
Chapter 7

Cumulative Impacts

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CHAPTER 7:

CUMULATIVE IMPACTS

7.1 Introduction

The cumulative impact analysis evaluates the direct and the indirect effects of implementing any of the study alternatives in association with past, present, and reasonably foreseeable future USACE actions on the MKARNS and the actions of other parties in the surrounding area (where applicable).

The Council on Environmental Quality (CEQ) has outlined a framework for incorporating cumulative effects analyses into the environmental impact assessment process. The framework includes the following points:

- 1) **Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.** The effects of a proposed action on a given resource, ecosystem, and human community include the present and future effects added to the effects that have taken place in the past. Such cumulative effects must also be added to effects (past, present, and future) caused by all other actions that affect the same resource.
- 2) **Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (Federal, non-Federal, or private) has taken the actions.** Individual effects from disparate activities may add up or interact to cause additional effects not apparent when looking at the individual effects one at a time. The additional effects contributed by actions unrelated to the proposed action must be included in the analysis of cumulative effects.
- 3) **Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.** Environmental effects are often evaluated from the perspective of the proposed action. Analyzing cumulative effects requires focusing on

the resource, ecosystem, and human community that may be affected and developing an adequate understanding of how the resources are susceptible to effects.

- 4) **It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.** For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited through scoping to effects that can be evaluated meaningfully. The boundaries for evaluating cumulative effects should be expanded to the point at which the resource is no longer affected significantly or the effects are no longer of interest to affected parties.
- 5) **Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.** Resources typically are demarcated according to agency responsibilities, county lines, grazing allotments, or other administrative boundaries. Because natural and socio-cultural resources are not usually so aligned, each political entity actually manages only a piece of the affected resource or ecosystem. Cumulative effects analysis on natural systems must use natural ecological boundaries and analysis of human communities must use actual socio-cultural boundaries to ensure including all effects.
- 6) **Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.** Repeated actions may cause effects to build up through simple addition (more and more of the same type of effect), and the same or different actions may produce effects that interact to produce cumulative effects greater than the sum of the effects.
- 7) **Cumulative effects may last for many years beyond the life of the action that caused the effects.** Some actions cause damage lasting far longer than the life of the action itself (e.g., acid mine drainage, radioactive waste contamination, species extinctions). Cumulative effects analysis needs to apply the best science and forecasting techniques to assess potential catastrophic consequences in the future.
- 8) **Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.** Analysts tend to think in terms of how the resource, ecosystem, and human community will be modified given the action's development needs. The most effective cumulative effects analysis focuses on what is needed to ensure long-term productivity or sustainability of the resource (CEQ 1997).

The Arkansas River Navigation Study cumulative effects analyses follows the framework and components just described. The following steps were addressed in each component of the cumulative environmental impact assessment:

- Establish the geographic scope for the analysis;
- Establish the time frame for the analysis;
- Identify other past, present and future actions affecting the resources, ecosystems, and human communities of concern;

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- Characterize the resources, ecosystems, and human communities identified in the affected environment in terms of their response to change and capacity to withstand stresses;
 - Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds;
 - Identify the important cause-and-effect relationships;
 - Determine the magnitude and significance of cumulative effects;
 - Modify or add alternatives to avoid, minimize, or compensate for significant cumulative effects; and
 - Monitor the cumulative effects of the selected alternative and adapt management.

The cumulative impact analysis has been prepared at a level of detail that is reasonable and appropriate to support an informed decision by the USACE in selecting a preferred alternative. The cumulative impact discussion is presented according to each of the alternatives listed.

The geographical extent is broadly defined by the MKARNS drainage basin. However, the primary impacts on resources of concern are associated with the main channel, secondary channels, and backwaters of the MKARNS. The pertinent time scale for assessing cumulative impacts spans approximately 85 years, and dates from 1970, when the MKARNS was largely constructed and operational, through 2055, the end of the project planning horizon.

Potential cumulative impacts are described for the following resource evaluation categories:

- Air Quality;
- Noise;
- Geology and Soils;
- Surface Waters;
- Land Use;
- Infrastructure;
- Biological Resources, including Fish and Wildlife, Vegetative Communities Types and Diversity, Wetlands, and Threatened and Endangered Species;
- Recreation and Aesthetic Values;
- Cultural Resources;
- Sociological Environment; and
- Economic Environment.

7.1.1 Definitions Used in Cumulative Analysis

This Section defines several key terms used in the cumulative impact analysis:

- **Cumulative Impact Analysis Area.** The cumulative impact analysis area includes that area that has the potential to be affected by implementation of any of the Proposed Action Alternatives. The boundary of the cumulative impact analysis area varies according to the resource evaluation category considered. For many of the resource categories considered, the impact of the USACE Proposed Action Alternatives are not expected to extend beyond the study area boundaries, or the impact to the resource is negligible beyond this area. For those categories, the cumulative impact analysis area is appropriately limited to lands within the

study area boundaries. The boundaries of the cumulative impact analysis area for each resource category are identified at the beginning of each resource category discussion.

- **Impact Evaluation Criteria.** Impact evaluation criteria are used to define or identify the level of effect that could result in a *significant* impact to the resource being considered. Impact evaluation criteria vary by resource category. Therefore, the introductory section for each resource category defines evaluation criteria that were considered, where applicable. In addition to the information presented in each resource category, the term *significant*, as defined in 40 CFR 1508.27 requires consideration of both the context and intensity of the impact evaluated. Significance can vary in relation to the context of the proposed action, and thus the significance of an action must be evaluated in several contexts and this varies with the setting of the proposed action. For example, context may include consideration of effects on a national, regional, and/or local basis depending upon the action proposed. Both short-term and long-term effects may be relevant. In accordance with 40 CFR 1508.27 and other regulatory guidance, impacts are also evaluated in terms of their intensity or severity.
- **Past Actions.** Past actions are defined as actions within the cumulative impact analysis area that occurred before the Arkansas River Navigation Study was initiated. These include past actions in the project area, and past demographic, land use and development trends in the areas that surround the study area. Past actions are discussed in greater detail in the following Section. In most cases, the characteristics and results of these past actions comprise the existing conditions that are included in the discussions of each of the resource categories.
- **Present Actions.** Present actions include: 1) current USACE activities within the cumulative impact analysis areas; and 2) current resource management programs, land use activities and development projects that are being implemented by other governmental agencies and the private sector (where they can be identified) within the cumulative impact analysis areas.
- **Reasonably Foreseeable Future Actions.** Reasonably foreseeable future actions may include those actions in the planning, budgeting or execution phases. Actions may be those of the Federal government, State or local government, or private organizations or individuals.

7.1.2 Structure of the Cumulative Impact Analysis

The impacts of past, present and reasonably foreseeable future actions, in association with implementation of the proposed action, are discussed with respect to each of the resource evaluation categories. The discussion of the No Action Alternative focuses on identifying the anticipated impacts of not implementing any of the action alternatives, and therefore defines the environmental baseline, which can be used for determining potential impacts associated with implementing any of the action alternatives. The discussion for each resource category includes the following items:

- The analysis area/project impact zone will be defined;
- Significance criteria unique to the resource category (if any) will be established;
- Reasonable foreseeable future actions under the No Action Alternative and Proposed Action Alternatives are identified; and
- The potential impacts of implementing the No Action Alternative and the Proposed Action Alternatives are summarized.

