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Levees and Dams at Fort Riley, Kansas, and the Response to the 1951 Flood

Sunny E. Adams, Aaron R. Schmidt, and Adam D. Smith

December 2023

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Sunny E. Adams, Aaron R. Schmidt, and Adam D. Smith

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Final Report

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Abstract

This project provides a historic context and inventory for the levees and dams constructed at Fort Riley, Kansas. The purpose of this historic context and inventory is to determine the levees and dams' eligibility for listing in the National Register of Historic Places (NRHP). Determinations of eligibility to the NRHP are then made based on the significance of the levees and dams and the degree to which they retain their integrity for conveying that significance. The authors inventoried and evaluated three levees and two lake dams on the installation. Based on the historic context and inventory, researchers for this project have determined that none of the levees and dams are eligible for the inclusion in the NRHP nor was there enough evidence for a noncontiguous historic district at Fort Riley.

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Preface

This study was conducted for the Environmental Division, Directorate of Public Works (DPW), at Fort Riley, Kansas, under Project Number 370286, "A1050-FY20 Levees and Dams," MIPR 11443257. The technical monitor was Ms. Theresa de la Garza (cultural resources manager, DPW).

The work was performed by the Training Lands and Heritage Branch of the Operational Science and Engineering Division of the Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL). At the time of publication, Ms. Angela Rhodes was chief, Training Lands and Heritage Branch; Dr. George Calfas was chief, Operational Science and Engineering Division; and Mr. Jim Allen was the technical director for Environmental Quality and Installations. The deputy director of ERDC-CERL was Ms. Michelle Hanson, and the director was Dr. Andrew Nelson.

COL Christian Patterson was commander of ERDC, and Dr. David W. Pittman was the director.

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1 Introduction

1.1 Background

The National Historic Preservation Act of 1966 (NHPA), as amended, defines responsibilities that federal agencies have to historic properties under their oversight. Section 106 of the NHPA stipulates that federal agencies must take effects on historic properties into consideration when planning and completing undertakings that it regulates, funds, or that occur on its lands. It defines "historic properties" as those listed or considered eligible for listing on the National Register of Historic Places (NRHP). Additionally, Section 110 of the NHPA requires cultural resource managers (CRMs) to develop preservation programs to identify, evaluate, protect, and nominate historic properties to the NRHP.[1]

Fort Riley is located near the confluence of the Republican, Smokey Hill, and Kansas Rivers in east-central Kansas (Figure 1). Fort Riley lies entirely within Geary and Riley Counties.

> Fort Riley is located in the northeastern part of Kansas (about 135 miles west of Kansas City and 130 miles north-northeast of Wichita).[2] It was established in 1852 . . . just east and a little north of Junction City. Fort Riley today consists of six areas: the Main Post, Camp Funston, Marshall Army Airfield, Camp Whitside, Camp Forsyth, and Custer Hill [Figure 2]. The historic areas of the fort are located along the lowlands and floodplain of the two rivers, while modern housing and training areas are found on land north of the original post. Training lands extend primarily to the north and northwest of the collective cantonment area.3

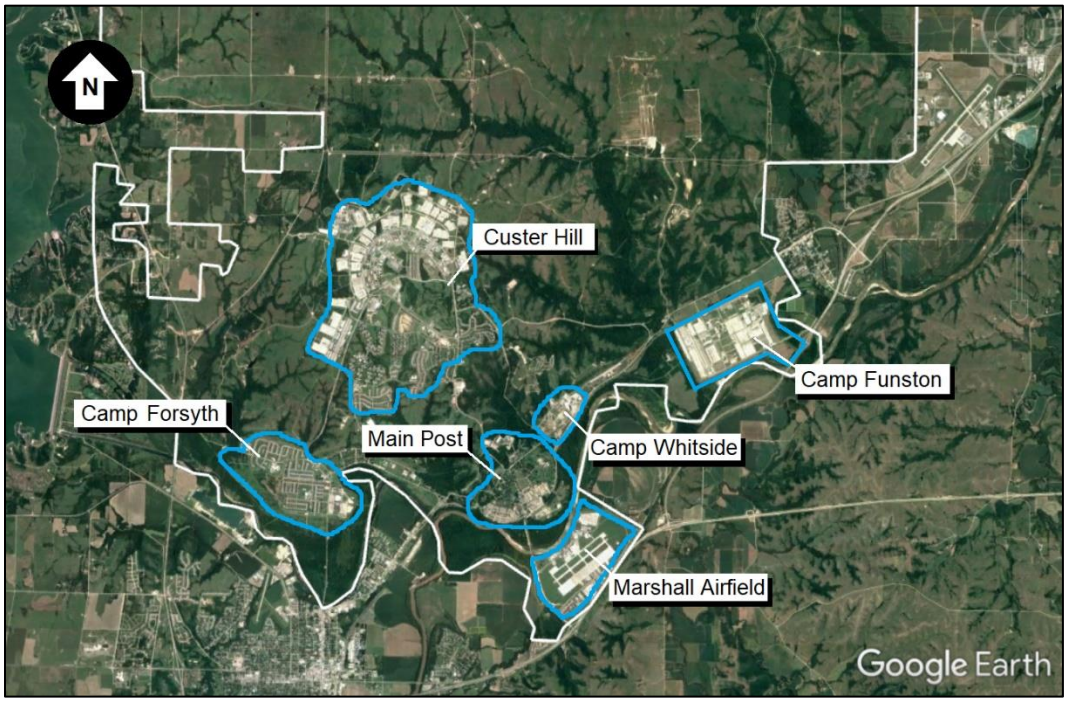
1. National Historic Preservation Act, Pub. L. No. 89-665, as amended by Pub. L. No. 96-515, Sections 110, 106 (1966).

2. For a full list of the spelled-out forms of the units of measure used in this document and their conversions, please refer to *US Government Publishing Office Style Manual*, 31st ed. (Washington, DC: US Government Publishing Office, 2016), 248–52 and 345–47, https://www.govinfo.gov/content/pkg/GPO-STYLEMANUAL-2016/pdf/GPO-STYLEMANUAL-2016.pdf.

3. Susan I. Enscore, Ellen R. Hartman, and Julie L. Webster, *Fort Riley Building Inventory, 1964–1974,* ERDC/CERL TR-17-28 (Champaign, IL: ERDC-CERL, 2017), 6.

Figure 1. Boundary outline and location of Fort Riley, in east-central Kansas. (Engineer Research Development Center, Construction and Engineering Research Laboratory [ERDC-CERL], 2022.)

Figure 2. Map of Fort Riley showing the six main areas of development. (Map data: Google, 2019. Blue boundary lines, identification titles, and north arrow added by ERDC-CERL.)



Founded in 1852 as Fort Center (due to its proximity to the geographic center of the United States), the post's name soon changed to Fort Riley. The original purpose of the post was to protect individuals traversing the Santa Fe Trail.[4] As the post achieved a greater measure of permanence in the mid-1850s, Congress appropriated money for the construction of quarters, storehouses, and stables for five troops of cavalry.[5] After the US government had forced the majority of Native Americans onto reservations by the late 19th century, most frontier posts began to close. In contrast, Fort Riley remained active and became a cavalry training installation.[6] This was due, in part, to a decision by General Philip Sheridan (the commanding general of the Army's Division of the Missouri) to locate the US Cavalry Headquarters at Fort Riley in 1884.[7]

After the United States entered World War I (WWI) in 1917, a cantonment named Camp Funston was constructed five miles northeast of Fort Riley's main cantonment to house thousands of cavalry troops in WWI-era temporary buildings. Fort Riley continued to develop during the interwar years. In 1924 a National Guard camp was established in the Pawnee Flats between the main cantonment and Camp Funston. The camp was named Camp Whitside in honor of Colonel Warren W. Whitside, who oversaw its construction.[8] After WWI, the War Department also announced that all arms of the military would have their own service schools, and Fort Riley soon became a cavalry school. With the threat of another world war in the late 1930s, authorities made plans to expand training capacity at Fort Riley. In response, Camp Funston was rebuilt to house the surge of new troops, and in 1941, a new cantonment, which was named Camp Forsyth, was built in the Republican Flats southwest of the main cantonment. Both used World War II (WWII)-era temporary buildings to house troops. During WWII, Fort Riley trained up to 125,000 Soldiers.[9]

4. Kansas Historical Society, s.v. "Fort Riley," *Kansapedia*, last modified February 2013, https://www.kshs.org/kansapedia/fort-riley/17809.

