USACE SOUTHWESTERN DIVISION

CIVIL WORKS STRATEGIC PLAN

STRATEGIC RESPONSE PLAN

NOVEMBER 2022

Developed through a coordinated effort of the USACE Southwestern Division and the Fort Worth, Galveston, Little Rock, and Tulsa Districts in conjunction with The Water Institute of the Gulf.

PREFACE

The United States Army Corps of Engineers (USACE) Southwestern Division (SWD/Division)—recognizing the risks and opportunities facing the Division and its Districts over the coming decades—developed a Civil Works Strategic Plan (CWSP) in 2020 to guide their Civil Works program through 2035. After examining six risk factors, the CWSP sets out four broad goals for the Division and its Districts, including:

- Enable innovative solutions to complex challenges,
- Shift towards a proactive response mode,
- Re-envision role as a collaborative partner, and
- Adaptively manage full lifecycle of water resources infrastructure.

The CWSP is an actionable plan and was developed to be adaptable over time. This Strategic Response Plan (SRP) has been developed to advance implementation of the CWSP in the context of current priorities and needs for the Division. The SRP includes revisiting the scenario analysis conducted in the CWSP and identifying how to achieve positive outcomes given current conditions in the region, reexamining the risk factors, assessing partner capacity, building new collaborative relationships, and updating the focus areas and action items. Execution of this SRP will therefore help the Division and Districts implement the CWSP and achieve the Civil Works mission.

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USACE Leadership

USACE Southwestern Division

USACE Fort Worth District

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USACE Galveston District

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USACE Institute of Water Resources

USACE Hydraulic Engineering Center

USACE Regional Planning and Environmental Center

USDA Natural Resources Conservation Service

North Central Texas Council of Governments

Brazos River Authority

Trinity River Authority

Dallas Water Utilities

North Texas Municipal Water District

Tarrant Regional Water District

Northeast Texas Municipal Water District

Southwestern Power Administration

Texas Department of Transportation

Texas General Land Office

Port of Catoosa

Port of Houston

Port of Corpus Christi

Port of Freeport

Texas Ports Association

Emerging/Gulf Ports Association

Northwest Arkansas Planning Commission

Arkansas Natural Resources Commissioners

Missouri Department of Transportation

Oklahoma Water Resource Board

Kansas Water Office

Missouri Department of Natural Resources

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EXECUTIVE SUMMARY

The United States Army Corps of Engineers (USACE) Southwestern Division (SWD) developed its Civil Works Strategic Plan (CWSP) in 2020 to guide the Division and its Districts for the coming decades as new and increasing risks and opportunities arise for Integrated Water Resources Management (IWRM). The CWSP included four overarching goals:

- Enable innovative solutions to complex challenges,
- Shift towards a proactive response mode,
- Re-envision role as a collaborative partner, and
- Adaptively manage full lifecycle of water resources infrastructure.

The CWSP was designed to be implementable, but also must adapt to changing conditions. In 2022, SWD began the process of developing a Strategic Response Plan (SRP) to nurture partnerships, update a shared understanding of risk factors and opportunities, and guide implementation. A regional workshop was held in spring 2022 to begin this work, and this SRP contains many insights from that workshop.

To ensure that the Division and Districts can make the most of new opportunities for IWRM while mitigating risks, the following near-term and long-term focus areas and action items are outlined in the SRP.

Near-Term Focus Areas:

- Lead Coordination of State and Federal Authorities
    - Action 1: Streamline SWD communication with and across regional authorities.
    - Action 2: Facilitate identification and leveraging of funding streams.
- Provide a Centralized Resource for Data Collection, Storage, Sharing, and Analysis
    - Action 3: Establish consistent data standards and facilitate data sharing.
    - Action 4: Coordinate and disseminate analysis of risks and trends.
    - Action 5: Support development of novel solutions to IWRM challenges.
- Expand Public and Stakeholder Communication
    - Action 6: Support state-level communication of water resources needs.

    - Action 7: Develop outreach approaches for rural communities.
    - Action 8: Improve engagement with underserved communities.
    - Action 9: Increase public outreach and communication.
- Facilitate Collaborative Partnerships
    - Action 10: Regularly conduct risk and opportunity assessment workshops.
    - Action 11: Expand partnerships with the academic community to support workforce needs.

Long-Term Opportunities:

- Proactively Plan and Implement O&M
    - Action 12: Develop a regional plan for SWD O&M.
- Streamline Development of New Infrastructure and Project Implementation
    - Action 13: Increase transparency throughout project development and implementation.
    - Action 14: Reduce project development and implementation timelines.
    - Action 15: Design and implement workflows for multi-benefit projects and long-term sustainability.
- Catalyze Regional/Holistic Planning and Project Development
    - Action 16: Lead advancement of scenario-based IWRM planning.
    - Action 17: Identify and participate in regional planning initiatives.
    - Action 18: Expand consideration of regional outcomes in project planning.

Together, these near-term focus areas and long-term opportunities can help the Division and Districts manage growth, climate change, and other risks to create a resilient Southwestern region.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ACRONYMS

Acronym	Term
AOR	Area of Responsibility
BIL	Bipartisan Infrastructure Law
CAP	Continuing Authorities Program
CWSP	Civil Works Strategic Plan
EI	Environmental infrastructure
ERDC	Engineer Research and Development Center
FPMS	Floodplain Management Services
FRM	Flood risk management
HQ	Headquarters
IWR	The Institute for Water Resources
IWRM	Integrated Water Resource Management
LULC	Land use and land cover
NAV	Navigation Mission Area
NBS	Natural and Nature-based Solutions
PAS	Planning Assistance to States
POC	Points of contact
SRP	Strategic Response Plan
SWD/Division	Southwestern Division
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

1.0 INTRODUCTION

To grow sustainably into the future, the Nation needs innovative and integrated solutions to sustainably manage water-related risks (i.e., floods, droughts, natural disasters) and the increasing and often competing demands for water resources. States in the southwest including Kansas, Missouri, Oklahoma, Texas, Arkansas, and Louisiana all face water-related challenges, driving the United States Army Corps of Engineers (USACE) Southwestern Division (SWD/Division) into a new era of innovation, and providing value to the Nation through Integrated Water Resources Management (IWRM). Building on the goals and vision articulated in the SWD Civil Works Strategic Plan (CWSP), SWD continues its work to provide an adaptable foundation to implement tactical plans and actions as future conditions evolve.

1.1 SOUTHWESTERN DIVISION

SWD encompasses four districts: Fort Worth (SWF), Galveston (SWG), Little Rock (SWL), and Tulsa (SWT). SWD's Area of Responsibility (AOR) includes all of Oklahoma and portions of Texas, Arkansas, Kansas, Missouri, and Louisiana. SWD's Civil Works Mission is to serve the public by providing the Nation with quality and responsive:

- Development and management of the Nation's water resources,
- Support of commercial navigation,
- Restoration, protection, and management of aquatic ecosystems,
- Flood risk management, and
- Engineering and technical services in an environmentally sustainable, economic, and technically sound manner with a focus on public safety and collaborative partnerships.