7.1.3 Past and Present, and Reasonably Foreseeable Future Actions

Past and present actions that have occurred both within and adjacent to the study area that have been considered in the analysis of cumulative impacts are identified below. These actions are grouped in one discussion, as together they have resulted in the existing conditions of the surrounding area. A summary list of past and present actions within and around the project area that have the potential to impact the wide range of resource issues being considered in this cumulative impact analysis is provided in the following Section. Existing conditions are discussed in the affected environment Chapter of this document.

Past and present actions that have resulted in the existing conditions of the MKARNS, associated reservoirs, and other features of the study area include the following:

- The construction of the MKARNS in 1970 and the operation of the MKARNS under prior and current operating plans together established commercial navigation operations and reduced flood damages along the river. In addition, other authorized project purposes include recreation; hydropower; water supply; and fish and wildlife habitat.
- Reservoirs (Federal and non-Federal) constructed within the upper Arkansas River system and its tributaries. The reservoirs are operated to provide multiple authorized purposes including flood control; recreation; hydropower; water supply; and fish and wildlife habitat. Reservoir operations (discharge and storage) influence flows on the MKARNS.
- USFWS National Wildlife Refuges (NWRs) established within the project area and operated for the management of fish and wildlife resources. Some of the refuges were established as mitigation for previous MKARNS and other USACE projects. The refuges within the study area include White River NWR; Holla Bend NWR; Logan Cave NWR; Ozark Plateau NWR; and Sequoyah NWR.
- Multiple Wildlife Management Areas (WMAs) established by the States of Arkansas and Oklahoma within the study area are operated for the management of fish and wildlife resources.
- Recreational facilities established by multiple agencies including USACE, USFWS, National Park Service, State agencies, local agencies and private entities along the MKARNS and the project reservoirs.
- Commercial, industrial, residential, and agricultural development that has occurred throughout the project area including floodplain and adjacent upland areas. These land uses have been established and are owned and operated by a variety of public and private entities including Federal, State, and local governments; private companies, organizations and individuals; and sovereign tribal nations.
- Hydropower facilities have been developed along the rivers and reservoirs within the study area. Routine rehabilitation and maintenance of these facilities occurs as required. The generation of hydroelectric power is one of the several authorized functions of the dams and reservoirs associated with the MKARNS. Fifteen of the MKARNS dam structures (including dams along the river and at the reservoirs) have hydroelectric power generation capabilities.
- Commercial sand and gravel dredging operations have occurred and would continue to occur along the MKARNS.

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- The MKARNS has five major publicly-developed ports and numerous privately developed facilities that adjoin the system. Port facilities including docking areas, warehouses, utilities, rail systems, access roads, gates and fencing, are rehabilitated and maintained as necessary.
 - Flood reduction projects have occurred and will continue to occur along the MKARNS. Such project components may include channel clearing and enlargement of tributary streams, road and railroad bridge alterations, and recreation features.
 - A dike and revetment notching program has been established in coordination with the USFWS and State agencies to improve aquatic habitat within the MKARNS. Notching of wing dikes and revetments has facilitated the deposit of sediments in the backwater areas of the river, which serve as critical spawning grounds for aquatic species. Notching is simply removing a small area of a revetment or dike to allow water to flow freely from the river channel. The calmer, more stable water created behind these structures give fish such as bass, crappie and bluegill a protected place to spawn.

Reasonably foreseeable future actions that have been considered for cumulative impacts are listed in this Section. The listing includes relevant foreseeable actions within and adjacent to the study area including USACE, other Federal Government agencies, State and local agencies, as well as private and commercial entities.

- Continued operation of the MKARNS for its authorized project purposes including commercial navigation operations; flood control; recreation; hydropower; water supply; and fish and wildlife habitat. Updating the Oklahoma portion Operations Plan.
- Continued operation of the reservoirs (Federal and non-Federal) within the system for their authorized purposes including flood control; recreation; hydropower; water supply; and fish and wildlife habitat.
- Continued operation of USFWS National Wildlife Refuges (NWRs) and State Wildlife Management Areas (WMAs) and programs.
- Continued operation of some existing recreational facilities along the MKARNS (Federal, State, local, and commercial). Due to tight budgets at the Little Rock District of the USACE, officials will close 20 parks along the MKARNS. Seven will be totally closed with all access restricted, and 13 will be closed with the launching ramps remaining open. The district will reduce the length of the visitor season in several other parks and amend reservation services to concentrate funds on higher priority work.
- Continued use and development of the study area, including areas adjacent to the river, floodplain, and upland areas, for commercial, industrial, residential, and agricultural uses in proportion to future increases in population throughout the study area.
- Deepening and maintenance dredging of harbors and entrance channels to the final navigation channel depth.
- Completion (and subsequent operation) of a 14th low-head lock and dam at the mouth of the White River (Montgomery Point Lock & Dam), anticipated to be complete in 2005. The construction of the Montgomery Point Lock and Dam, authorized by the River and Harbor Act of 1946, is currently underway. The decision to build the structure resulted from the chronic low water levels and subsequent dredging near the mouth of the White River. It is being constructed near navigation mile 0.6 of the White River Entrance Channel.

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- Continuation of ongoing current and future operation and maintenance activities on the MKARNS and reservoirs including dredging, dredged material disposal, and construction and maintenance of river training structures such as dikes and revetments.
 - Commercial sand and gravel dredging operations along the MKARNS would continue.
 - Construction and operation of a slack-water harbor at Russellville, Arkansas.
 - Construction and operation of a slack-water harbor at Fort Smith, Arkansas.
 - Major rehabilitation of the Ozark Powerhouse.
 - Rehabilitation of the Webber Falls Powerhouse.
 - Continuation of the USACE dike-notching program previously described in section 4 to improve fish habitat in the river.
 - Installing environmentally compatible bank stabilization structures in Jim Smith Lake.
 - Passage of the Clean Air Nonroad Diesel – Final Rule (May 2004) by the U.S. Environmental Protection Agency (EPA). This regulation will require future nonroad diesel engines to use fuel with 99% less sulfur which will reduce particulate matter emissions.
 - The EPA also plans to propose more stringent emission standards for all new commercial, recreational, and auxiliary marine diesel engines, with the exception of very large engines used for deep-sea vessels. These standards would require the use of advanced emission-control technologies similar to those to be phased in for large diesel trucks and buses.
 - Water quality may continue to improve with the implementation of more stringent non-point source pollution standards, such as Total Maximum Daily Loads (TMDLs).
 - The Tenkiller Lake Dam Safety Project, which will consist of two Phases. Phase I will provide a new spillway structure with 5 tainter gates and a maintenance bridge. Phase II will consist of a new Highway 100 bridge, built to carry traffic across the upstream approach channel for the new spillway. Construction of Phase I is underway.
 - Proposed construction of Interstate 49 and its associated bridge over the Arkansas River near Fort Smith, Arkansas.
 - Population growth within the project area will continue to increase at historical rates.
 - The development of a Master Plan for the Arkansas River Corridor within Tulsa County. The objective is to identify promising river corridor development alternatives that consider economic development, environmental quality and social well-being.
 - An ivory-billed woodpecker recovery plan will be developed by the USFWS.

7.2 Climate and Air Quality

7.2.1 Introduction

The purpose of the air quality cumulative impact analysis is to determine if the air emission sources associated with the proposed action alternatives, in association with other past, present and reasonably foreseeable actions, would cause an exceedance of the National Ambient Air Quality Standards (NAAQS). A significant adverse impact occurs for any individual or cumulative impact scenario that is projected to exceed NAAQS for any criteria pollutant.

7.2.2 Analysis Area/Project Impact Zone

The cumulative impact analysis area for climate and air quality includes the six Air Quality Control Regions (AQCRs) that fall within the study area (AQCRs 016, 017, 021, 185, 186, and 188). The greatest direct, indirect, and cumulative impacts of the proposed action are expected to be concentrated near the river and along major travel corridors (highways and railroads) within the study area.