5. Woodbury F. Pride, *The History of Fort Riley* (Fort Riley, KS: Cavalry School Book Department, 1926), 61, 65.

6. Kansas Historical Society, "Fort Riley."

7. Carey L. Baxter and Michael L. Hargrave, "Geophysical and Archival Investigations of the World War II Prisoner of War Camp, Camp Funston, Fort Riley, Kansas," unpublished report, June 2009, 5, ERDC-CERL.

8. Pride, *The History of Fort Riley*, 215.

9. "History of Fort Riley and 1st Infantry Division," US Army Fort Riley, https://home.army.mil/riley/index.php/about/history.

Historically, some of the most significant flooding events in Kansas have occurred within the Kansas River basin.[10] The principal rivers within this basin are the namesake Kansas River, the Republican River, and the Smoky Hill River.[11] Fort Riley is located near to the confluence of these three channels. Typically, high precipitation oversaturates soils and causes runoff, which funnels into the river basin and swells its tributaries. Some of the most destructive floods within the Kansas River basin occurred in 1844, 1903, 1935, and 1951. In particular, the 1951 flood caused the most significant damage at Fort Riley.

1.2 Objectives

This project satisfies three main objectives. First, it presents a historic context for the levees and dams constructed at Fort Riley. Next, it provides an inventory of three levees, one at Camp Funston, one at Marshall Airfield, and one at Camp Forsyth, and two dams, one at Moon Lake and one at Breakneck Lake. These efforts culminate in a determination of NRHP eligibility status for the levees and dams.

1.3 Researchers

This project was conducted by the US Army Corps of Engineers, Engineer Research Development Center, Construction and Engineering Research Laboratory (ERDC-CERL), based in Champaign, Illinois. The research team included Sunny E. Adams, master of architecture, as project manager and architectural historian, with 20 years of experience in military architectural history; Aaron R. Schmidt, master of public history with 2 years of experience as primary writer for the historic context; and Adam D. Smith, master of architecture, who has 25 years of experience in project management and military architectural history.

1.4 Approach

1.4.1 Site Visits

ERDC-CERL researchers conducted site visits to Fort Riley from 28 June to 02 July 2021 and from 13 to 17 September 2021 to document and photograph the levee and dam features. Field work conducted during those trips

10. Kansas Historical Society, s.v. "Weather in Kansas," *Kansapedia*, last modified July 2011, https://www.kshs.org/kansapedia/weather-in-kansas/14281.

11. James R. McCauley, "Development and General Geology of the Kansas River Corridor," *Kansas Geological Survey*, 1998, http://www.kgs.ku.edu/Publications/KR/kr_geol.html.

included physical evaluations as well as archival research in various offices and repositories both on and off the installation.

1.4.2 Archival Repositories

Researchers reviewed published material to determine the general history of Fort Riley for the time period under study. The material included archival repositories, government reports, and books and newspaper articles from the Fort Riley vicinity found at area libraries, museums, and online resources. A research trip to Fort Riley occurred from 13 to 17 September 2021. The following places were either contacted or searched:

- Geary County Historical Society, Junction City, Kansas
- Riley County Historical Society, Manhattan, Kansas
- US Cavalry Museum, Fort Riley, Kansas
- Dorothy Bramlage Public Library, Junction City, Kansas

1.5 Analysis

After the initial research was completed, the team analyzed the gathered information. Archival information was contained in text documents, photographs, and historic maps. Using archival sources, the research team extracted relevant historical information. The material was then combined to tell the story in both text and images.

2 Historical Overview of Levees and Dams at Fort Riley, Kansas

Kansas has a long history of widespread flooding events. In particular, some of the state's more notable floods have historically affected the waterways within the Kansas River basin.[12] This basin's principal tributary is the namesake Kansas River, a latitudinal channel in the east-central portion of the state created by the confluence of the Republican and Smoky Hill Rivers near Junction City.[13] While spring and summer river swelling is a periodic occurrence in central and eastern Kansas, on occasion, prolonged rains oversaturate the soils and amplify runoff, leading to significant flooding events. In addition, the state often experiences river swelling caused by high precipitation in Nebraska that channels downstream.

Fort Riley was not significantly threatened by floods until the installation began to develop into the Republican and Kansas River floodplains. Consequently, efforts to construct flood intervention structures did not become a necessity until the establishment of Camp Funston, where crews constructed the installation's first levee between 1917 and 1918. In the 1940s, the renovation of the levee at Camp Funston and the construction of subsequent levees around the new Cavalry Replacement Training Center (Camp Forsyth) and Marshall Field brought the total number of levees at Fort Riley up to three. Designed to protect each respective area from typical flooding events, Fort Riley's levees faced an unprecedented test during the flood of 1951. In particular, the massive flood severely compromised the levees at Marshall Airfield and Camp Funston, causing major damage at both areas. Following the disaster, the levees at Marshall Airfield and Camp Funston were fortified to withstand another flood of equal magnitude. Fort Riley continues to maintain levees at Camp Forsyth, Marshall Airfield, and Camp Funston today (Figure 3).

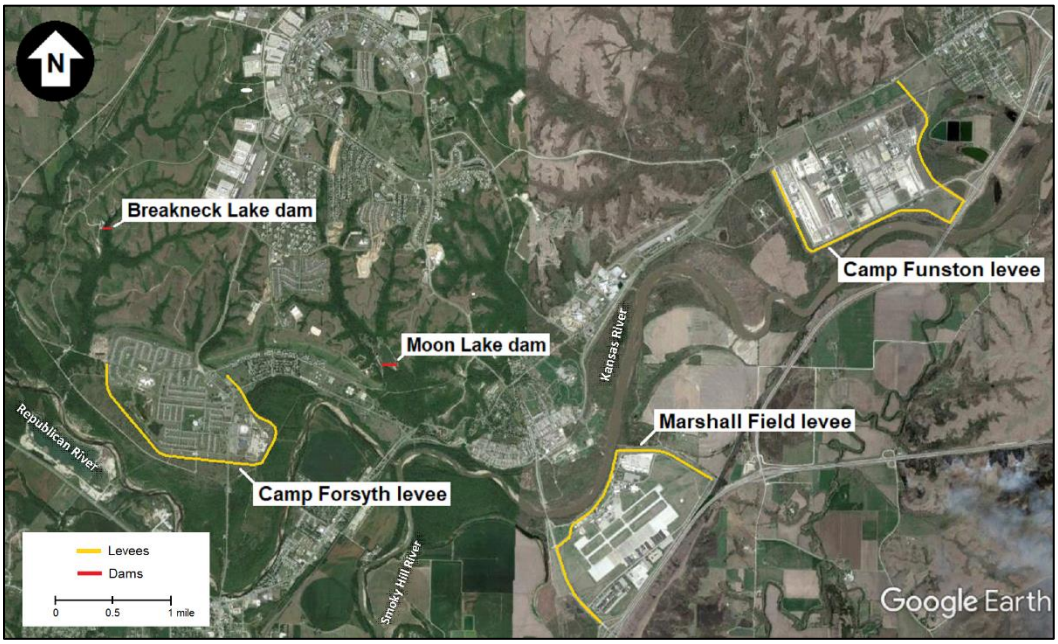
In addition to its three levees, Fort Riley maintains two dams (as defined by the *Federal Guidelines for Dam Safety* and real property records): one at Breakneck Lake and the other at Moon Lake (Figure 1). Unlike the levees, these assets were not intended for flood defense. Newspaper articles indicate that Moon Lake and its accompanying dam were constructed during a hunting and fishing improvement campaign in the late 1950s and

12. Kansas Historical Society, "Weather in Kansas."

13. McCauley, "Development and General Geology of the Kansas River Corridor."

early 1960s, thus primarily serving a recreational function. Construction on Breakneck Lake and its accompanying dam likely began in 1950 and was also intended to facilitate recreation and water conservation.