SWD's extensive Civil Works business lines and strengths include:

- **Hydropower.** Hydroelectric power plants in the SWD AOR provide energy to more than eight million customers across the region.
- **Water Supply.** SWD water storage capacity is sufficient to provide more than four billion gallons per day to the public and industry during drought conditions.
- **Recreation.** Recreational facilities in SWD support 83 million visitors annually, first among all USACE Divisions.
- **Regulatory.** The SWD Regulatory Program makes over 6,000 regulatory permit decisions annually for the protection of waters and wetlands.
- **Environmental Stewardship.** Over 17 endangered species are supported in SWD.

- **Navigation.** Over 1,500 miles of channels carry more than 500 million tons of commerce each year.
- **Flood Risk Management.** Over 760 miles of flood protection projects, including 74 flood risk reduction reservoirs, protect more than $190 billion in public and private assets as of 2019.

1.2 CIVIL WORKS STRATEGIC PLAN

SWD began developing its CWSP in 2019 to provide guidance to the Civil Works Program for the next 20 years. Released in 2020, the CWSP articulates four goals for the Program and positions SWD as a leader in incorporating IWRM principles throughout the Program (USACE, 2020). The Civil Works Vision, also articulated in the CWSP, includes four overarching goals and associated objectives (Figure 1):

GOAL 1
Enable innovative solutions to complex challenges

PARTNERSHIP OBJECTIVES
1.1 Coordinate to identify and develop solutions at **regional watershed and landscape scales**

PROCESS OBJECTIVES
1.2 Coordinate Business Lines and project timelines around key **nexus opportunities and tradeoffs**
1.3 Optimize workflows and processes to be more **agile, flexible, faster, and less risk averse** while maintaining safety and reliability
1.4 Enable and encourage **interdisciplinary and creative** approaches to problem solving

PROJECT OBJECTIVES
1.5 Encourage and prioritize **multi-use and multi-benefit** projects
1.6 Reevaluate **cost and benefit consideration** in decision making to be more inclusive
1.7 Consider **structural and non-structural approaches** in safe and reliable flood risk management that can be implemented by USACE or with partners

GOAL 2
Shift towards a proactive response mode

PARTNERSHIP OBJECTIVES
2.1 Engage with academia to **build the workforce needed for the future**

PROCESS OBJECTIVES
2.2 Develop tools and processes to regularly **protect future demands for Civil Works**
2.3 Update **technology** to meet **industry standards**

PROJECT OBJECTIVES
2.4 Invest in **pre-disaster** planning and **resillence** improvements
2.5 Incorporate **future trends** in population, land use, weather, and the economy into **planning and project design**

GOAL 3
Re-envision role as a collaborative partner

PARTNERSHIP OBJECTIVES
3.1 **Raise awareness** of the USACE Mission at the local, state, and national level through **targeted outreach**
3.2 Develop a strategy for working with and benefitting **underserved communities**
3.3 Take a leadership role in **coordinating federal decision makers and stakeholders**
3.4 Expand participation in **interagency water resource management** teams and working groups

PROCESS OBJECTIVES
3.5 Ensure **consistent messaging and communication** from leadership through project teams.

PROJECT OBJECTIVES
3.6 Identify action strategies for **studies that result in recommended approaches outside of USACE authority**
3.7 Support the **leadership of state and local agencies** in regional water resources strategic planning initiatives

GOAL 4
Adaptively manage full lifecycle of water resources infrastucture

PARTNERSHIP OBJECTIVES
4.1 Consider **public-private partnership options** and delegation of authority in developing, rehabilitating, and improving water resource infrastructure

PROCESS OBJECTIVES
4.2 Integrate project monitoring and metrics as part of an **adaptive management approach**
4.3 Develop a **division-wide operations and prioritization plan** for Civil Works Funding

PROJECT OBJECTIVES
4.4 Design **new projects with a plan for long-term operations and maintenance**
4.5 Consider the benefits of **natural and nature-based features** (NNBF) and other approaches in improving and extending performance over time
4.6 Evaluate the most efficient and cost-effective ways to meet current needs, including **opportunities to revamp existing projects**

Figure 1. Strategic goals and objectives of the SWD Civil Works Vision. From Figure 22, USACE (2020).

The CWSP was designed to inform the Division, Districts, and regional stakeholders, and to be relevant across all Mission Areas and Business Lines. The CWSP considered six interrelated risk drivers: Rapid Population Growth & Urbanization, A Changing Regional Landscape, Increases in Extreme Weather, Uncertain Future of Energy, Increasing Demand on Limited Water Resources, and Aging Infrastructure. The goals and objectives were designed to position SWD to meet the challenges of those risk drivers within the region both for the present and into the future.

A scenario analysis was also conducted to juxtapose demand pressures for Civil Works under an uncertain future against the Division's capacity and ability to adapt to changing and potentially volatile needs (Figure 2).