7.2.3 Climate and Air Quality Significance Criteria

The following criteria have been established for the determination of significant air quality impacts in this cumulative impact assessment. These criteria are in addition to the criteria established for determining significant impacts in guidance:

- Any action or combination of actions that would result in a significant air quality improvement from non-attainment to attainment of the NAAQS, within the six AQCRs, would be considered to be a significant beneficial impact; and
- Conversely, any action or combination of actions that would result in significant air quality deterioration as defined as a State identification of a violation of the NAAQS, within the six AQCRs, would be considered to be a significant adverse impact.

7.2.4 Cumulative Impacts Associated with Alternative A – No Action Alternative

Once current disposal site capacity has been reached, dredged material would be pumped to previously used but currently inactive disposal sites. Maintenance dredging and disposal on the MKARNS would be maintained.

Cumulative air quality impacts associated with the No Action Alternative include the anticipated continued use of truck and train shipments of commercial and industrial goods not shipped on the MKARNS by commercial navigation and the associated potential for a minor cumulative increase in vehicle emissions. Additionally, as the population continues to grow within the study area, an increase in mobile and point sources of air emissions would be expected to occur in direct response to population growth. The enforcement of air quality standards would, however, make any cumulative increase in emissions influencing air quality minor.

7.2.5 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

Maintenance dredging would continue under Alternative B as under current conditions. Current air emissions do not have a significant impact on air quality, and this is not anticipated to change as a result of foreseeable future actions.

7.2.6 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Cumulative impacts are similar to those identified for Alternative B.

7.2.7 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

Construction equipment used for dredging operations and construction of river training structures would produce dust and exhaust emissions that would degrade air quality. Deeper channels would require longer construction periods and, thus, more negative impacts would occur to air quality as channel depth increases. These impacts would be minor and short term. All six AQCRs in the study area are in attainment of applicable air quality standards. Therefore, given the minor nature of the impacts associated with dredging and disposal activities implemented under this alternative, in conjunction with minor levels of air emissions from current and foreseeable future activities, implementation of this alternative would not have cumulatively significant adverse air quality impact.

7.2.8 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts would be similar to those identified for Alternative D.

7.3 Noise

7.3.1 Introduction

Land use and noise impacts are closely related. Sensitive land uses in high noise areas can lead to noise impacts.

Noise issues considered as part of the cumulative noise analysis include:

- Noise produced during dredging and dredged material disposal activities;
- Noise from additional port, marina, or industrial development and construction;
- Existing and future projected highway, rail, and river traffic noise;
- Other current noise sources within the development area;
- Potential future point sources within the proposed development area; and
- Nature of noise receptors within the project impact zone.

7.3.2 Analysis Area/Project Impact Zone

The cumulative impact analysis area for noise includes the MKARNS, its floodplain, reservoirs influencing the MKARNS, and the major travel corridors within the study area. The greatest cumulative noise impacts of the proposed action are expected to be concentrated near the river and along major travel corridors (highways and railroads) within the study area.

7.3.3 Noise Significance Criteria

The criteria for the determination of significant noise impacts are established in 40 CFR 1508.27 and other regulatory guidance.

7.3.4 Cumulative Impacts Associated with Alternative A – No Action Alternative

As the population continues to grow within the study area, an increase in traffic would be expected to occur in direct response to population growth, potentially resulting in a minor increase in noise along highways. Construction noise associated with the reasonably foreseeable actions identified in Section 7.1.3.2 would occur. These noise impacts would be localized, short-term, and of an intermittent nature and are not expected to be cumulatively significant.

7.3.5 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

Cumulative impacts would be similar to those identified for Alternative A. Given the existing noise environment, and the nature of land use in the area, no additional significant noise impacts are anticipated as a result of the construction of new dredged material disposal sites, river training structures and revetments.

7.3.6 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Cumulative impacts would be similar to those identified for Alternative B.

7.3.7 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

Cumulative impacts would be similar to those identified for Alternative A, although channel deepening would require longer construction periods and therefore a longer period of exposure to noise. However, noise from dredging and disposal activities in combination with noise resulting from other actions in the cumulative impact analysis area, would not have cumulatively significant adverse noise impacts as increased noise levels would be localized, short-term and intermittent in nature.

7.3.8 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts would be similar to those identified for Alternative D.

7.4 Geology and Soils

7.4.1 Introduction

Evaluation criteria for consideration of impacts to geologic features and soils are based on chemical constituent concentrations in the soil (relative to applicable laws and regulations) and on physical damage to soil and geologic features. Among the more important geological processes are stream and wind erosion, deposition, mass wasting, and soil formation.

Geology and soil issues considered as part of the analysis include:

- Changes in the rate of erosion within the river channel or banks due to a change in river levels and/or flows;
- Soil types within the dredge sites and dredged material disposal areas, and their potential to support proposed construction of the dredge pits;
- Potential contaminants present in river-bed sediments at dredge sites; and
- The potential for soil erosion from construction of both public and private sector construction projects.

7.4.2 Analysis Area/Project Impact Zone

The cumulative impact analysis area for geology and soils includes the geologic setting, soils, topography, and mining activity within the study area proper.

7.4.3 Geology and Soils Significance Criteria

In addition to the criteria established for determining significant impacts in 40 CFR 1508.27 and other regulatory guidance, the following criteria have been established for the determination of significant geology and soils impacts:

- A cumulative effect that results in soil containing concentrations of contaminants above applicable regulatory standards would be considered a significant adverse impact; and
- Physical damage to soil and geologic features, as well as the alteration of natural geological processes is less quantifiable, and significance levels are based upon professional judgment.

7.4.4 Cumulative Impacts Associated with Alternative A – No Action Alternative

Cumulative impacts would be limited to minor impacts related to activities associated with this project and population growth within the study area. Residential and commercial construction

activities, including the proposed construction of Interstate 49 and its associated bridge over the Arkansas River, coupled with population growth may result in soil erosion. The use of best management practices (BMPs) and adherence to local, State, and Federal construction standards and regulations would, however, lessen any short-term cumulative increase in soil erosion.

7.4.5 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

Cumulative impacts would be similar to those identified for Alternative A. Maintenance dredging would be sustained utilizing new disposal sites; however the volume of dredged material is not anticipated to change under Alternative B. Therefore, soil erosion associated with maintenance dredging under Alternative B, in combination with foreseeable future actions in the cumulative impact analysis area, not anticipated to have a significant cumulative adverse impact to soils.

7.4.6 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Cumulative impacts would be similar to those identified for Alternative B.

7.4.7 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

Deepening the navigation channel to 11 feet would disturb more sediment than under current conditions. A previous assessment of potential dredged materials from pools 16-18 of the Arkansas River system, as presented in final reports submitted by the USACE Tulsa District (1993, 1994, 1995) indicated concentrations of metals exceed sediment quality guidelines and background levels at numerous sites in pool 16 and selected pesticides and zinc concentrations exceeded guideline levels in pool 18. Given these issues, it was recommended that the USACE resample the sediments along the watercourses for an Inland Testing Manual Tier I evaluation (see Section 4.4.4, EPA/USACE, 1998). Impacts would be in direct proportion to the surface area disturbed by dredging. Future development and construction activities, including the proposed construction of Interstate 49 and its associated bridge over the Arkansas River, associated with this project, other projects, and population growth along the MKARNS would produce cumulative changes in the amount of sediment entering the system. These projects would adhere to local, State, and Federal erosion control BMPs and regulations. Consequently, cumulative impact on soils from this alternative would be minimal.