Figure 3. Map of levees and dams at Fort Riley. (Map data: Google, 2019. Yellow boundary lines, identification titles, north arrow, and legend added by ERDC-CERL.)



2.1 Overview of Historic Floods in Kansas Before 1951

2.1.1 The Flood of 1844

The flood of 1844 was one of the earliest documented natural disasters within the present boundaries of Kansas and is frequently cited as one of its worst flooding events. The flood of 1844 primarily affected the northern and eastern portions of the state, where the Kansas River swelled to unprecedented heights before funneling its overflow into the Missouri River. According to USGS data, many of the highest water levels recorded along the Kansas River occurred during the flood of 1844, including at a point adjoining the present-day town of Ogden near Fort Riley. The scope of structural damage was limited since the region was sparsely populated with permanent settlements.[14] Impacts to Fort Riley did not occur because the installment had not yet been established.

14. Kyle E. Juracek et al., *The 1951 Floods in Kansas Revisited* (USGS, 2001), https://pubs.usgs.gov/fs/2001/0041/report.pdf.

2.1.2 The Flood of 1903

In 1903 another significant flood affected northern and eastern Kansas. Throughout the last half of May, much of the state received rainfall on a near-daily basis. As soils in north-central Kansas became oversaturated, excess precipitation soon overwhelmed both the Kansas River basin and the Missouri River basin.[15] In nearby Junction City, the Republican and Smoky Hill Rivers rose at an alarming rate in late May, engulfing much of the community and washing out "uncounted miles of railroad track and telephone lines."[16] In Riley County, the magnitude of the flood was so strong that it altered the channels of the Kansas and Blue Rivers.[17] Though the waters did not rise as high as they had in 1844, the flood of 1903 caused more destruction than the flood of 1844 because the state contained more permanent settlements. The flood ultimately caused $22 million in damages and claimed 57 lives.[18]

The flood of 1903 did not cause excessive damage at Fort Riley due to its limited development in nearby floodplains. Losses from the flood included the Quartermaster Bridge, which spanned the Kansas River near the veterinary hospital, and two unspecified culverts (Figure 4).[19] The flood also interrupted communication channels, as high water from the Smoky Hill River inundated the main road connecting Fort Riley with Junction City and temporarily suspended electric trolley service between the two locations (Figure 5).[20] Following the flood, construction of intervention structures like dikes and levees did not seem to be prioritized at Fort Riley since most of the original cantonment's built environment remained on high ground.

15. Lanna J. Combs and Charles A. Perry, *The 1903 and 1993 Floods in Kansas—The Effects of Changing Times and Technologies* (USGS, 2003), https://pubs.usgs.gov/fs/2003/0019/report.pdf.

16. James R. Shortridge, *Our Town on the Plains: J. J. Pennell's Photographs of Junction City, Kansas, 1893–1922* (Lawrence: University Press of Kansas, 2000), 180.

17. "Summary History of Riley County," Riley County Historical Museum, https://www.rileycountyks.gov/DocumentCenter/View/1534/F---Summary-History.

18. Combs and Perry, *The 1903 and 1993 Floods in Kansas*; Kansas Historical Society, "Flood of 1903," *Kansapedia*, last modified May 2016, https://www.kshs.org/kansapedia/flood-of-1903/17221.

19. Pride, *The History of Fort Riley*, 240; *Annual Reports of the Secretary of War*, vol. III, (Washington, DC: Government Printing Office 1903), 85.

20. "Three Disastrous Floods in the Past Half Century," *Junction City Daily Union*, June 24, 1953.

Figure 4. "Ruins of Quartermaster Bridge Fort Riley Kans." Looking south, 1903. (Image from Geary County Historical Society. Public domain.)[21]

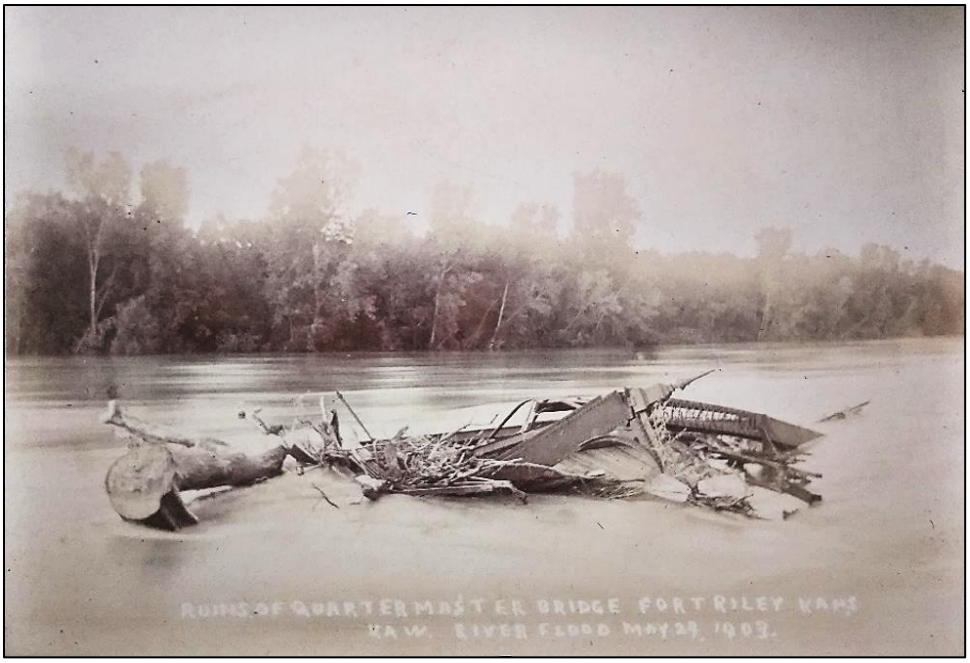
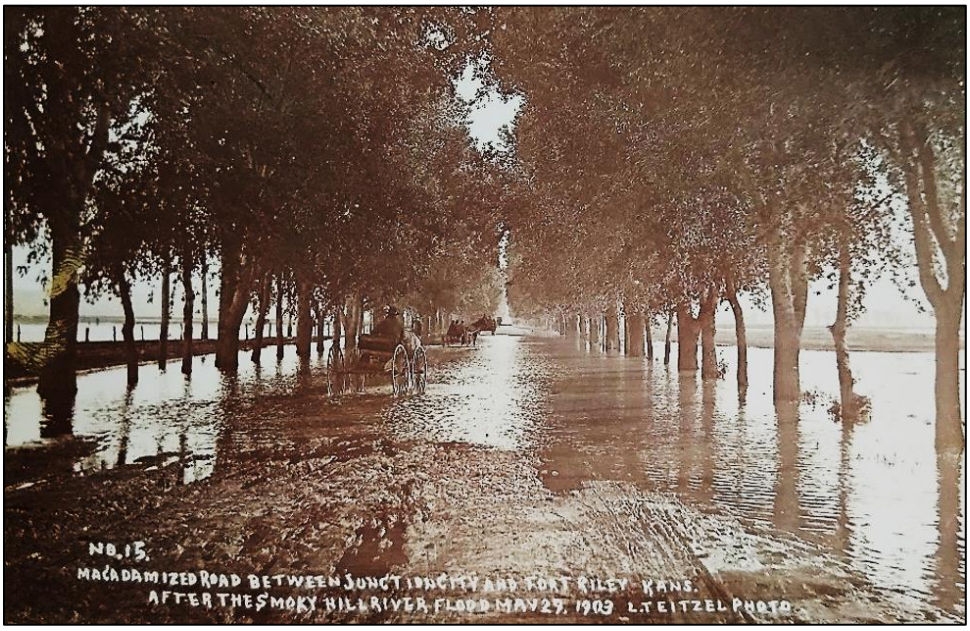


Figure 5. "Macadamized Road between Junction City and Fort Riley Kans." Looking south, 1903. (Image from Geary County Historical Society. Public domain.)[22]



21. Flood photo collection, Geary County Historical Society, Junction City, Kansas.
22. Flood photo collection, Geary County Historical Society, Junction City, Kansas.