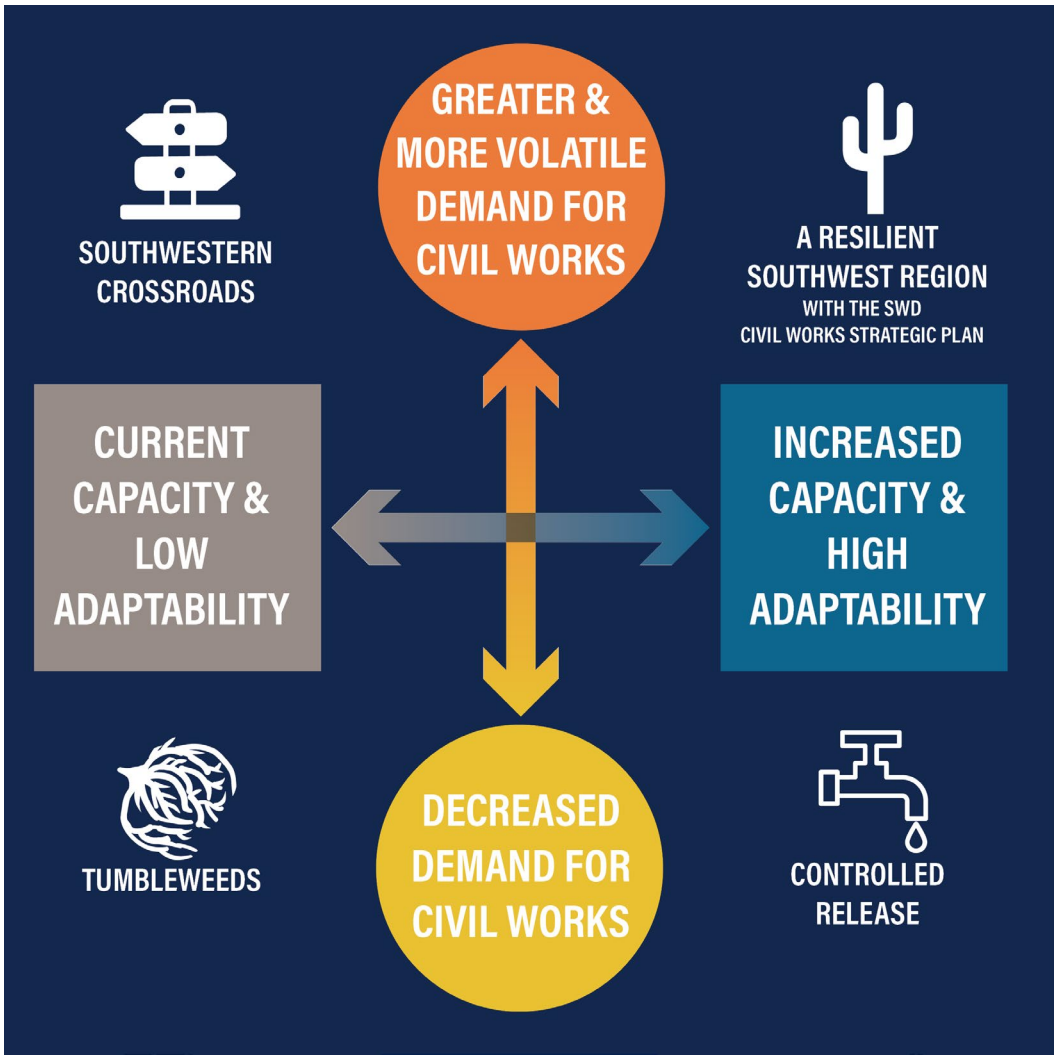

Figure 2. Schematic diagram illustrating four scenarios of SWD Civil Works (white text) under differing regional pressures (colored boxes). From Figure 16, USACE (2020).

The four scenarios show potential futures under differing regional pressures and SWD Civil Works preparation regimes: (1) "A Resilient Southwestern Region" scenario, in which greater and more volatile demand for Civil Works is met through increased capacity and the ability to readily adapt to changing needs; (2) a "Controlled Release" scenario, in which increased adaptability allows SWD to broadly support the region during times of reduce need while being prepared for sudden surges in demand; (3) a "Southwestern Crossroads" scenario, in which low adaptability and capacity make it challenging to address increased demand; and (4) a "Tumbleweeds" scenario, in which the Southwestern region has reduced demand for Civil Works and contraction of the SWD Program leaves it unprepared to address emerging threats. Successful implementation of the goals and objectives of the CWSP will position SWD with the capacity and adaptability to actualize the positive potential outcomes of these scenarios.

1.3 STRATEGIC RESPONSE PLAN

The CWSP was intentionally developed with a focus on implementation and the understanding that successful implementation requires a cycle of needs evaluation and action. This Strategic Response Plan (SRP), grounded in regional coordination, contains key components of advancing the CWSP into implementation. First, by revisiting the risk factors and updating them with additional context and current events, the SRP helps to define successful outcomes by assessing risks to successful operations. By identifying opportunities, gaps, and enablers, the SRP is identifying critical pathways. Finally, the SRP is an action plan, outlining specific steps for the Division and Districts to advance the CWSP through its Operations, Projects, and Partnerships (Figure 3).

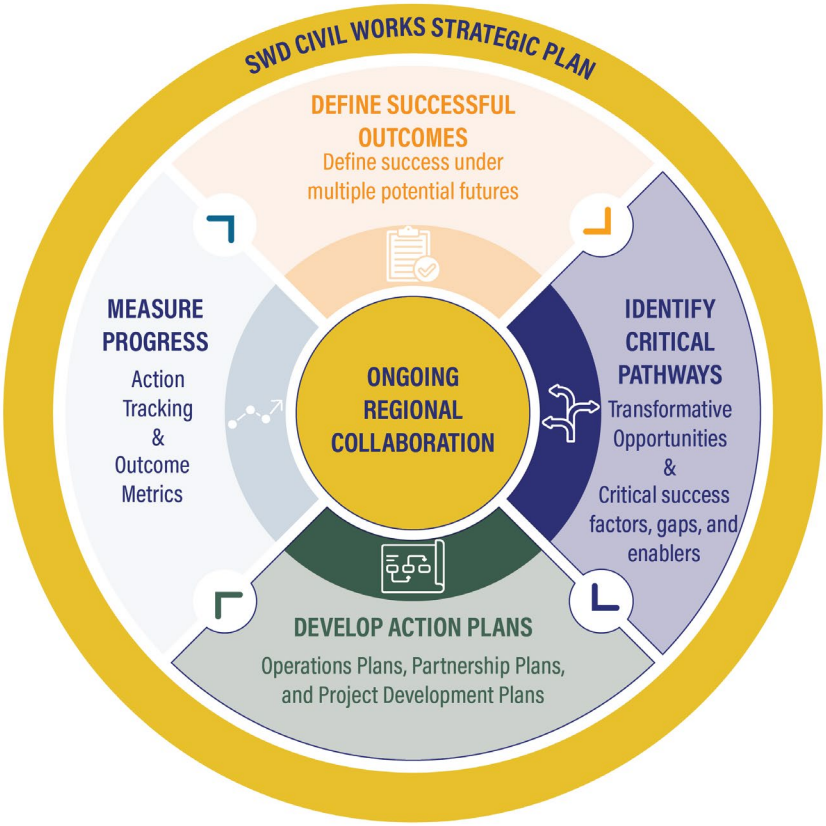

Figure 3. SWD CWSP non-linear approach to implementation planning. From Figure 27, USACE (2020).

The work to develop the SRP began with a Regional Stakeholder Workshop (hereafter workshop), held in June 2022 at the Division headquarters in Dallas, Texas. This workshop brought together USACE leaders and personnel from SWD, its Districts, Headquarters (HQ), U.S. Army Engineer Research and Development Center (ERDC), and The Institute for Water Resources (IWR); state agency partners; municipal and utility partners; academic researchers; Congressional representatives; and other partners. The goal of the workshop was to advance IWRM throughout the Division and Districts by discussing goals and opportunities, updating the collective understanding of risk factors, developing initial action items, and building collaboration among USACE and partners to support more cohesive regional planning and operations. The full synthesis of the workshop is available in the *USACE SWD Strategic Response Plan: Interim Workshop Synthesis* (DeJong et al., 2022).

2.0 EVOLVING RISKS AND OPPORTUNITIES

The SWD workshop provided an opportunity to reevaluate long-range known and potential obstacles that could impact water resource management, and to identify gaps that could be addressed through innovative IWRM solutions. The following sections summarize the major themes identified from the workshop related to evolving water resources management risks and opportunities, building on the foundation established by the SWD CWSP.

2.1 UPDATING RISK FACTORS

The CWSP outlined six key socio-economic and bio-physical drivers of risk relevant to SWD's AOR. These interconnected risk drivers evolve over time, requiring SWD to adaptively manage existing programs, and necessitate future strategic planning under an uncertain outlook. This update examines all six risk drivers for new trends or connections.