The slight increase in barge traffic associated with this alternative would have a negative long-term impact on soils within the river. This impact, in conjunction with soil disturbance anticipated to occur as a result of foreseeable future action is not expected to be cumulatively significant given the relatively minor nature of the anticipated soil disturbances relative to the overall size of the MKARNS.

7.4.8 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts would be similar to those described for Alternative D. However, deepening the navigation channel to 12 feet would disturb more sediment than the volume disturbed for Alternative D. Impacts would be in direct proportion to the amount of sediment removed from the system, therefore, this alternative would have a greater impact on geology and soils than Alternative D. Given the relative increase in volume of soils affected relative to the overall MKARNS, the impact on geology and soils associated with this alternative would not be cumulatively significant.

7.5 Surface Waters

7.5.1 Introduction

Surface water and floodplain impacts are closely interrelated. Surface water and floodplain issues considered as part of the analysis include:

- Increase and/or reduction of local flooding;
- New development in the floodplain;
- Increased impervious surfaces and potential increases in storm water runoff;
- Increase in river or reservoir stage height;
- Increase in current velocity within the MKARNS;
- Loss of floodplain values;
- Executive Order 11988, Flood Plain Management issues;
- Section 401 and 404 permit considerations; and
- Increased turbidity and/or release of contaminants during dredging and dredged material management

Adverse cumulative impacts to floodplains within or beyond the study area are not anticipated since all proposed actions, present actions, and reasonably foreseeable future actions within the study area would be implemented in compliance with Executive Orders 11988 and 11990. Together these Executive Orders require the application of sound floodplain management practices, including controls on any future encroachments on the 100-year regulatory floodplain. By keeping this floodway free of encroachments, 100-year flood elevations will not be increased.

The Arkansas and Verdigris Rivers along the MKARNS meet water quality criteria a majority of the time except for a few isolated locations (see Section 5.5.). Impairment of these segments includes pathogens, TDS, lead, turbidity, and low dissolved oxygen. Those impairments associated with pathogens and low dissolved oxygen would not be affected by the proposed action. Impairments from lead concentrations in water could be worsened by contaminated dredged material, but because strict USACE regulations and procedures would be followed to test sediments for such contaminants, no impacts to water quality are expected. The impairments caused by TDS and turbidity have the potential to be exacerbated by dredging and dredged

material management activities. Strict controls placed on dredging activities would reduce impacts to water quality within both impaired and unimpaired segments of the MKARNS.

7.5.2 Analysis Area/Project Impact Zone

Consideration of surface waters and floodplains includes physiography and surface drainage, surface water quality, floodplains, and storm water. Implementation of BMPs and other protective measures is expected to reduce any impacts associated with construction by others within the study area. Therefore, the cumulative impact analysis area for water resources is defined by the MKARNS and associated floodplain, as well as the reservoirs and their flood control pools.

7.5.3 Surface Waters Significance Criteria

The criteria for identification of significant adverse impacts to surface waters and floodplains include the necessity that all actions allow compliance with applicable Federal and State regulations. Any action or combination of actions that are expected to result in the inability to comply with these permits and regulations would be considered to be significantly adverse. These criteria are in addition to the criteria established for determining significant impacts in 40 CFR 1508.27 and other regulatory guidance.

7.5.4 Cumulative Impacts Associated with Alternative A – No Action Alternative

Past, present, and future activities, including continued and future wastewater and stormwater discharges would affect water quality. However, water quality and water resources impacts associated with the No Action Alternative, when considered in combination with these actions, are not anticipated to result in significant adverse cumulative effects given the overall scope of the MKARNS.

Future development and construction activities associated with this project and other foreseeable future projects such as the proposed construction of Interstate 49 and its associated bridge over the Arkansas River, in combination with population growth along the MKARNS would produce cumulative changes in the amount of impervious surfaces and associated runoff within the watershed. All projects would adhere to local, State, and Federal stormwater control regulations and BMPs which are designed to limit surface water inputs. Consequently, cumulative impacts to surface water across the MKARNS would be minimal.

7.5.5 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

Cumulative impacts are anticipated to be similar to those identified for Alternative A. Maintenance dredging would be sustained utilizing new disposal sites, but the volume of dredged material is not anticipated to change from current conditions under Alternative B. Therefore, no cumulatively negative impacts to surface waters would result from this alternative.

7.5.6 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Cumulative impacts are anticipated to be similar to those identified for Alternative A. River flow management would change as defined by the Operations Only Plan. River, associated tributary, and reservoir levels would fluctuate at different levels under this alternative, but annual average high flows and low flows would remain unchanged, therefore, no cumulative impacts to surface waters are anticipated.

7.5.7 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

Dredging to deepen the navigation channel and management of dredged materials would have minor short-term adverse impacts on water quality. These impacts would include increased sediment suspension during dredging and potential release of contaminants within riverbed sediments. Impacts would increase in proportion to the amount dredged. Therefore, deeper dredging would produce slightly more impacts to water quality. However, the overall quantity of sediment disturbed from this alternative combined with that anticipated from existing and foreseeable future activities, is minor in relation to the size of the overall MKARNS. Therefore, adverse impacts to surface water would not be cumulatively significant.

Other past, present, and future activities, including continued and future wastewater and stormwater discharges, dredging of ports and harbors to be compatible with deepening the channel, and the proposed construction of Interstate 49 and its associated bridge over the Arkansas River, would affect water quality. These impacts are not expected to be cumulatively significant given the scope of the MKARNS relative to the impacts.

Future development and construction activities associated with this project, other projects, and population growth along the MKARNS would produce cumulative changes in the amount of impervious surfaces and runoff in the system. All projects would adhere to local, State, and Federal stormwater control regulations and BMPs which are designed to limit inputs to surface water. Consequently, impacts to surface water would be minimal.

7.5.8 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts would be similar to those identified for Alternative D.

7.6 Land Cover and Land Use

7.6.1 Introduction

Land use issues associated with the proposed action and considered as part of this analysis include, but are not limited to, the following:

- Direct consumption and conversion of land for the proposed project;
- Potential impacts to on- and off-site land use in the form of development incompatible with adjacent land uses;
- Interference with access to other land uses;
- Railroad operations in the analysis area;
- Creation of changes in land use patterns, including the increased potential for industrial and commercial development in the area by this project;
- Local community development master planning and master planning by the local districts within the study area; and
- The potential for increased “urban sprawl” and the loss of prime farm land within the study area.

7.6.2 Analysis Area/Project Impact Zone

The cumulative impact analysis area for land use is defined by the 100-year floodplain adjacent to the MKARNS and the reservoirs within the study area. Direct and indirect impacts of the proposed action are expected to be restricted to this area since high water flows would not be influenced by any of the project alternatives

7.6.3 Land Use Significance Criteria

The criteria for the determination of significant land use impacts are established in 40 CFR 1508.27 and other regulatory guidance.

7.6.4 Cumulative Impacts Associated with Alternative A – No Action Alternative

River and reservoir operations would remain unchanged under the No Action Alternative. Consequently, no changes in land use patterns are anticipated under this alternative.

Population growth similar to recent historical growth is anticipated within the study area and may cause a minor increase in development of rural land to commercial, industrial, or residential uses. These impacts are not anticipated to be cumulatively significant given the historical rate of growth in the area.