2.1.3 The Flood of 1935

In June of 1935, central Kansas was battered with another destructive flood. The worst impacts occurred along the Republican River after a period of prolonged rainfall overwhelmed its upper basin. While the event was most severe in Colorado and Nebraska, flooding in Kansas damaged 1,485 homes and 1,552 nonresidential structures. In total, the flood destroyed 275,000 acres of land and killed 110 people.[23] Moving east, the flood advanced near Junction City on 3 June, where water crested to a height even greater than the 1903 levels. Though the flood destroyed thousands of acres of land and damaged hundreds of homes, proactive evacuation measures prevented any loss of life in the Junction City area.[24]

Because the flood of 1935 primarily affected the Republican River valley, the southern portions of Fort Riley were most susceptible to the rising water. Consequently, as the Republican River crested near Junction City, the excess flow spilled into the adjacent valley northwest of town (known as the Republican Flats) and flooded the site of present-day Camp Forsyth. No levees were in place to prevent flooding in the Republican Flats because a semipermanent cantonment had not yet been established there.[25] Like the flood of 1903, the flood of 1935 disrupted transportation networks and twisted Union Pacific railroad tracks (Figure 6–Figure 13). Gas and light service at Fort Riley were temporarily interrupted as well, but the installation was largely spared from widespread damage.[26] While some photographs from the era depict standing water along Forsyth Avenue on the Main Post, this was likely localized street flooding caused by high precipitation rates and poor drainage. The elevation of this street above the Republican River makes it unlikely that flooding here was a result of high water from the river (Figure 9 and Figure 10).

23. Robert Follansbee and J. B. Spiegel, "Flood on the Republican and Kansas Rivers, May and June 1935," (Washington, DC: Government Printing Office, 1937), 21, https://pubs.usgs.gov/wsp/0796b/report.pdf.

24. "Three Disastrous Floods in the Past Half Century," *Junction City Daily Union*, June 24, 1953.

25. "Three Disastrous Floods in the Past Half Century," *Junction City Daily Union*, June 24, 1953.

26. "Flood Sweeps Down Republican," *The Junction City Union*, June 3, 1935; "High Waters Recede Here," *Junction City Daily Union*, June 5, 1935.

Figure 6. Water from the Kansas River approaching Fort Riley's Union Pacific station. Looking southwest, 1935. (Image from the Fort Riley Cavalry Museum Archives. Public domain.)[27]

Figure 7. Union Pacific tracks approaching the Kansas River at Fort Riley. Looking south, 1935. (Image from the Fort Riley Cavalry Museum Archives. Public domain.)[28]

27. Horse Cavalry Association (HCA) photo no. 3891, Fort Riley Cavalry Museum Archives.

28. HCA photo no. 3877, Fort Riley Cavalry Museum Archives.

Figure 8. Union Pacific tracks twisted off their roadbed. Looking east, 1935. (Image from Geary County Historical Society. Public domain.)[29]

Figure 9. Street flooding along Forsyth Street caused by high precipitation. Looking southwest, 1935. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[30]

29. Flood photo collection, Geary County Historical Society, Junction City, Kansas.

30. HCA photo no. 3878, Fort Riley Cavalry Museum Archives.

Figure 10. Street flooding along Forsyth Street caused by high precipitation. Looking southwest, 1935. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[31]

Figure 11. Widespread flooding possibly near the Camp Funston area. Looking east, 1935. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[32]

31. HCA photo no. 4298, Fort Riley Cavalry Museum Archives.

32. HCA photo no. 3884, Fort Riley Cavalry Museum Archives.

Figure 12. Spectators observe the flood from bluffs near Fort Riley. Looking east, 1935. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[33]

Figure 13. A view of floodwaters in the plains near Fort Riley. Looking southeast, 1935. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[34]

33. HCA photo no. 3892A, Fort Riley Cavalry Museum Archives.

34. HCA photo no. 3886, Fort Riley Cavalry Museum Archives.

2.1.4 National Flood Control Measures in the Early 20th Century

In the early 20th century, several widespread and destructive floods struck river basins in the eastern and western United States. The severity of these events prompted Congress to pass the Flood Control Act of 1917. This act, which focused on flooding control along the Mississippi, Ohio, and Sacramento Rivers, authorized the government to subsidize up to half the cost of new levees constructed in these areas, provided that the affected communities maintained the levees. A decade later, Congress passed additional measures in the Flood Control Act of 1928. Creation of this legislation was due, in part, to poor construction and maintenance of existing levees. The former flood control act was expanded to accommodate new approaches in flood control, including spillway and channel improvements.[35] Because the new act was in response to devastating floods in the lower Mississippi River valley in 1927, it authorized the US Army Corps of Engineers (USACE) to survey the Mississippi River and its tributaries for flood control recommendations.[36] Less than 10 years later, the Flood Act of 1936 authorized USACE to "construct flood-control structures such as levees and floodwalls, and perform channel improvements."[37] These acts demonstrate that regulated flood control measures had become a collective priority in flood-prone areas across the nation in the first half of 20th century.

2.2 Flood Intervention Structures at Fort Riley Before 1951

During the first 60 years of its existence, the majority of Fort Riley's built environment was contained in the Main Post, which was located on high ground and not especially vulnerable to flooding. Consequently, there does not seem to have been an impetus to construct flood intervention structures, such as levees, at Fort Riley until the installation expanded into the surrounding floodplains in the early 20th century. In general, levees from this era were often intended to protect areas from seasonal flooding rather than major flood events. By the flood of 1951, Fort Riley had three large-scale levees in place to protect its low-lying developments at Camp Funston, Camp Forsyth, and Marshall Airfield.

35. "History of Levees," Federal Emergency Management Agency (FEMA), https://www.fema.gov/sites/default/files/2020-08/fema_history-of-levees_fact-sheet_0512.pdf.

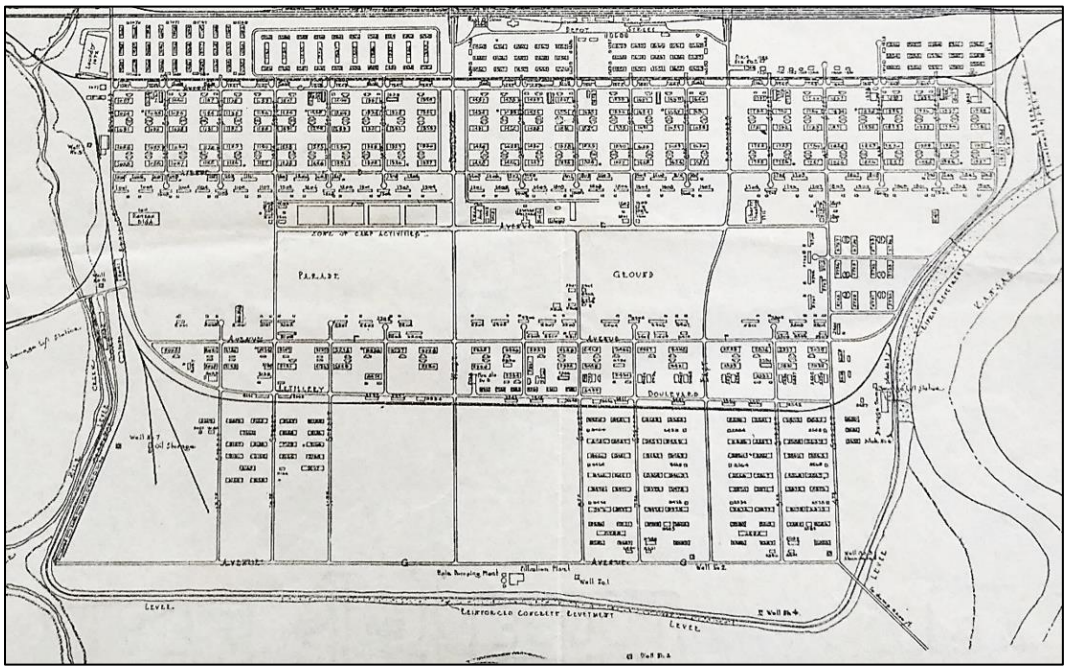
36. 1928 Flood Control Act, Pub. L. 391, 45 Stat. 534 (1928). https://us-code.house.gov/statviewer.htm?volume=45&page=534.