2.1.1 Rapid Population Growth & Urbanization

The CWSP highlighted rapid migration from rural areas to urban areas, as well as the growth of metro areas like Dallas, Houston, Oklahoma City, and northwest Arkansas (Texas Demographic Center, 2019; University of Virginia Weldon Cooper Center for Public Service, 2017; U.S. Census Bureau, 2020; USACE, 2020; Yan & Edwards, 2012); if these growth patterns drivers are not considered in SWD planning, there is a risk to meeting future water resources demands. Work by Vespa et al., (2020) show that these demographic growth forecasts are still relevant today . For example, cities such Temple, Texas, outside major metro areas exhibit some of the fastest population growth in the nation. Meanwhile, rural areas are seeing continued population declines (Dobis et al., 2021).

This dynamic has multiple implications for IWRM. Foremost is the increased need for water supply in the areas of growing population (Mishra et al., 2021), especially in areas where the region experiences drought conditions that impact reservoir storage and operations. Additional challenges associated with this risk factor are managing water quality despite the potential for increased urban runoff and managing wastewater in high population areas. Rural and agricultural areas have unique challenges, as well, despite population decreases. States such as Arkansas and Missouri noted at the workshop that small drinking water utilities in rural areas of the states have difficulty keeping their infrastructure in good repair as population patterns change across the region. Lastly, population gains and urban sprawl can increase the demand for flood risk management (FRM) projects and reduce the space available for natural and nature-based solutions (NBS) and other mitigation opportunities.

2.1.2 A Changing Regional Landscape

This risk factor is associated with two primary interrelated regional dynamics: changes in land use and land cover (LULC), and changes in flora and fauna habitat quantity and quality. The impacts of LULC on stormwater runoff, flood risk management, urban heat island effect and associated microclimates, watershed hydrology, and coastal erosion are well documented in the CWSP (USACE, 2020). The workshop highlighted several additional considerations for rural and agricultural areas, including how LULC conversions from grassland or prairie to monoculture crops may impact nutrient runoff, sedimentation of reservoirs and other water bodies, and ecosystem diversity and function (Higgins et al., 2002; Odhiambo et al., 2022; Sollenberger et al., 2019). Solutions that address the additional compounding factors of rural LULC are key to addressing the most urgent water supply issues in SWD.

Specifically, sedimentation in reservoirs was highlighted as a key issue in the workshop. As extreme weather and climate change cause large swings between drought and heavy precipitation, urban and rural erosion and runoff are likely to increase sediment load in reservoirs. Cascading effects on aquatic habitat, hydropower generation capacity, dam and reservoir operations and maintenance, and water supply will then occur throughout the associated watersheds.

2.1.3 Extreme Weather: Floods & Drought

Importantly, climate change is not only a future condition. The impacts of climate change and extreme weather are currently being felt throughout the Division. Floods, sea level rise, and drought were noted in the CWSP, and are challenges that have impacted the SWD AOR in the two years since publication (USACE, 2020).

An additional extreme weather event that occurred in the same period was a prolonged freeze that paralyzed a large swath of Texas and neighboring states in February 2021. The resulting power and water outages from this event led to hundreds of deaths, with one independent estimate placing the toll at over 700 (Aldhous et al., 2021). NOAA notes that this event is now the costliest winter storm on record, with over $25 billion in damages (NOAA, 2022). Planning for and mitigating extended power losses, even as droughts impact reservoirs and hydropower generation, will be critical for managing reliable power supply. Increasing frequency of extreme weather events will place further pressure on power generation and supply infrastructure.

Significant billion-dollar events such as hailstorms, tornadoes, and flooding have impacted SWD states since 2020, and there has been an ongoing drought impacting the AOR. While SWD states such as Arkansas and Missouri have experienced severe weather events, for instance tornadoes, in the past, these events are occurring more frequently and in historically atypical times of year, such as the December 2021 tornado outbreak. Climate change and related factors

may be contributing to changes in the frequency and severity of storm events (Agee et al., 2016; Brooks, 2013).

Although storms can result in short pulses of surface water hazard, drought often is presented as a chronic stressor. A lack of water at critical times during the year can be a disaster for supplying water for agriculture, power generation, and municipal supply operations. Drought response and resilience has been a central concern of the SWD's AOR over the last several years as large portions of the west and southwest U.S. have continued to experience the worst drought in their history (Williams et al., 2022). Critical reservoirs, including Lake Mead and Lake Powell, are at record lows, threatening both water supply and hydroelectric power availability for millions of people (Budryk, 2022). A July 2022 memorandum from the Assistant Secretary of the Army for Civil Works highlights the need for USACE to "assess how it can more effectively use its authorities, address the growing demand for [IWRM], and apply its significant capabilities to advance a whole-of-government effort to build drought resilience across the nation" (Connor, 2022b). The memorandum contains ten areas in which USACE can specifically advance drought resilience; many of which are applicable to the drought conditions within the Division and Districts.

2.1.4 Uncertain Future of Energy

As noted in the CWSP, uncertainties in the global and regional energy market have specific implications for the Galveston District and the Navigation Mission Area (NAV; USACE, 2020). A potential global shift to renewable energy or a prolonged economic downturn were noted in the CWSP as potential drivers for reduced demands on the Civil Works Program. However, the COVID-19 pandemic and the Russian war in Ukraine disrupted the global market for energy, and in particular the market for natural gas (Thompson, 2022). Demand for natural gas in Europe, compounded by slowing exports from Russia, has sent the prices of gas and electricity in other countries (e.g., Germany) to record highs (Dezem, 2022). This surging demand for energy products has driven exports from the Houston-Galveston customs district, from the Ship Channel to Corpus Christi, to record highs (Thompson, 2022).

While the global energy market continues to evolve, Congress and the Biden Administration have focused on catalyzing a shift to renewable energy to meet demand (Iaconangelo, 2022). Texas is a focus area for offshore wind power development, with projects off the coast of Galveston and near Port Arthur expected to power 2.3 million homes and 799,000 homes, respectively (Ferman, 2022). These projects are situated to utilize existing energy sector infrastructure in Texas and Louisiana and will modulate demand for the Houston Ship Channel and other NAV infrastructure.

Finally, drought will also impact the future of energy in the SWD, as the Division is the second-largest operator of hydroelectric power plants in USACE. The extended drought is having significantly negative consequences on water levels in large western reservoirs such as Lake Powell and Lake Mead; hydroelectric power production could halt at these dams as soon as July 2023, impacting tens of millions of people (Yeung, 2022). Replacing this power capacity would require new energy resources that could increase demand for regional oil and natural gas exports and/or renewable energy generation. Monitoring these interrelated risks will be key to understanding demand for Civil Works in SWD.

2.1.5 Increasing Demand on Water Resources

Drought and drought response has implications for almost all other risk factors for the southwest, illustrating the interconnected nature of the water resource management challenges facing SWD and its partners. The CWSP focused on the water-food-energy nexus, highlighting agricultural and hydropower uses that are dependent on water availability (USACE, 2020). The CWSP also notes that reservoirs and downstream rivers are integral to outdoor recreational opportunities in the region and provide economic benefit through the associated tourism industry.