7.6.5 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

A minimal change in land use associated with 26 new dredged material disposal sites would occur throughout the watershed under this alternative. In addition to the existing approved maintenance dredge disposal sites, dredged material disposal under Alternative B would replace 165 acres of aquatic habitat and 569 acres of terrestrial habitat at the new disposal sites. These acreages in addition to the loss of 2,484 acres of aquatic habitat and 5,664 acres of terrestrial habitat associated with maintenance dredge disposal represent an approximate 2.0 % loss of aquatic habitat and an approximate 1.3% loss in terrestrial habitat in the study area. This relatively minor change, combined with the conversion of rural land use to urban use associated with general population growth, would result in a minor cumulative adverse impact. However, given the scope of the analysis area/project impact zone, this impact is not significant.

7.6.6 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Under Alternative C, river flow fluctuations would be similar to current conditions, but it is anticipated that agricultural lands may be inundated slightly more frequently than under the current operation plan. However, this is not expected to be cumulatively significant.

Other cumulative impacts would be similar to those identified for Alternative B.

7.6.7 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

A minimal change in land use and land cover associated with 62 new dredged material disposal sites would occur throughout the watershed under this alternative. In addition to the existing pre-approved maintenance dredge material disposal sites. Dredge material disposal for Alternative D would replace 165 acres of aquatic habitat for maintenance and 3,482 acres for existing deepening and new deepening sites for a total of 6,131 acres of aquatic habitat. and new of 3,647 acres of aquatic habitat (5 % of aquatic habitat in the study area) and 569 acres of terrestrial habitat for maintenance and 927 acres of terrestrial habitat for deepening which amounts to a total of 7,160 acres of terrestrial habitat that would be converted to dredge material disposal areas. This represents approximately 1.6% of terrestrial habitat in the study area. This loss of habitat, combined with the conversion of rural land use to urban use associated with general population growth, would result in a minor cumulative adverse impact. However, given the scope of the analysis area/project impact zone, this impact is not significant.

7.6.8 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts would be similar to those described for Alternative D.

7.7 Infrastructure

7.7.1 Introduction

Infrastructure issues considered as part of the cumulative impact analysis include:

- Highway, bridge, and/or railroad expansions and redevelopment;
- Ports and marinas already constructed within the region;
- Construction of other ports and marinas within the region, including ports that are planned, designed but not constructed, or those under construction;
- Other major river structures (i.e. locks and dams) including those that are planned, designed or under construction;
- Additions or alterations of river control structures;
- Water treatment plants, storage tanks, and intakes located within the area affected by potential water height changes resulting from the project;
- Wastewater treatment plants and discharge locations within the area affected by potential water height changes resulting from the project, including: interceptor lines; force mains, overflow, gravity sewer lines, and pumping stations;
- Stormwater discharge locations within the area affected by potential water height changes resulting from the project; and
- Other utility systems that traverse the proposed project area.

7.7.2 Analysis Area/Project Impact Zone

Infrastructure includes potable water supply, wastewater collection and treatment, solid waste disposal, landfills, locks and dams, ports, river training structures, highways and roadways, railways, runways, incinerators, energy systems, and communications systems. The cumulative impact analysis area for infrastructure includes the MKARNS including its floodplain, reservoirs influencing the MKARNS and the major travel corridors and developed areas within the study area.

7.7.3 Infrastructure Significance Criteria

In addition to the criteria established for determining significant impacts in 40 CFR 1508.27 and other regulatory guidance, the following criteria have been established for the determination of significant infrastructure cumulative impacts:

- Infrastructure must have sufficient capacity to safely handle total demand without adversely affecting the environment, or unacceptably deteriorating the transportation, energy, utilities, and water supply and treatment systems.

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- For the potable water and wastewater system, applicable permits and regulations define significance evaluation criteria. Drinking water systems must satisfy the requirements of the Safe Drinking Water Act and their associated permits. Wastewater and stormwater discharges must be able to meet their required flow conditions to allow discharges into the river without backups that would impact on nearby low-lying areas. If construction, operation, or maintenance of the levee were to result in conditions that would preclude the water treatment, wastewater treatment, or storm sewage discharge facilities from meeting their requirements, a significant impact would occur.

The evaluation of transportation systems considers whether design capacities will be exceeded and whether standards established by the U.S. Department of Transportation (DOT) and Arkansas and Oklahoma DOT have been met. If future development in the study area would result in traffic levels that would exceed established U.S. DOT or State DOT standards, a significant impact would occur

7.7.4 Cumulative Impacts Associated with Alternative A – No Action Alternative

Infrastructure within the study area would remain relatively unchanged under the No Action Alternative. Water- and land-based transportation systems would continue to operate under conditions similar to those currently in existence. Lock, dam, and hydroelectric, water, and wastewater facility operations would also remain unchanged. Minor changes in overall infrastructure operations may occur as a result of the anticipated continued population growth within the study area.

Likely changes throughout the watershed would include population growth similar to recent historical growth that may cause minor increases in the development of roads, buildings, utilities, and other infrastructure. In addition, the following reasonably foreseeable future infrastructure projects are anticipated:

- Construction and operation of a slack-water harbor at Russellville, Arkansas;
- Construction and operation of a slack-water harbor at Fort Smith, Arkansas;
- Major rehabilitation of the Ozark Powerhouse;
- Rehabilitation of the Webber Falls Powerhouse;
- Proposed construction of Interstate 49 and its associated bridge over the Arkansas River; and
- Continuation of the USACE dike-notching program previously described in Section 4.7, to improve fish habitat in the river.

When considered within the geographical scope of the MKARNS, these infrastructure changes would not result in a cumulatively significant impact.

As the region grows economically, more goods would need to be transported via truck and/or rail. This would create a minor cumulative impact since an increase in truck traffic on local highways would result in higher traffic levels, which would require more roadway maintenance, repair, and may result in additional road construction. Likewise, an increase in train transport of goods would require more maintenance and repair of railways in the region.

7.7.5 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

The cumulative impacts associated with the changes anticipated in the watershed would be similar to those identified for Alternative A.

Infrastructure changes under Alternative B would also include construction of 2 new training structures, and modification of 50 existing structures and construction of 2 new revetments and modification of 4 existing revetments. Given the number of existing structures, and the scope of the system, this would not create a cumulatively significant impact.

Overall implementation of this alternative would result in greater reliability of water levels on the MKARNS and greater efficiencies in the transportation of goods. These increases in efficiencies would benefit the navigation industry and their customers resulting in a reduction in transportation costs for the region. Hydroelectric power generation would also benefit under the proposed action. These benefits, when combined with benefits obtained from reasonably foreseeable future projects that facilitate transportation in the area, would create a minor beneficial cumulative impact.

7.7.6 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

The cumulative impacts associated with anticipated changes in the watershed and modification and construction of river training structures would be similar to those described above for Alternative B.

7.7.7 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

The cumulative impact of anticipated changes in the watershed will be similar to those described for Alternative B. This alternative would require a total of 91 new training structures, modification of 137 existing training structures, 3 new revetments and modifications of 20 existing revetments. Currently there are 1,314 dike structures and 330 miles of revetments throughout the MKARNS. Although infrastructure needed for this alternative is at a larger scale than Alternative B, it is a relatively minor amount given the overall scope of the MKARNS.

Improved efficiencies in commercial navigation resulting from implementation of this alternative would facilitate the movement of goods associated with future regional growth. This would have a cumulative beneficial impact to the navigation industry.

7.7.8 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts to infrastructure would be similar to those described for Alternative D. .

7.8 Biological Resources

7.8.1 Introduction

Biological resource issues considered as part of the analysis include the following:

- Section 401 and 404 permit considerations;
- Threatened and endangered species;
- Existing and potential wetlands; and
- Fish, wildlife, and aquatic and terrestrial habitats.