37. "History of Levees," FEMA.

2.2.1 Camp Funston Levee Before 1951

Documentary evidence suggests that one of the earliest levees at Fort Riley was constructed between 1917 and 1918. This feature was built to protect Camp Funston, a WWI cantonment four miles northeast of the Main Post. Placed near the Kansas River in a plain known as the Ogden Flats, Camp Funston represented the first major building development at Fort Riley that was situated almost entirely in a floodplain. An initial site selection report recognized the hazard posed by the Kansas River and called for the construction of a U-shaped levee that buffered the east bank of Three Mile Creek, proceeded across the southern portion of Ogden Flats, and continued northward near the bank of the Kansas River (Figure 14).[38]

Figure 14. *Map of Camp Funston*, 1917. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[39]



Following a design prepared by V. R. Parkhurst, construction of the levee began in the autumn of 1917.[40] The structure ranged in height from 3 to 10

38. Frederick J. Herman, "Completion Report of Camp Funston: Fort Riley, Kansas," Box 107–108, Construction Completion Reports, Records of the Office of the Chief of Engineers, Record Group 77 (RG 77), National Archives and Records Administration (NARA) at Washington, DC,

39. *Map of Camp Funston*, 1917, SD 125 Collection on Ft. Riley (1 of 18), Series 1—Materials on Camp Funston, 1917–1920, Fort Riley Cavalry Museum Archives.

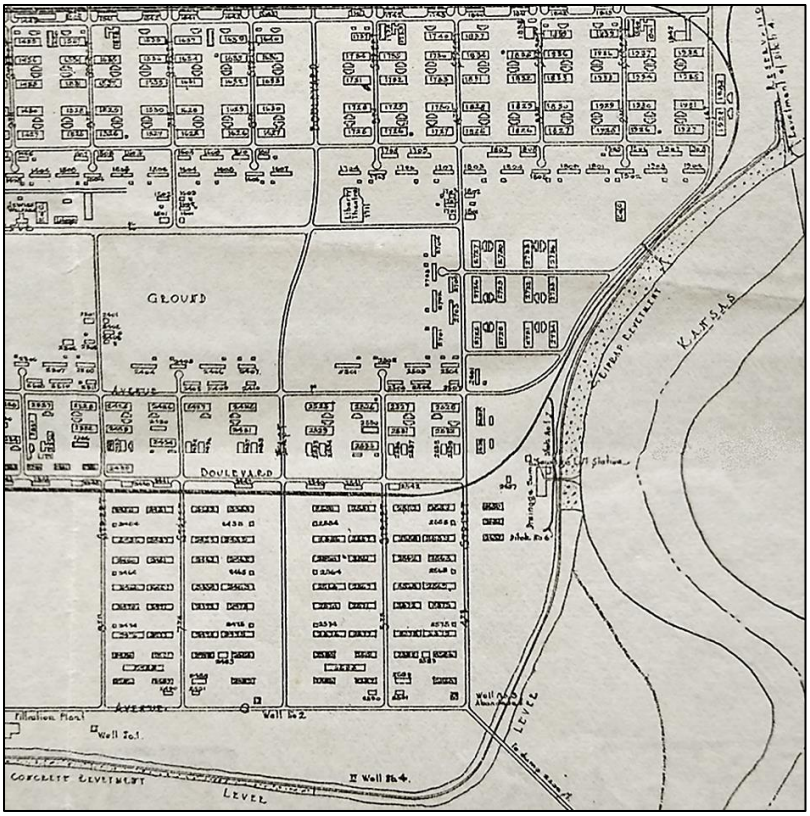
40. "Will Dike the Kaw." *Junction City Union*, September 14, 1917; "Dikes Planned for Fort Riley," *Manhattan Mercury*, January 9, 1941.

ft, and the top was wide enough to accommodate a narrow wagon road.[41] An early site map of Camp Funston indicates that the west side of the levee began south of Remount Road, following a concave path that was influenced by the course of Three Mile Creek. The map also indicates that the south side of the levee, which followed a linear path across the Ogden Flats, was intended to have a reinforced concrete revetment on its river-facing slope. On the east side, the levee proceeded north until it intersected the junction of the reservation boundary with the Kansas River. The plan called for a riprap revetment to blanket the river-facing slope on the levee's east side and a ditch to be installed adjacent to the levee (Figure 15). It is interesting to note that newspaper articles from this time period refer to this levee beginning near the Kansas Territorial Capitol (west of Camp Funston), running parallel to the river bank, and proceeding around Camp Funston.[42] However, this path is not evident in cartographic material from this era and further investigation is required to determine whether any remnants of a levee extending from the Kansas Territorial Capitol to Camp Funston are extant.

41. "At Work on the Dikes," *Junction City Union*, June 6, 1918.

42. "An Eight-Foot Tall Concrete Dike," *The Ottawa Herald*, September 14, 1917; "Will Dike the Kaw," *Junction City Union*, September 14, 1917; "At Work on the Dikes," *Junction City Union*, June 6, 1918.

Figure 15. Detail of *Map of Camp Funston*, 1917. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[43]



By the summer of 1918, crews had finished half of the structure.[44] The completed levee was first put to the test in 1919, when the Kansas River valley around Camp Funston flooded in March and June. Though warnings were issued during the June flood, the *Junction City Union* noted that the event did not present a danger to Camp Funston, which was "protected by an immense dike [and] regarded as safe from floods."[45]

With its mobilization mission complete, Camp Funston was dismantled after WWI.[46] Presumably, the 1918 levee around Camp Funston remained unaltered for the next 20 years. However, as crews rebuilt Camp Funston in anticipation for another war, preparations were made to renovate the cantonment's levee. V. R. Parkhurst, who designed the original levee at

43. *Map of Camp Funston*, 1917, SD 125 Collection on Ft. Riley (1 of 18), Series 1—Materials on Camp Funston, 1917–1920, Fort Riley Cavalry Museum Archives.

44. "At Work on the Dikes," *Junction City Union*, June 6, 1918.

45. "The Smoky Is on a Rampage," *Junction City Union,* March 17, 1919*;* "Flood Warning Issued Today," *Junction City Union,* June 11, 1919.

46. Department of the Army, *Fort Riley: Its Historic Past* (Washington DC: Government Printing Office, 1984), 8.

Camp Funston, was consulted to lead the renovation. Parkhurst was commended for his experience constructing and fortifying flood intervention structures in the region and was quoted by one contractor as knowing the "Smoky Hill, Republican, and Kaw Rivers 'better than the man who dug them.'"[47] The renovated design was based on river metrics from the floods of 1903 and 1935, benchmarks that appeared more than adequate at the time. The design was finalized by Widmer Engineering Company, architect-engineers responsible for defense construction at Fort Riley. Crews from Long-Manhattan-Watson Construction Company began renovating Camp Funston's levee on 23 January 1941, and rapid work brought the levee to completion by the first week of May 1941.[48]

The renovated levee was designed with a three-to-one grade on its river-facing slope, and a two-to-one grade on its land-facing slope. The crest of the levee was approximately 12 ft wide and reached a height 3 ft above the highest recorded flood stage on the Kansas River.[49] Cartographic evidence suggests that the renovations also resulted in the extension of Funston Levee on the west and east sides, where both ends of the structure terminated near the Union Pacific railroad tracks (Figure 16 and Figure 17). This levee protected Camp Funston until a significant portion of it was destroyed by the flood of 1951. Additionally, German prisoners of war (POWs) performed work on a drainage ditch that was adjacent to the east side of the levee during WWII. This work either constituted the construction of a new ditch or the resurfacing of an existing ditch (Figure 18). In addition, POWs constructed a limestone culvert where the ditch passed under 4th Street that is still extant today.[50]

47. "Dikes Planned for Fort Riley," *Manhattan Mercury*, January 9, 1941.