The role of ground water and aquifers in meeting water supply demands was highlighted as an important additional component of this risk factor during the workshop. The agricultural demands in the SWD AOR, such as rice cultivation in Arkansas, have historically necessitated use of groundwater resources to augment available surface water resources. Seasonal agricultural needs for water are also present in Kansas, Missouri, and other areas with shorter growing seasons. Drawing significant amounts of water from aquifers can deplete them, and ongoing drought may prevent sufficient aquifer recharge from occurring. State regulatory agencies are also limited in their ability to regulate and monitor groundwater use, hindering accurate data collection and preventing development of precise water budgets. Managing the distribution of water supply from reservoirs and other surface sources is critical to preserving groundwater resources.

Lastly, maintaining adequate surface flow in riverine systems was also identified by workshop participants as important for aquatic species survival and ecological health. Non-consumptive uses can impact riverine ecosystems in other ways, as well, such as hydroelectric dam outflows altering downstream water temperatures. Management of water resources within the SWD AOR must also consider these factors as part of holistic, integrated, and sustainable solutions.

2.1.6 Aging Infrastructure

Risks associated with the age and condition of the Nation's infrastructure is documented in the CWSP (USACE, 2020). These risks are corroborated in the "2021 Report Card for America's

Infrastructure", a report by the American Society of Civil Engineers that evaluates the performance and condition of America's infrastructure (ASCE, 2021). The 2021 evaluation shows a C- grade overall, while subcategories like levees received a grade of D. Recent legislation from Congress, such as the Bipartisan Infrastructure Law (BIL) and the 2022 Water Resources Development Act (WRDA), are investing billions of dollars in Civil Works. This opportunity to address aging infrastructure brings its own challenges, however, including ensuring equitable, efficient, and effective expenditure of funding to address current and future needs.

The risk of inequitable impacts to communities was also documented in the CWSP, noting that historically marginalized populations face additional vulnerabilities from aging infrastructure and other risk factors (USACE, 2020). The Biden Administration's whole-of-government initiative, Justice40, sets explicit goals that 40% of the overall benefit of federal investments flow to marginalized, underserved, and pollution-burdened communities (*Executive Order No. 14008*, 2021). Climate change, clean energy, remediation of pollution, and the development of clean water infrastructure are priorities for Justice40 that intersect concerns and priorities across the SWD. USACE has committed to Justice40 using investment as its benefit metric; 40% of USACE investments in climate, clean water and waste infrastructure must benefit disadvantaged communities (Connor, 2022a).

2.2 UPDATING OPPORTUNITIES

Managing evolving risks also presents opportunities for the SWD Civil Works program to move towards a more integrated and adaptive paradigm of water resources management. At the workshop, USACE SWD, its Districts, and its partners demonstrated their commitment to effective, efficient, and proactive IWRM through teamwork and interdisciplinary solutions.

SWD states (Texas, Arkansas, Missouri, Oklahoma, and Kansas) shared current water resources management challenges, successes, and ongoing strategies during the workshop. It is evident that no "one size fits all" solution to water resources management is practical across such a diverse region, nor within a single state or District bounds. For example, intrastate variability in water supply (i.e., surface water and ground water) creates challenges for Arkansas water management, necessitating a critical need to strategically plan water usage around locations with more abundant surface water resources. Across the SWD AOR, key themes with associated opportunities emerged from workshop discussions:

- **Funding and Infrastructure.** Participants discussed opportunities via legislation to fund water resources management and to expand water-related infrastructure (e.g., the American Rescue Plan Act).

- **Data.** Participants discussed opportunities to 1) grow central data repositories (e.g., Texas Water Development Board website, Missouri Hydrology Information Center), 2) increase research and development of aquifers (e.g., impacts of land management practices on ground water resources in Arkansas), and 3) expand data-driven scenario planning (e.g., ongoing efforts in Missouri and across the region).
- **Educating decision-makers**. Participants discussed opportunities for training and education with decision-makers on water systems (e.g., the Arkansas Conservation Partnership Groundwater Summit).

A significant and important theme to emerge from the workshop was **collaboration and partnerships.** Bridging boundaries across states and USACE Districts was identified as a critically important aspect of holistic IWRM. Cooperation across authority boundaries is a key opportunity to transition from competition to collaboration at local, state, and federal levels. This is highlighted as an important opportunity for USACE to help build trust across federal agencies, local leadership, and the public. Partnership and collaboration can result in multiple opportunities to advance IWRM, including accelerating research and development (reducing redundancies and building on existing efforts), and identifying co-benefits of project implementation for all stakeholders (e.g., communities, industry, and natural resources). Lastly, more opportunities for cross-agency communication of existing plans, priorities, challenges, and successes at additional workshops were identified as important mechanisms for overcoming barriers to IWRM.

3.0 NEAR TERM FOCUS AREAS

The near- and long-term focus areas for capitalizing on the opportunities outlined Section 2.2 is described in Sections 3.0 and 4.0, and additional detail can be found in the *Interim Workshop Synthesis* (DeJong et al., 2022).

3.1 LEAD COORDINATION OF STATE AND FEDERAL AUTHORITIES

The USACE role across water resource management encompasses planning, regulation, development, operations, and maintenance. The expertise and resources SWD possess and manage are critical for coordinating IWRM across state and federal authorities given that variability of authorities, priorities, and governance limits the capacity individual states have to lead coordination. SWD taking this role in IWRM coordination advances **CWSP Objective 3.3,** USACE should take a leadership role in coordinating federal decision makers and stakeholders, and **Objective 3.6,** identify action strategies for studies that result in recommended approaches outside of USACE authority (USACE, 2020).

Action 1: Streamline SWD communication with and across regional authorities. Coordination across entities requires clear communication and a shared understanding of opportunities and needs. The workshop advanced coordination and identified gaps that limit effective IWRM. To continue this work, SWD can focus on identifying and clearly communicating centralized USACE points of contact (POC) and facilitating the identification and communication of POCs for other entities. For example, SWD could designate a central POC within the Division to continue mapping gaps in regulatory authorities; connecting state partners across watersheds; and communicating with non-federal sponsors and other partners. This POC could work with state and regional entities to address specific issues of authority (e.g., groundwater permitting) by requesting and coordinating legal research, offering best practices from other states, or other complementary efforts.

Action 2: Facilitate identification and leveraging of funding streams. IWRM solutions identified through feasibility studies and other mechanisms are outside the scope of USACE resource authorities at times. However, SWD has extensive knowledge of other federal funding sources and can work with state and regional partners to understand, access, and maximize these resources. In addition, SWD can help coordinate state and local entities to apply for support as part of regional and watershed-based solutions. For example, SWD could work with states and communities raise awareness of alternate funding opportunities, including for projects identified through feasibility studies; assist them with technical components of the applications; and be an ongoing resource through implementation. The Planning Assistance to

States (PAS) program could be used to expand this kind of support. This support may also lead to new authority, layered funding for projects, or transferring analyses to a new team outside USACE.