7.8.2 Analysis Area/Project Impact Zone

Biological resources include fish and wildlife, vegetation, wetlands, Federal threatened and endangered species, other protected species, and natural resources management. The cumulative impact analysis area for biological resources is defined by the MKARNS and associated 100-year floodplain, as well as the reservoirs including their flood control pools.

7.8.3 Biological Resources Significance Criteria

Criteria established for determining significant impacts to biological resources are listed in 40 CFR 1508.27 and other regulatory guidance.

7.8.4 Cumulative Impacts Associated with Alternative A – No Action Alternative

Current effects on riverine, reservoir, wetland, and floodplain areas would remain unchanged as a result of implementing the No Action Alternative. Continued operation of USFWS NWRs , State WMAs and programs, and the recently instituted dike-notching program initiated by the USACE would continue to improve aquatic habitat and aquatic communities in the river; and conditions for endangered species (e.g. least tern) are not expected to decline.

As identified in Chapter 6, under this alternative the USACE Tulsa District would eventually have to utilize inactive terrestrial sites identified and approved in the 1974 EIS and/or in existing sites in Arkansas for deposition of maintenance dredged material. Many of the Tulsa District terrestrial sites approved in the 1974 EIS contain mature vegetation. Utilizing these sites would require site reworking and additional mitigation for terrestrial impacts and thus would have a major adverse impact on terrestrial resources. This impact, in combination with other anticipated impacts to terrestrial habitats associated with continued population growth across the study area

would result in a major adverse cumulative impact. However, given the historical rates of encroachment and nature of anticipated future projects, the impact would not be considered significant.

Future development and construction activities associated with this project, other projects, such as the proposed construction of Interstate 49 and its associated bridge over the Arkansas River, and population growth along the MKARNS would produce cumulative changes in the amount of sediment entering the watershed and thus affecting aquatic habitat. These projects would adhere to local, State, and Federal stormwater control regulations and BMPs. Consequently, impacts to aquatic habitat would be minimal.

7.8.5 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

Cumulative impacts would be similar to those described for Alternative A.

A total of 2,649 acres of aquatic habitat would be impacted by disposal of dredged material. This amounts to approximately 2% of aquatic habitat in the study area. This impact, together with impacts to aquatic habitat associated with reasonably foreseeable future projects would not be cumulatively significant.

Alternative B would also utilize a total of 6,233 acres of terrestrial habitat for dredged material disposal. This impact, when combined with impacts to terrestrial habitat associated with population growth in the project area, could have a cumulative impact on terrestrial habitat. However, as the total loss of terrestrial land amounts to approximately 1.3 % of the total terrestrial habitat in the study area, and the majority of areas that would be impacted are agricultural croplands and old field habitats that are not of high quality, cumulative impacts to biological resources would be minor.

7.8.6 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Cumulative impacts would be similar to those identified for Alternative B. Current effects on riparian habitats adjacent to the MKARNS are expected to remain unchanged under this alternative since the overall range of river flows would be unchanged.

7.8.7 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

Cumulative impacts would be similar to those described for Alternative A.

A total of 6,131 acres of aquatic habitat would be impacted by disposal of dredged material. This amounts to approximately 5% of aquatic habitat in the study area. Although this impact

along with other losses in aquatic habitat associated with foreseeable future project is minor, given the relative increase of aquatic habitat impacted by this alternative, a minor cumulative impact would be realized. This impact would not be considered significant when considered at the scale of the MKARNS.

A total of 7,160 acres of terrestrial habitat will be impacted by disposal of dredged material at existing approved and proposed new sites under this alternative. This number represents approximately 1.6% of similar land cover in the study area and these areas are not areas of high quality habitat. Therefore, this impact is not cumulatively significant.

7.8.8 Cumulative Impacts Associated with Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts will be similar to those described above for Alternative D.

7.9 Recreation and Aesthetic Values

7.9.1 Introduction

Recreation and Aesthetic Values issues considered as part of the analysis include the following:

- Existing marinas, and State and Federal parks and WMAs and refuges;
- Potential future development of private and public recreational areas along the MKARNS;
- Present and future recreational boat traffic on the MKARNS;
- Present and future recreational traffic patterns on roads and highways along the MKARNS;
- Present and future use of reservoirs, WMAs, and the MKARNS main channel for consumptive recreation (hunting and fishing); and
- Present and future use of parks, reservoirs, NWRs, and the MKARNS main channel for non-consumptive recreation (bird watching, wildlife viewing, camping, etc.).

7.9.2 Analysis Area/Project Impact Zone

Recreation and aesthetic resources are directly associated with the river and reservoirs within the study area. Therefore the cumulative impact analysis area for recreation and aesthetic resources is defined by the MKARNS and associated floodplain as well as the reservoirs including their flood control pools.

Criteria for significant impacts to recreation and aesthetic values are a substantial long-term change in access to recreation opportunities or a substantial long-term change in the recreation experience.

7.9.3 Cumulative Impacts Associated with Alternative A – No Action Alternative

Cumulative impacts to recreational and aesthetic resources under the No Action Alternative are anticipated to be minor. No changes in river or reservoir operations would occur. Consequently no changes to riverine or reservoir recreation or aesthetics are anticipated.

Continuing increases in population within the study area would be expected to result in higher usage of recreational facilities potentially increasing operation and maintenance costs. These costs would be expected to be partially offset via the collection of user fees associated with many of the recreational areas.

Cumulative impacts would include a minor decrease in recreational opportunities from USACE activities such as park closings due to budget constraints and/or minor flooding coupled with a minor increase in recreational opportunities from USACE and non-USACE activities such as dike notching projects to improve aquatic habitat and aquatic communities in the river and river corridor development projects. When considered relative to the number of other recreational facilities available throughout the MKARNS, these changes would not be cumulatively significant

7.9.4 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

Cumulative impacts would be similar to those identified for Alternative A.

7.9.5 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Cumulative impacts would be similar to those identified for Alternative A. Flow changes realized under this alternative would not affect public use areas along the MKARNS. Because this alternative will only result in two fewer days when the channel flow exceeds 100,000 cfs, this would not have a cumulatively significant impact on recreation opportunities for pleasure boaters.

7.9.6 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

Deepening the channel would require additional land be utilized for dredged material disposal sites. Although these sites would be previously degraded sites, this loss of land in combination with other land development occurring in the area may result in a cumulative loss of land available for recreational development. This loss is not anticipated to be significant given the geographic scope of the MKARNS.

Other cumulative impacts would be similar to those identified for the No Action Alternative.

7.9.7 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative Impacts would be similar to those identified for Alternative D.

7.10 Cultural Resources

7.10.1 Introduction

Cultural Resource issues considered as part of the analysis include cumulative impacts that would occur to cultural resources in the study area and the Area of Potential Effect (APE) as a result of this project in combination with other past, present, and reasonably foreseeable Federal, State, local and private projects. These include the following:

- Study area development;
- Channel, harbor, and entrance channel dredging;
- Construction and operation of dams, locks, and reservoirs;
- River bank stabilization; and
- Construction of wildlife habitat.

7.10.2 Analysis Area/Project Impact Zone

The cumulative impact analysis area for cultural resources includes those areas influenced by the operation of the MKARNS and its associated reservoirs. The cumulative impact analysis area for cultural resources is defined by the MKARNS and its associated floodplain as well as the reservoirs including their flood control pools.