48. "Flood Barriers Finished at Fort," *Manhattan Mercury*, May 8, 1941.

49. "Flood Barriers Finished at Fort," *Manhattan Mercury*, May 8, 1941.

50. "WWII POW Camp Funston Culvert," Kansas Archeological Site Inventory 14RY8144, May 18, 2015, Fort Riley Department of Public Works (DPW).

Figure 16. *Fort Riley and Vicinity*, 1947. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[51]

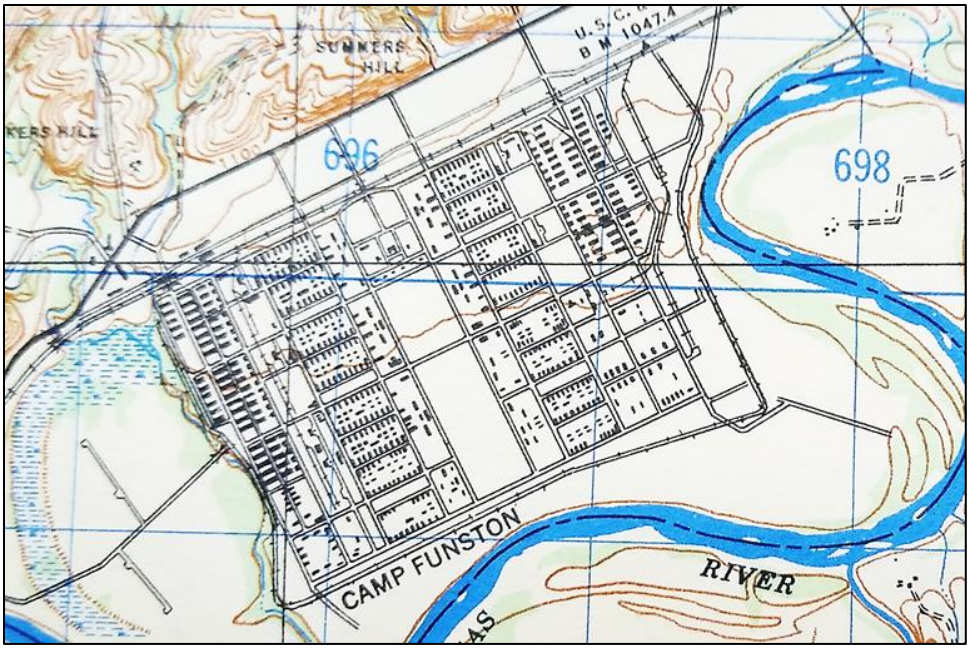
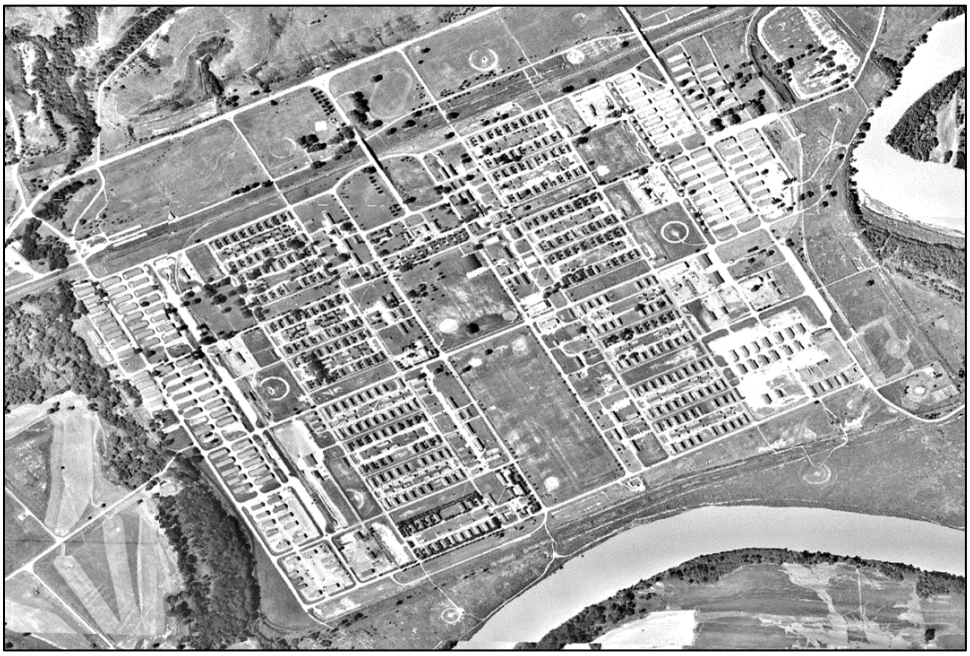
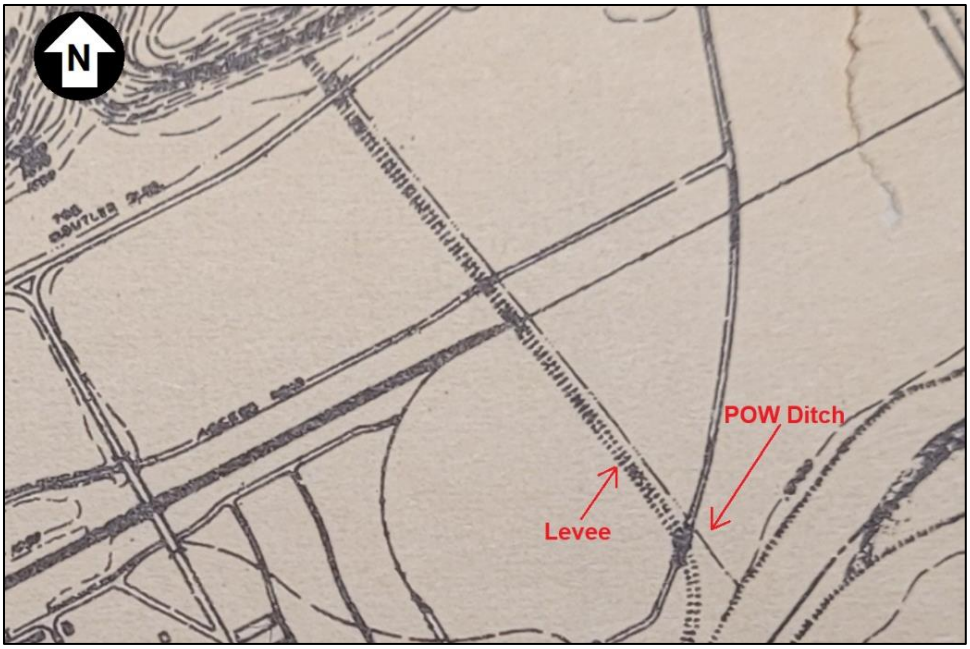


Figure 17. Camp Funston from the air, 1950. (Image from Fort Riley GIS data files. Public domain.)



51. USGS, *Fort Riley and Vicinity*, 1947, 7.5-minute topographic map, map collection, Fort Riley Cavalry Museum Archives.