3.2 PROVIDE A CENTRALIZED RESOURCE FOR DATA COLLECTION, STORAGE, SHARING, AND ANALYSIS

A frequent topic for discussion at the workshop was the need for improved data collection and sharing. In addition, research is required to understand evolving needs in the region, as well as to develop technological solutions where necessary. Partners from across SWD identified locations where either new data or access to data held by another entity would be beneficial for an ongoing water resources issue. USACE can lead in addressing this issue: just as the USACE HEC software suite, developed by the Hydrologic Engineering Center, is used by hydrologic engineers across the country, standards for state and regional level data collection, storage, and sharing could be set at the federal level for maximum accessibility and consistency. Similarly, state and federal entities—including USACE—expressed synergistic needs in analyzing data to understand how climate change and trends in other risk factors will impact the region. These activities advance CWSP **Objective 2.2,** develop tools and processes to regularly project future demands for civil works, **Objective 2.3,** update technology to meet industry standards and **Objective 2.5,** incorporate future trends in population, land use, weather, and the economy into planning and project design.

Action 3: Establish consistent data standards and facilitate data sharing. SWD can work with states and other federal agencies to establish and disseminate data standards and protocols; increase awareness of and access to existing data repositories; and support the advancement of data sharing and access. Activities could include promulgating standards or database systems that are already in use, such as the Texas Disaster Information System (TDIS). The data standards underlying these critical datasets could be strengthened through USACE leading coordination with agencies like the U.S. Geological Survey (USGS) as well as the academic community. Similarly, USACE could continue to host workshops and/or provide information on available datasets online to increase regional awareness and access. One potential outcome of those workshops could be building a holistic, multi-agency understanding of the potential uses for these datasets, which would also help to determine the relevant spatial and temporal scales in support of IWRM.

Action 4: Coordinate and disseminate analysis of risks and trends. Workshop attendees expressed considerable need to improve understanding across topics such as aquifer recharge rates and drivers; effectiveness of conservation measures; factors influencing regional water quality; and local implications and impacts of future climate projections. In many cases, research

to address these gaps could be leveraged across the SWD AOR by multiple partners. SWD could continue to facilitate coordinate of state partners to identify the most immediate use cases and research needs, such as through establishing topic area focus groups. In addition, SWD could also facilitate the transfer of relevant academic research to state partners. Lastly, SWD could serve as a regional connection to ERDC. Several relevant areas of research are identified within the *USACE Research and Development Strategy*; the District can provide input to ERDC on specific research focus areas as well as sharing the outcomes of ERDC research with regional partners.

Action 5: Support development of novel solutions to IWRM challenges. SWD's regional role allows the District to assess regional needs for technological solutions and decision support tools to address current and future needs for USACE and its partners. When coupled with Actions 3 and 4, the region can move forward with improved solutions as well as improved understanding of the emerging needs. SWD can, for example, hold regional workshops with state and Federal entities, private companies, the academic community, and non-governmental organizations (NGOs) to identify and share new solutions. This approach has been used by Galveston District and could be expanded to include other regions and focus areas.

3.3 EXPAND PUBLIC AND STAKEHOLDER COMMUNICATION

With drought causing considerable disruption across SWD, communicating the value, benefits, and opportunities of IWRM is more important than ever. Almost all participants at the regional workshop discussed how engagement with state legislators and leaders, Federal delegations, and the public is needed to communicate water resources priorities more accurately and urgently. While these strategies will vary across states, USACE should provide regional support as outlined in CWSP **Objective 3.1,** raise awareness of the USACE Mission at the local, state, and national level through targeted outreach. Not every local or state partner is familiar with IWRM approaches or opportunities that can be leveraged through working with USACE. In particular, targeted mechanisms are needed to advance **Objective 3.2,** develop a strategy for working with and benefitting underserved communities. Building relationships, communicating successes and obstacles, and expanding technical knowledge of IWRM will help USACE achieve its Mission and improve outcomes for the AOR.

Action 6: Support state-level communication of water resources needs. Gaps in water resources authority between states can lead to differing planning approaches, data collection, monitoring, conservation practices, and more. While local communities often have clear ideas and goals for their own water resources, sometimes legislative or regulatory obstacles prevent local communities from coordinating more closely across state borders. SWD could support IWRM in these cases by encouraging and participating in efforts to engage with state legislative

delegations, local community leaders, state agency personnel, or other key stakeholders. Where interstate dialogue and sharing of best practices may benefit, SWD's regional presence could support such exchange efforts. For example, communicating the benefits of IWRM by sharing past SWD successful projects may be persuasive to stakeholders less familiar with the full USACE Mission and business lines.

Action 7: Develop outreach approaches for rural communities. Rural communities face unique challenges, often compounded by depopulation and changing economic conditions. Rural residents need consistent communication and engagement, both to understand their water resources challenges as well as to be a trusted partner for creative solutions. Communication lines that may be effective for urban regions with more centralized coordination across Federal, state, and local entities can be ineffective in reaching rural communities. Improving and maintaining communication with rural communities can offer additional benefits throughout the Division. For example, raising awareness of the potential benefits of coupling infrastructure improvements and/or maintenance with broader conservation strategies for rural communities may increase support and enable similar results at a lower cost.

Action 8: Improve engagement with underserved communities. Multiple Federal efforts are currently focused on expanding outreach to underserved communities, already an objective established for SWD under the CWSP. Reaching the goals set by the Biden Administration's Justice40 program is a priority for USACE's Civil Works Mission; the Assistant Secretary for Civil Works has committed that 40% of USACE investments in climate and critical clean water and waste infrastructure must benefit disadvantaged communities, while striving to extend this goal to PAS, Floodplain Management Services (FPMS), and the Tribal Partnership Program (Connor, 2022a). While the complete guidance is under development, SWD could begin by proactively identifying communities in the Division and Districts that would benefit from these investments. Ongoing planning studies and projects in the development pipeline could be evaluated against that assessment to rapidly catalyze action when funding and support becomes available. This proactive approach also could offer benefits for project design and scoping, enabling communities to be engaged and supporting resources identified early in the process.

Action 9: Increase public outreach and communication. A shared understanding of evolving risks to the region and the potential opportunities to mitigate those risks can engender public support for mitigation action at the local, state, and Federal level. In many cases, the outcomes of USACE studies and projects are communicated via technical reports that are confusing or inaccessible to the public, potentially leading to a perception of a lack of transparency or justification for actions taken. By continuing to expand the dissemination of information through more publicly accessible platforms (e.g., plain language summaries, social media, video stories), the public will gain increased understanding of the projects, programs, and successes of SWD

and the Districts. In addition, the technical reports that encapsulate study outcomes could be made more accessible through format standardization and improved discoverability on USACE and SWD websites.

