased stream flow.

From the USACE alternatives, Number 7a was selected as having the greatest net NED benefits. However, concerns regarding this alternative have been raised by the USFWS and TPWD including:

- Impacts to aquatic resources through reduced stream salinity and native fishes that are adapted and dependent on naturally high salinities;
- Selenium levels in Truscott Brine Reservoir and potential impacts to migratory birds;
- Security of water supplies for the Dundee State Fish Hatchery at Lake Diversion;
- Changes in water quality at the Dundee State Fish Hatchery and the potential for golden algae blooms;
- Potential impacts to sport fisheries at Lakes Kemp, Diversion and Texoma;
- Impacts to prairie stream ecosystems due to exacerbated low flow conditions and reduction in chloride loads; and
- Invasion of salt cedar or zebra mussels.

Due to higher economic, technical, and regulatory viability, Alternative No. 7a best serves the purpose and need for the proposed action. Consequently, Alternative No. 7a is the proposed plan.

The purpose and need for the chloride control project, as stated in Section 1, is to improve the quality of the Wichita River water resources to the extent that they would be usable for municipal, industrial, and agricultural purposes. The Wichita River system is ideally located to provide a supplemental water supply to a multi-county region of North Texas which is expected to collectively require an additional source supply by 2015. In addition, some communities have an immediate need for a supplemental source supply to accommodate present water supply shortages. In summary, supplemental water supplies are contingent upon improved water quality from chloride control measures. The other alternatives would not serve the purpose and need for the proposed action for one or more of the following reasons:

- They do not meet NED requirements.
- They do not provide substantial reduction of brine flows (chloride and TDS concentrations) to meet water quality standards consistently.
- They do not provide consistent water quality in a cost effective manner.
- They cannot be completed due to technical, regulatory, or other feasibility issues.