7.10.3 Cultural Resources Significance Criteria

For the purposes of this document, an ‘adverse effect’ as defined in Section 106 of the National Historic Preservation Act will distinguish a significant impact under NEPA. An undertaking is considered to have an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register of Historic Places (NRHP). An effect is considered adverse when it diminishes the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties (i.e., NRHP-listed or eligible resources) would include, but not be limited to:

- physical destruction, damage, or alteration of all or part of the property;
- isolation of the property from or alteration of the character of the property’s setting when that character contributes to the property’s qualification for the National Register of Historic Places;

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- introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
 - neglect of a property resulting in its deterioration or destruction; and
 - transfer, lease, or sale of the property (36 CFR 800.9[b]).

Because the USACE has determined that Feasibility Study-related activities may have an effect upon properties potentially eligible for inclusion in the National Register of Historic Places (NRHP), and has consulted with the Arkansas State Historic Preservation Officer (SHPO), the Oklahoma SHPO, and the Oklahoma Archaeological Survey (OAS) pursuant to Section 800.14(b) of the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (NHPA)(16U.S.C. 470f); [and Section 110(f) of the same Act (16 U.S.C. 470h-2(f))], the USACE and the Arkansas SHPO agreed that subsequent to completion of the NEPA documentation, a Programmatic Agreement (PA) shall be implemented to satisfy the USACE's Section 106 responsibility for all individual aspects of the Feasibility Study. The USACE, Oklahoma SHPO, and the OAS agreed that a PA was not necessary for the USACE to satisfy Section 106 and 110 responsibilities for activities proposed as part of this project. In Oklahoma, the USACE would follow normal Section 106 procedures (as detailed in 36 CFR 800) for all undertakings that may have an effect on historic properties. If necessary, mitigation of historic properties that may be adversely affected by a project activity would be determined on a case-by-case basis in consultation with the Oklahoma SHPO and the OAS.

A PA will be prepared and implemented by the Little Rock USACE for the identification, evaluation and treatment of cultural resources adversely affected by the Proposed Action on the MKARNS in Arkansas. This PA is reproduced in Appendix D of this EIS.

Implementation of the PA and consultation with the Oklahoma SHPO and the OAS on a case-by-case basis will serve as mitigation and as such will reduce the level of potential impact to cultural resources to below the significance threshold.

7.10.4 Cumulative Impacts Associated with Alternative A – No Action Alternative

Cumulative adverse impacts under the No Action Alternative would result from continued use and development of the river floodplain for commercial, industrial, residential and agricultural uses. Cumulative effects would include physical disturbance of submerged cultural and archaeological resources through ongoing future construction of pipeline crossings, utility corridor crossings, and construction of piers for bridges. A list of reasonably foreseeable action is given in section 7.1.3. Given the number of proposed projects and regulatory requirements, the adverse cumulative impact would be minor.

7.10.5 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

Maintenance dredging could cause physical disturbance to submerged cultural resources in addition to the baseline level of disturbance described for Alternative A. Activities associated with maintenance dredging that impact submerged cultural resources include channel

maintenance, construction of new islands for wildlife habitat, construction of revetments and bank stabilization structures along river and lake shorelines, wave action erosion along the shoreline, and dike-notching throughout the MKARNS. These types of physical disturbance would disturb or destroy the integrity of the archaeological sites and subsequently, their eligibility for the NRHP. The implementation of Alternative B, combined with impacts associated with existing and reasonably foreseeable future actions, would have a minor adverse cumulative impact on Cultural Resources given the scope of the MKARNS.

7.10.6 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Cumulative impacts would be similar to those described for Alternative B.

7.10.7 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

Cumulative effects would include physical disturbance of submerged cultural resources in addition to the baseline level of disturbance described for Alternative A. Activities associated with this alternative that could disturb submerged cultural resources include channel deepening and harbor entrance dredging activities, construction of new islands for wildlife habitat, construction of revetments and bank stabilization structures along river and lake shorelines, wave action erosion along the shoreline, and dike-notching throughout MKARNS. These types of physical disturbance would disturb or destroy the integrity of the archaeological sites and subsequently, their eligibility for the NRHP. Thus, the implementation of Alternative D, combined with impacts associated with existing and reasonably foreseeable future actions, would have a minor adverse cumulative impact on Cultural Resources, given the scope of the MKARNS.

7.10.8 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts of Alternative E would be similar to those of Alternative D, except to a slightly greater degree given the increased channel depth associated with this alternative.

7.11 Sociological Environment

7.11.1 Introduction

Cumulative effects to the sociological environment are defined through consideration of changes in population growth, housing demand, school enrollment, and public service delivery demands

resulting from the proposed action in combination with past, present and reasonably foreseeable future demands occurring in the region.

Sociological environment issues considered as part of the analysis include the following:

- Population, including low-income and minority populations;
- Housing;
- School enrollment and educational facilities;
- Public and community services and infrastructure; and
- Community cohesion.

The sociological environment includes demographics, Native American and other ethnic concerns, environmental justice, homeless and other special programs, impacts to children, and community facilities and services. The cumulative impacts area of analysis for the sociological environment is the 40-county area contiguous to the MKARNS and its associated reservoirs.

In addition to the criteria established for determining significant impacts in 40 CFR 1508.27 and other regulatory guidance, the following additional criteria have been established for the determination of significant sociological development resource impacts:

- On February 11, 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations* (FedR 1994). The purpose of this executive order is to avoid disproportionate adverse environmental, economic, social, or health impacts from Federal actions and policies on minority and low-income populations or communities. It is USACE policy to fully comply with Executive Order 12898 by incorporating environmental justice concerns in decision-making processes supporting USACE policies, programs, projects, and activities. In this regard, USACE ensures that it will identify, disclose, and respond to potential adverse social and environmental impacts on minority and/or low-income populations within the area affected by a proposed USACE action. The initial step in this process is the identification of minority and low-income populations that might be affected by implementation of the proposed action or alternatives. For environmental justice considerations, these populations are defined as individuals or groups of individuals that are subject to an actual or potential health, economic, or environmental threat arising from existing or proposed Federal actions and policies. *Low-income*, or the poverty threshold, is defined as the aggregate annual mean income for a family of four of \$19,157 in 2004 based on the U.S. Census Bureau poverty guidelines.
- On April 21, 1997, the President issued Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (FedR 1997). This Executive Order recognizes that a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because children's bodily systems are not fully developed; because they eat, drink, and breathe more than adults in proportion to their body weight; because their size and weight can diminish protection from standard safety features; and because their behavior patterns can make them more susceptible to accidents. Based on these factors, the President directed each Federal agency to make it a high priority to identify and assess environmental health risks and safety risks that might disproportionately affect children. The President also

directed each Federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. It is USACE policy to fully comply with Executive Order 13045 by incorporating these concerns in decision-making processes supporting USACE policies, programs, projects, and activities. In this regard, USACE ensures that it will identify, disclose, and respond to potential adverse social and environmental impacts on children within the area affected by a proposed USACE action.

7.11.2 Cumulative Impacts Associated with Alternative A – No Action Alternative

There would be no additional cumulative impacts on the sociological environment under the No Action Alternative, as existing impacts would continue as under current conditions.

7.11.3 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

Because commercial navigation is expected to continue into the foreseeable future, no significant cumulative impacts are anticipated in respect to subsequent population changes, housing, demands on community facilities and public services, or community cohesion.

7.11.4 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

The projected increase in annual average navigation days and cost efficiencies under this alternative would have minor beneficial direct and indirect regional and local sociological impacts. However, given the relatively minor nature of the beneficial impact, no significant cumulative impacts are anticipated in respect to subsequent population changes, housing, demands on community facilities and public services, or community cohesion under this alternative.