3.4 FACILITATE COLLABORATIVE PARTNERSHIPS

Collaborative partnerships make IWRM possible, and the importance in advancing and adapting these partnerships to address the evolving risks for the region is highlighted by CWSP **Goal 3:** Re-envision role as a collaborative partner. This is inclusive of projects, which involve non-federal sponsors, but should also extend to planning, communications, operations, maintenance, technical assistance, and other advisory services. SWD will need to expand its collaborative partnerships to meet the mandates and goals of legislation such as the Infrastructure Investment and Jobs Act, which contains over $17.1 billion for Civil Works across the Nation. For example, advancing CWSP **Objective 2.1,** engage with academia to build the workforce needed for the future, will be required to support implementation of the projects funded through this legislation.

Action 10: Regularly conduct risk and opportunity assessment workshops. The workshop conducted in developing this SRP was highly effective in bringing together regional partners to gain further understanding of the challenges facing the area and the potential actions for overcoming them. SWD can continue to hold these workshops on a regular basis to update the CWSP and SRP, while also holding workshops that target specific themes such as individual risk drivers; Mission Areas and project types; watershed planning; and other focus areas.

Action 11: Expand partnerships with the academic community to support workforce needs. The public and private sectors will need trained personnel to implement and maintain infrastructure projects. SWD can help create interest and support expansion of the workforce by working with state and local universities and communities to highlight the opportunities and research challenges that USACE employees and workers in related industries address. Similarly, SWD can consider internships and other mechanisms that engage current students and create pathways to future employment with USACE and other partners.

4.0 LONG-TERM OPPORTUNITIES

In addition to the near-term focus areas described above, SWD should use this opportunity to plan for the future. The following three long-term opportunities connect projects, partnerships, and processes to achieve the Civil Works Mission for decades to come.

4.1 PROACTIVELY PLAN AND IMPLEMENT O&M

Aging infrastructure and expanding Civil Works needs are the focus of renewed investment at the Federal level. These resources can help prepare the AOR for evolving risks if infrastructure rehabilitation and renovation is done with deliberate consideration of those risks and the associated challenges. Reactive maintenance and emergency response can result in inefficient use of water supply, conflicts across USACE Mission Areas such as flood control and navigation, and missed opportunities for holistic water management. SWD can improve efficiency and reduce overall costs by proactively developing O&M plans at the regional level. This approach also enables potential leveraging of additional resources to fund and implement these projects, such as coordination with state Departments of Transportation. This focus area supports CWSP **Objective 1.1,** coordinate to identify and develop solutions at regional watershed and landscape scales, and **Objective 4.3,** develop a Division-wide operations and prioritization plan for Civil Works funding.

Action 12: Develop a regional plan for SWD O&M. USACE O&M and infrastructure enhancement have historically been focused within jurisdictional boundaries and Mission Areas, which can result in lost opportunities for IWRM and, in some cases, negative effects (e.g., unintended impacts of water conservation and reservoir operations on downstream communities). Rehabilitation programs and operations plans for dams, hydropower, service lines, reservoirs, levees, navigation, and other infrastructure could be developed with a regional focus, with SWD expertise ensuring that solutions provide the broadest benefit while limiting new conflicts. Regional rehabilitation programs have a greater chance of bringing in new funding and can potentially accelerate implementation.

4.2 STREAMLINE DEVELOPMENT OF NEW INFRASTRUCTURE AND PROJECT IMPLEMENTATION

As climate change and other evolving risk factors drive drastic shifts in water availability and demand throughout the Nation, new infrastructure will inevitably be needed in some locations. In addition, cycles of floods, droughts, and other stressors will continue to expand the need for USACE-supported local and regional projects across Mission Areas. Project implementation times in the past have been slower than partner needs and expectations, in some cases inhibiting SWD engagement and leveraging of expertise as partners chose solutions

independently of USACE. It is imperative that SWD continue to accelerate project development and delivery to meet the evolving needs of the Nation. This focus area supports CWSP **Objective 1.2,** coordinate business lines and project timelines around key nexus opportunities and tradeoffs, **Objective 1.3,** optimize workflows and processes to be more agile, flexible, faster, and less risk averse while maintaining safety and reliability, **Objective 1.5,** encourage and prioritize multi-use and multi-benefit projects, **Objective 1.6,** reevaluate cost and benefit considerations in decision making to be more inclusive, **Objective 3.5,** ensure consistent communication from leadership through project teams, and **Objective 4.4,** design new projects with a plan for long-term operations and maintenance.

Action 13: Increase transparency throughout project development and implementation. Mechanisms are needed to effectively engage partners and entities across all Mission Areas. Early engagement can reduce implementation times by identifying and addressing stakeholder concerns before they impede the development process. In addition, awareness of project timelines allows partners to coordinate their own plans and actions to be synergistic with USACE projects. Lastly, as noted in the CWSP**,** consistency leads to credibility and trust. Transparent communication to partners, stakeholders, and the public on project goals, scoping, needs, implementation progress, and timelines will build trust over time and bring more partners to USACE.

Action 14: Reduce project development and implementation timelines. The Biden Administration's focus on infrastructure is an opportunity for regulatory change that could benefit USACE. SWD could work with HQ and other Divisions to analyze and address the causes of project development delays, as well as to build new workflows that minimize implementation times while preserving effective project outcomes. For example, the needs of USACE, as the Nation's Public Engineer, should be considered in the framing and implementation of new legislation, such as potential reforms to the environmental review process.

Action 15: Design and implement workflows for multi-benefit projects and long-term sustainability. Because of their expected lifespan, new projects provide some of the greatest opportunities for IWRM implementation, with lasting impacts for decades to come. This action can include developing and implementing infrastructure development workflows that span Mission Areas, allowing holistic solutions to be identified for water management. SWD can also consider how projects are evaluated and what impediments to IWRM have historically arisen in the Division, then use this evaluation to provide input to Headquarters on the development of Principles and Guidelines that more broadly and accurately capture project benefits across Mission Areas. Similarly, cost estimation workflows could be reevaluated for estimating long-term costs of O&M based on SWD experience, helping ensure that new infrastructure can be maintained into the future. These activities support the CWSP and are consistent with the

January 2021 policy directive on comprehensive documentation of benefits in water resources development project planning (James, 2021). By updating, standardizing, and training on new benefits methodologies and other improvements to project design, SWD can lead USACE in implementation of this directive.

4.3 CATALYZE REGIONAL/HOLISTIC PLANNING AND PROJECT DEVELOPMENT

The magnitude, trajectory, and interconnected nature of risk factors driving demand for the SWD Civil Works Program will require innovative solutions to IWRM. These solutions can only be conceptualized and actualized through holistic, regional approaches to project portfolio development. In addition, there is increasing understanding that all communities and partners must be engaged for effective execution of the USACE Civil Works Mission. Forethought and deliberate action must be taken to consistently engage underserved communities and achieve equity goals such as those laid out in the Justice40 initiative. This focus area supports CWSP **Objective 1.1,** coordinate to identify and develop solutions at regional watershed and landscape scales, **Objective 1.7,** consider structural and non-structural approaches in safe and reliable flood risk management, **Objective 3.7,** support the leadership of state and local agencies in regional water resources strategic planning initiatives, **Objective 4.5,** consider the benefits of NNBF and other approaches in improving and extending project performance over time, and **Objective 4.6,** evaluate the most efficient and cost-effective ways to meet current needs.