Figure 18. *Fort Riley Kansas Master Planning General Site Map*, no date. (Image from Fort Riley Directorate of Public Works [DPW]. Public domain.)[52]



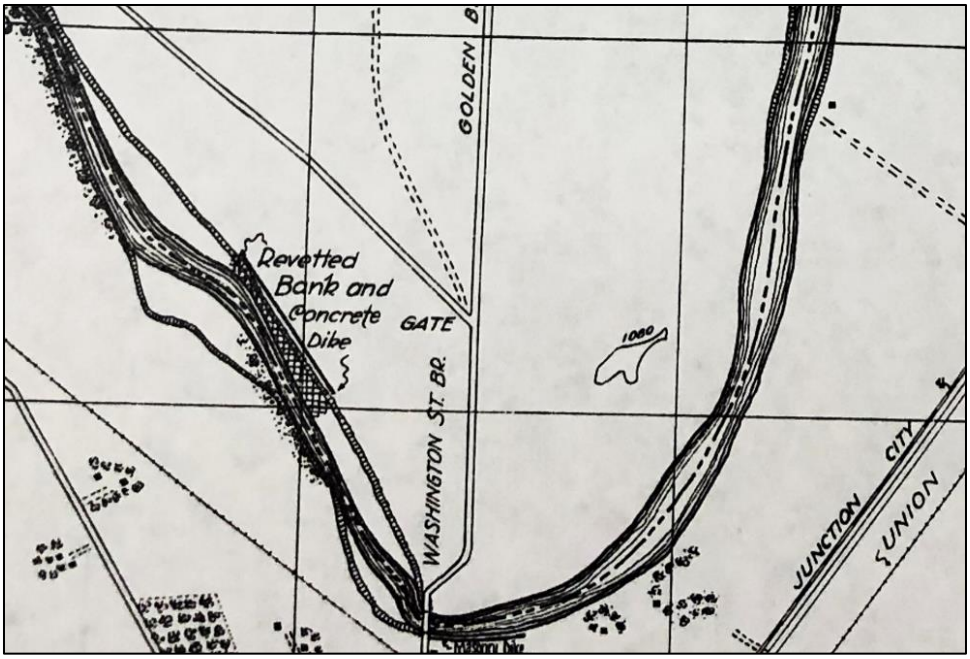
2.2.2 Camp Forsyth Levee Before 1951

Present-day Camp Forsyth is located in the Republican River valley three miles west of the Main Post. The wedge-shaped floodplain in which it is situated, known as the Republican Flats, was a potential site for Camp Funston in 1917. One reason that surveyors rejected it, however, was because they considered it more difficult to protect from floods than the Ogden Flats.[53] An installation map from 1917 indicates that a small revetment and concrete dike was located near the southern tip of the Republican Flats, perhaps to prevent localized bank erosion (Figure 19).

52. US Army Corps of Engineers, *Fort Riley Kansas Master Planning General Site Map*, n.d., Fort Riley DPW.

53. Herman, *Completion Report of Camp Funston: Fort Riley, Kansas*. 6–7.

Figure 19. *US Military Reservation Fort Riley Kansas*, 1917. (Image from ERDC-CERL Landscape Lab collection. Public domain.)[54]



While no large-scale development took place in the Republican Flats during the interwar years, its level topography did accommodate a rifle range, polo fields, and the Riverside Race Course.[55] As the threat of war intensified in the late 1930s and early 1940s, the Army initiated an expansion program that, in part, "involved the mechanization of the US Cavalry—a process of reorganizing, retraining, and reequipping the Cavalry for combat as separate units and as elements of Armored and Infantry divisions."[56] In response, the Cavalry Replacement Training Center was established in the Republican Flats in 1941. That same year, crews began constructing a levee to protect the new development.

Under the supervision of Parkhurst and the Widmer Engineering Company, construction began in January 1941. The levee in the Republican Flats followed the same general specifications as the renovated levee at Camp Funston.[57] The river-facing slope was characterized by a three-to-one grade, and the land-facing slope had a two-to-one grade. The slope

54. US Army Corps of Engineers, *U.S. Military Reservation Fort Riley Kansas*, 1917, Landscape Lab collection, CERL.

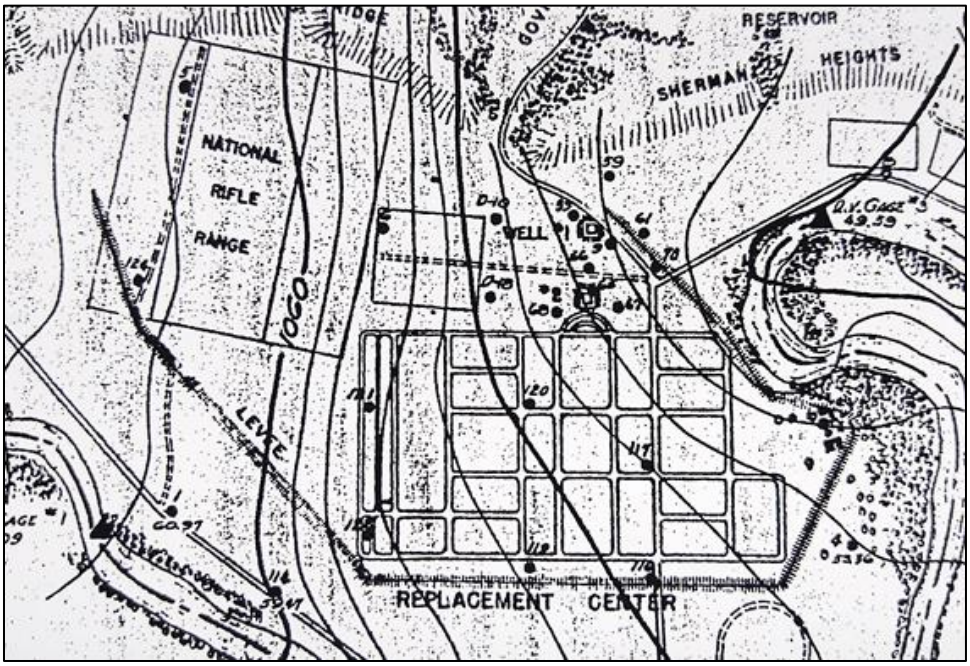
55. US Army Corps of Engineers, *Special Military Map, Fort Riley, Kansas, Grid Zone D*, 1934, #60-10, US Army Corps of Engineers, map collection, Fort Riley Cavalry Museum Archives.

56. Department of the Army, *Fort Riley: Its Historic Past*, 11.

57. "Flood Barriers Finished at Fort," *Manhattan Mercury*, May 8, 1941.

changed to four to one where the levee was adjacent to the sewer plant. According to a real property record inventory in 1948, the levee was constructed from "selected nonporous soils placed in 8″ strips and rolled with sheepsfoot roller."[58] The finished structure exhibited a horseshoe shape, skewed to the northwest, that protected the cantonment on its west, south, and east sides (Figure 20). During WWII, POWs built a drainage ditch at Camp Forsyth approximately 250 ft north of the levee's south side. This feature runs parallel to the levee between Trooper Drive and I Street and is still extant (Figure 21).[59]

Figure 20. *Fort Riley Reservation, General Map Ground Water Survey*, 1941. (Image from ERDC-CERL Landscape Lab collection. Public domain.)[60]



58. Camp Forsyth levee cost account code 3611.3, 1948, Fort Riley real property records.

59. Fiona Price, "POW Built Features," October 21, 2020, Fort Riley DPW.

60. Widmer Engineering Company, *Fort Riley Reservation, General Map Ground Water Survey*, January 28, 1941, ERDC-CERL Landscape Lab collection.

Figure 21. Satellite image of Camp Forsyth showing the POW ditch between Trooper Drive and I Street. (Map data: Google, 2014. Street names, north arrow, and legend added by ERDC-CERL.)

