EXECUTIVE SUMMARY

RESPEC Company, LLC (RESPEC) conducted the Six-Mile Creek Feasibility Study to understand flooding issues along Six-Mile Creek as well as develop mitigation alternatives and assess their feasibility to reduce flood risks in the City of Brookings. Funding for the study was provided by the State of South Dakota Hazard Mitigation Grant Program (HMGP), and the City of Brookings. The study focus area is the northwest corner of Brookings, within the Six-Mile Creek watershed, as shown in Figure ES-1. The purpose of this study was to understand the factors contributing to flooding, evaluate potential mitigation measures, and engage with the community to obtain input on flood concerns and potential projects.

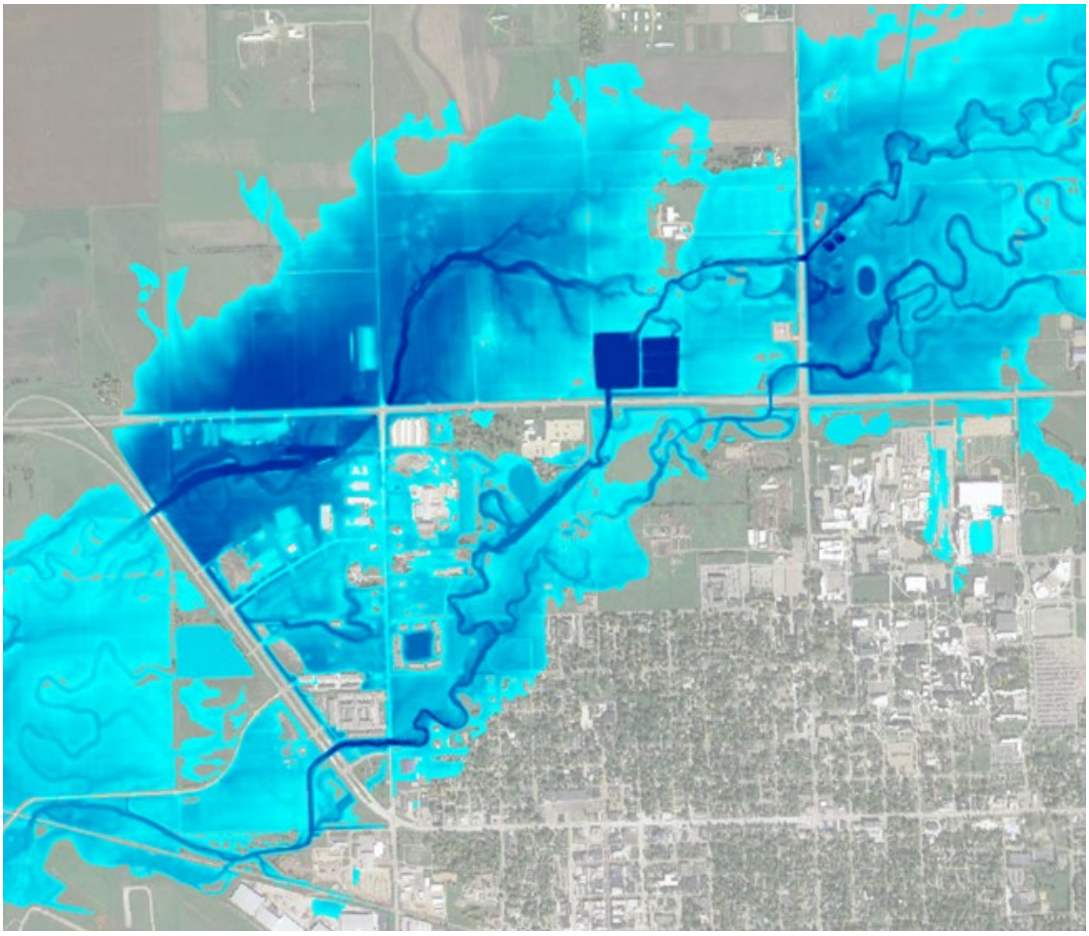

Figure ES- 1. Six-Mile Creek Study Area and 100-Year Flood Inundation Extents.

The Six-Mile Creek watershed covers approximately 78 square miles and includes urban and rural areas. Historical flood data indicate that Six-Mile Creek has experienced numerous flooding events, with the most recent significant floods occurring in 2010 and 2019. These floods resulted in damage to homes, businesses, and infrastructure, highlighting the need for comprehensive flood mitigation measures. The 2024 feasibility study used an updated version of the Federal Emergency Management Agency (FEMA)-provided proposed effective hydraulic model modified to create a feasibility study model. The FEMA Zone AE enhanced model received Hydrologic Engineering Center River Analysis

System (HEC-RAS) re-versioning, study area, and hydraulic updates to create a model for use in the feasibility study.[1] The study model was updated to include additional and explicit hydraulic structures and the model extents were truncated and boundary conditions developed to permit efficient study simulations. Base conditions, rain-on-grid (precipitation applied to the model grid cells) simulations were performed to determine the flow rates for input in unsteady-flow simulations for the various recurrence-interval events (e.g., 10, 25, 50, 100, and 500 years) from the proposed effective hydraulic model and recorded at boundary condition locations FEMA established for the community's floodway model. The study model was used to simulate the various recurrence-interval events and generate pre- and post-alternative implementation inundation extents and flood depths for evaluating alternative effectiveness using FEMA Region 8 depth-damage frequency curves and the FEMA Benefit-Cost Analysis (BCA) Version 6.0 Toolkit.

Community engagement was a key component of the study, with public meetings conducted to gather input from residents and stakeholders. The feedback received was used in developing flood mitigation alternatives with community input. Several flood mitigation concepts were developed and evaluated based on their effectiveness, cost, and feasibility. These concepts were refined down to five final mitigation alternatives: north channel/south channel connectivity, a channel bypass, upstream detention, increased length of the north bridge on the Highway 14 Diagonal, and a system of levees. A BCA was completed to evaluate each alternative's effectiveness on a benefit-cost ratio basis. These ratios were determined for each alternative at each recurrence-interval event, and composite ratios were established to evaluate the overall effectiveness across the range of recurrence-interval events for each alternative. FEMA required BCA tools and procedures were used in completing the study to maintain eligibility in future FEMA grant planning.

The Six-Mile Creek Feasibility Study has provided valuable insights into the flooding issues along Six-Mile Creek and identified potential FEMA-fundable flood mitigation alternatives to reduce flood risk. Implementing the recommendations outlined in this report has the potential to help protect lives, properties, and infrastructure within the City of Brookings.

[1] FEMA Zone AE enhanced Base Level Engineering Model received from Compass Production & Technical Services (PTS) Joint Venture (JV) March 8, 2022.