Action 16: Lead advancement of scenario-based IWRM planning. Multiple workshop attendees identified the need for greater understanding of climate change impacts and other evolving risk factors, as well as the identification of innovative solutions for mitigating those risks. SWD also faces this challenge, and as part of the CWSP developed a scenario-based approach to identifying risks, potential outcomes, and opportunities as part of an informed and adaptive method of planning. SWD can support regional partners in implementing a similar approach, such as by holding Scenario Workshops that identify specific risk factors and associated opportunities; consider partner-based solutions and potential outcomes; develop multi-partner and regional approaches that lead to preferred outcomes; and determine roles and responsibilities for participating entities in executing those approaches.

Action 17: Identify and participate in regional planning initiatives. In addition to SWD-led regional planning exercises, the Division and Districts can participate in planning processes developed by public and private regional partners. The first step in this process is ensuring awareness of these efforts through partner engagement. USACE personnel can then work with regional planning organizations and participate in regional land use and transportation planning

processes to better understand regional growth and change. This engagement can also ensure that regional planning processes are informed by critical issues like water availability, environmental restoration, and flood protection. This action supports the CWSP, which recognized that SWD can provide a supporting role to the AOR beyond its regulatory authorities by providing expertise and input on water resource management.

Action 18: Expand consideration of regional outcomes in project planning. Individual USACE projects often have broad regional impacts, but full understanding and evaluation of those impacts may be limited by policies, procedures, and workflows. SWD could identify processes and workflows for project development that more holistically evaluate upstream and downstream impacts. In addition to implementing these workflows at the District and Division level where possible, SWD can work with USACE Headquarters to adapt policies and procedures Nationwide. Because projects that incorporate Natural and Nature-Based Features (NNBF) often provide regional and varied benefits that may not be fully considered under current evaluation procedures, this activity also supports the broader emphasis on NNBF found in the CWSP and other USACE guidance.

5.0 CONCLUSION

The SRP development process included reexamining risk factors for SWD and its regional partners (Figure 4). This evaluation strongly suggests that the risks and needs brought on by climate change and other risk factors are growing for the region. The increased variability and intensity of extreme weather is likely to increase the demand for USACE Civil Works in the foreseeable future, mandating that SWD play a strong role in helping the region prepare for drought, population growth, flooding, habitat change, agricultural shifts, and energy demand shifts—all at once.

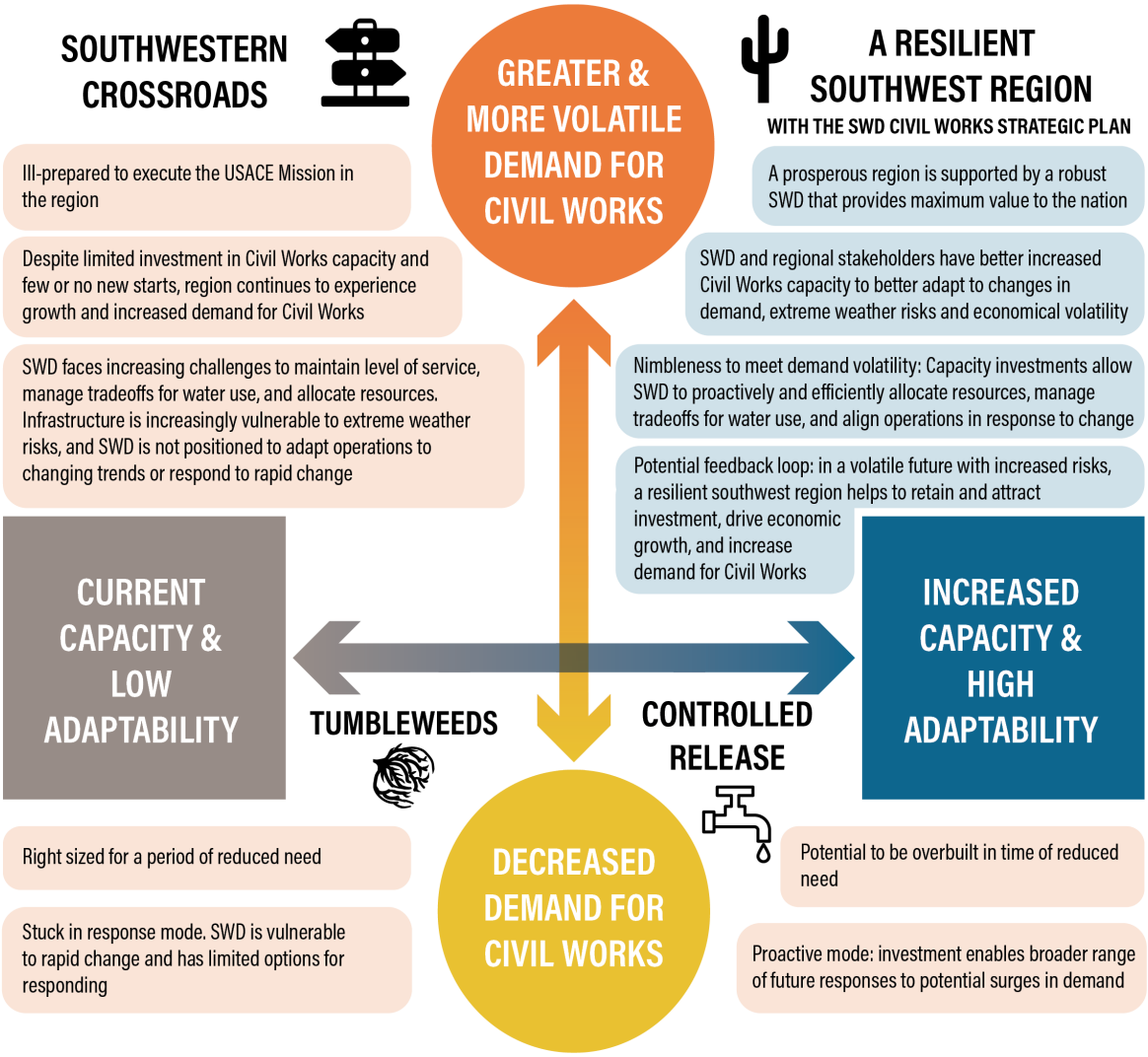

Figure 4. Examining risk factors for SWD and its regional partners. From USACE (2020).

To meet these needs, SWD must maintain focus on the goal of a Resilient Southwestern Region. Investments in capacity and adaptability are needed, as are holistic, regional, and innovative solutions that allows SWD to align operations in response to rapid change.

This SRP takes direction from recent USACE and Administration guidance, feedback from regional stakeholders and partners, updates to risk factors facing the region, and progress made in implementing the CWSP. It sets short-term and long-term focus areas where SWD can lead, support, and catalyze action to meet the Civil Works Mission. While more data, more analytics, and more partners are needed to achieve this goal, SWD can work to advance changes in processes, training, and communications. Growth does not yet appear to be slowing, and SWD will meet the Mission by ensuring a prosperous region for all.

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