7.11.5 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

The projected decrease in transportation costs under this alternative could have some minor beneficial direct and indirect regional and local sociological impacts. However, given the minor nature of the beneficial impact, no significant cumulative impacts are anticipated in respect to subsequent population changes, housing, demands on community facilities and public services, or community cohesion under this alternative.

7.11.6 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts would be similar to those described for Alternative D.

7.12 Economic Environment

7.12.1 Introduction

Various economic indicators, including gains in employment, income, business volume and populations, define cumulative effects on economic development and economic activity. Changes in these indicators associated with the study alternatives, in combination with other past, present and reasonably foreseeable future actions are predicted. Other measurements of economic activity include industrial and commercial expansion, housing construction and the growth in assessed valuation and tax base as a result of these actions.

Economic development resource issues considered as part of the analysis include the following:

- Commercial navigation;
- Hydropower resources;
- Recreation/tourism resources;
- Agricultural resources;
- Industrial/port investment and development;
- Employment;
- Business sales and income;
- Project development costs; and
- Operations and maintenance costs.

The economic environment cumulative impact area of analysis is the 40-county area contiguous to the MKARNS and its associated reservoirs.

The criteria used to identify or define a significant impact to the resource being considered vary in relation to the context and intensity of the action and resource. For those resources reflecting a broader regional context (such as absorption and pace of development), significance has been evaluated in the context of effects on those regional or sub-market factors. For those resources described in a more site-specific context (such as existing business operations or assessed value), significance has been evaluated in terms of those local factors. These specific significance criteria are in addition to the criteria established for determining significant impacts in 40 CFR 1508.27 and other regulatory guidance.

7.12.2 Cumulative Impacts Associated with Alternative A – No Action Alternative

Under the No Action Alternative there would be no short-term beneficial or adverse economic impacts, since existing impacts would continue as under current conditions. In addition to past

and present actions that have resulted in the existing conditions of the MKARNS, associated reservoirs, and other features of the study area, likely changes throughout the watershed would include population growth similar to recent historical growth which may cause minor increases in the economic growth of the region. The following projects are also anticipated:

- Completion (and subsequent operation) of the Montgomery Point Lock & Dam is anticipated in 2005;
- Construction and operation of a slack-water harbor at Russellville, Arkansas;
- Construction and operation of a slack-water harbor at Fort Smith, Arkansas;
- Major rehabilitation of the Ozark Powerhouse;
- Rehabilitation of the Webber Falls Powerhouse;
- Continuation of the USACE dike-notching program previously described in Section 4.7.4 to improve fish habitat in the river;
- Flood reduction projects have occurred and will continue to occur along the MKARNS. Such project components may include channel clearing and enlargement of tributary streams, road and railroad bridge alterations, and recreation features; and
- Continuation of ongoing current and future operation and maintenance activities on the MKARNS and reservoirs including dredging, dredged material disposal, and construction and maintenance of river training structures such as dikes and revetments.
- Because of the ongoing nature of many of these projects, impacts to economics are not anticipated to be cumulatively significant.

Minor long-term foregone benefits could occur directly in the navigation industry as a result of the continuation of navigation inefficiencies as currently occur under existing conditions. Long-term adverse indirect impacts could potentially include a lack of additional port development and investment, decrease in navigation-related employment and other indirect employment in businesses supporting navigation and service sectors, and a decrease in income and business volume.

Under the No Action Alternative impacts on hydroelectric power, and tourism and recreation would continue as under existing conditions. In addition, there would be no additional impacts on agricultural and non-agricultural properties.

However, when considered within the geographical scope of the MKARNS, along with past, present, and potential future actions within the region, these economic changes would not be cumulatively significant.

7.12.3 Cumulative Impacts Associated with Alternative B – Navigation Channel Maintenance Only Alternative

There will be both beneficial and adverse economic impacts under this Alternative as a result of the requirement for new dredged material disposal sites. Some productive cropland will be acquired for these new sites, resulting in a long-term loss of cropland production and a reduction in land value and property tax revenues. However, the dredging operations will create additional employment, resulting in increased business volume and income for the local economy. In addition, the dredged materials can become a resource as a raw material for various construction and industrial related uses. When considered within the geographical scope of the MKARNS,

along with past, present, and potential future actions within the region, these economic changes would not be cumulatively significant.

7.12.4 Cumulative Impacts Associated With Alternative C – Navigation Channel Maintenance and Operations Only Flow Management Alternative

Overall cumulative net beneficial economic impacts would occur under Alternative C. The majority of these benefits would accrue to the navigation industry as a result of an increase in navigation days, reduction in fuel costs, and overall increases in waterway transportation efficiencies. Positive economic benefits would be associated with navigation and hydropower, with navigation accounting for 95 percent or more of these benefits. Negative economic impacts would be associated with real estate, recreation/tourism, and non-agricultural and agricultural properties, with the greatest adverse impacts on recreation/tourism.

As a result of the increase in navigation days and waterway transportation efficiency, beneficial indirect impacts could occur in respect to port investment and development, and expansion of navigation-related industries in the region. As a result of these investments, additional employment, income and business volume would be indirectly created. In addition, there could be some increases in values of strategically located properties and resultant increase in property tax revenues. However, when considered within the geographical scope of the MKARNS, along with past, present, and potential future actions within the region, these economic changes would not be cumulatively significant. It is anticipated that there would be no significant regional or site-specific economic impacts under any of the flow management alternatives.

7.12.5 Cumulative Impacts Associated With Alternative D – Navigation Channel Maintenance and Operations Only Flow Management & 11-Ft Depth Navigation Channel Alternative

Under the Channel Deepening Alternatives there will be both beneficial and adverse economic impacts under each alternative. The major beneficial impacts will accrue to the navigation industry in respect to navigation efficiency as a result of fewer tows and increased barge loadings as a result of channel deepening. In addition, some existing overland traffic is expected to be transferred to waterway transportation as the result of increase in the efficiencies of waterway transportation and consequential lower transportation costs. It is expected that this gain in efficiencies could potentially result in some increase in navigation and port-related investments and employment, resulting in additional contributions to the local and regional economy in respect to business volume and income.

There will be some negative economic impacts as a result of implementation of the Channel Deepening Alternatives. These would include loss of real estate and agricultural land from productive capacity as a result of new dredged material disposal sites and mitigation requirements.

It is anticipated that there would be no significant regional or site-specific cumulative economic impacts under any of the channel deepening alternatives.

7.12.6 Cumulative Impacts Associated With Alternative E – Navigation Channel Maintenance and Operations Only Flow Management & 12-Ft Depth Navigation Channel Alternative

Cumulative impacts associated with Alternative E would be similar to Alternative D, with navigation benefits slightly greater under Alternative E.

7.13 Cumulative Impact Summary

This cumulative impact analysis evaluated the direct and the indirect effects of implementing any of the study alternatives in association with past, present, and reasonably foreseeable future USACE and other parties in the surrounding area on the MKARNS. Past and present actions have resulted in the current condition of the MKARNS, associated reservoirs, and other features of the study area. Reasonably foreseeable future actions that have been considered for cumulative impacts included relevant foreseeable actions within and adjacent to the study area including USACE, other Federal Government agencies, State and local agencies, as well as private and commercial entities.

The cumulative impacts associated with implementation of the proposed action, were evaluated with respect to each of the resource evaluation categories. A summary of cumulative impacts is included in Chapter 8. No significant cumulative adverse impacts would occur as a result of implementation of any of the alternatives evaluated.