When comparing maps of the Forsyth levee from 1941 and 1943, there is an interesting discrepancy in the west side of the structure. The 1941 map depicts the west leg of the levee trending toward the northwest before terminating just past the National Rifle Range at a point near present-day Rifle Range Road (Figure 20).[61] This is the same path depicted in a map of Camp Forsyth in 1947 and, with minor modifications, shown in all subsequent maps until the present day (Figure 23).[62] However, a map of the levee in 1943 depicts the western leg following a south-to-north path approximately 650 ft from the edge of the cantonment (Figure 22).[63] While it is possible to dismiss this discrepancy as a cartographic error in the 1943 map, this may not be the most satisfying conclusion given that the other contours in the levee are depicted accurately and the inconsistency on the west side differs substantially from all other cartographic representations. It is possible that the 1941 map depicted the Forsyth levee with the path it was intended to follow (and did assume at a later time), but the 1943 map depicted the levee as it was actually constructed. Because it was built during an era of wartime mobilization, adjusting the west side of the levee to

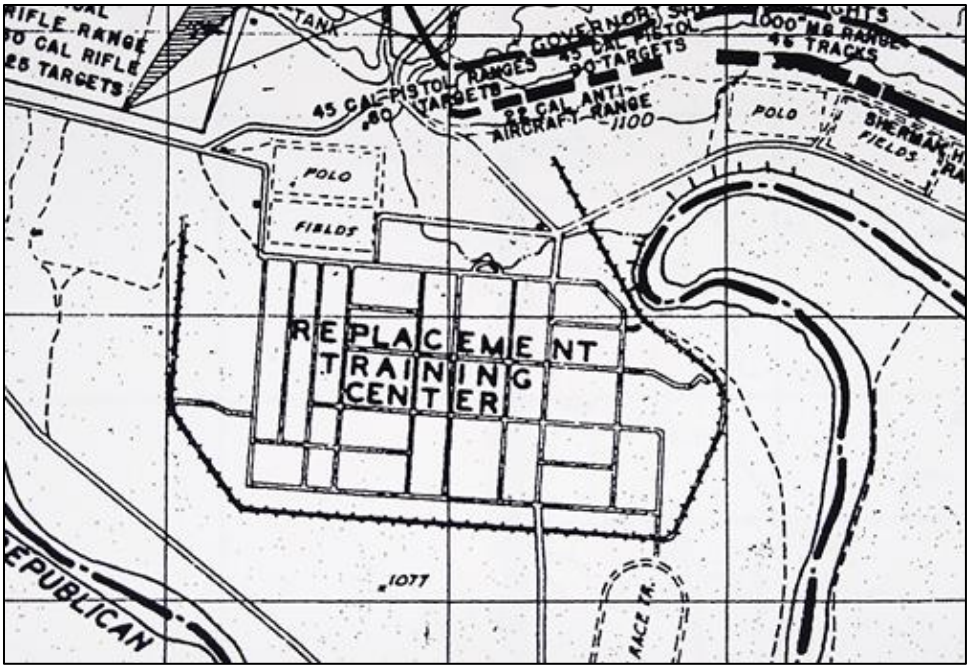
61. Widmer Engineering Company, *Fort Riley Reservation, General Map Ground Water Survey*, January 28, 1941, ERDC-CERL Landscape Lab collection.

62. USGS, *Fort Riley and Vicinity*, 7.5 Minute topographic map, 1947, map collection. Fort Riley Cavalry Museum Archives.

63. Howard, Needles, Tammen & Bergendoff, *Plan of the Military Reservation of Fort Riley, Kansas*, March 27, 1943, ERDC-CERL Landscape Lab collection.

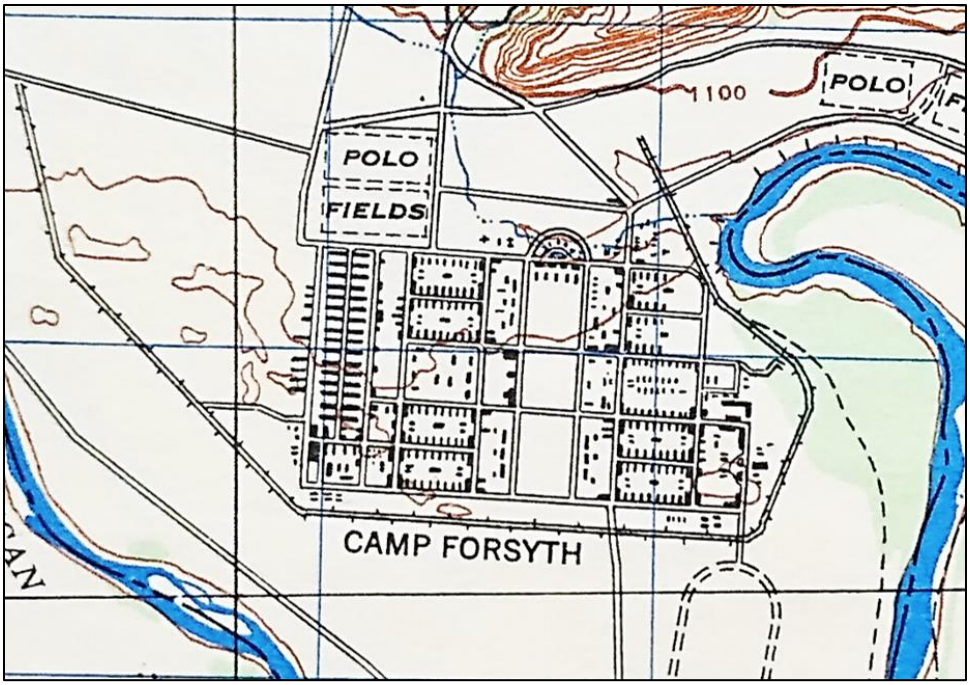
run parallel with the cantonment may have been a matter of expedience that saved the crew's valuable time. After the war, the west side of the levee may have been modified to follow the route as originally designed in 1941 (Figure 23). With minor changes, this is the path the levee has assumed since the late 1940s.

Figure 22. *Plan of the Military Reservation of Fort Riley, Kansas*, 1943. (Image from ERDC-CERL Landscape Lab collection. Public domain.)[64]



64. Howard, Needles, Tammen & Bergendoff, *Plan of the Military Reservation of Fort Riley, Kansas*, March 27, 1943, ERDC-CERL Landscape Lab collection.

Figure 23. *Fort Riley and Vicinity*, 1947. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[65]



2.2.3 Marshall Airfield Levee Before 1951

According to photographic evidence, construction of the earliest levee adjacent to Marshall Airfield likely occurred between 1941 and 1942. Before that time, a series of spur dikes existed along the east bank of the Kansas River, which were likely installed after the flood of 1935 to prevent bank erosion (Figure 24 and Figure 25). It does not appear that a levee was introduced, however, until Marshall Airfield expanded for wartime use in the early 1940s. Cartographic evidence suggests that construction of the levee occurred between 1941 and 1943. Like at Camp Funston and Camp Forsyth, the levee at Marshall Airfield was a U-shaped structure, protecting the area's southwest, northwest, and northeast sides (Figure 26 and Figure 27).

65. USGS, *Fort Riley and Vicinity*, 1947, 7.5-minute topographic map, map collection, Fort Riley Cavalry Museum Archives.

Figure 24. *Marshall Field, Ft. Riley, Kansas—Taken after Flood of June 3, 1935*, 1936. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[66]

Figure 25. *Quarters & Hangars Marshall Field Ft. Riley, Kansas*, 1937. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[67]

66. *Marshall Field, Ft. Riley, Kansas—Taken after flood of June 3, 1935*, February 20, 1936, Museum Division Photo File: Fort Riley–Marshall Army Airfield [F–MA], Fort Riley Cavalry Museum Archives.

67. *Quarters & Hangars Marshall Field Ft. Riley Kans*, August 11, 1937, Museum Division Photo File: Fort Riley—Marshall Army Airfield [F–MA], Fort Riley Cavalry Museum Archives.

Figure 26. *Fort Riley Reservation, General Map Ground Water Survey*, 1941. (Image from ERDC-CERL Landscape Lab collection. Public domain.)[68]

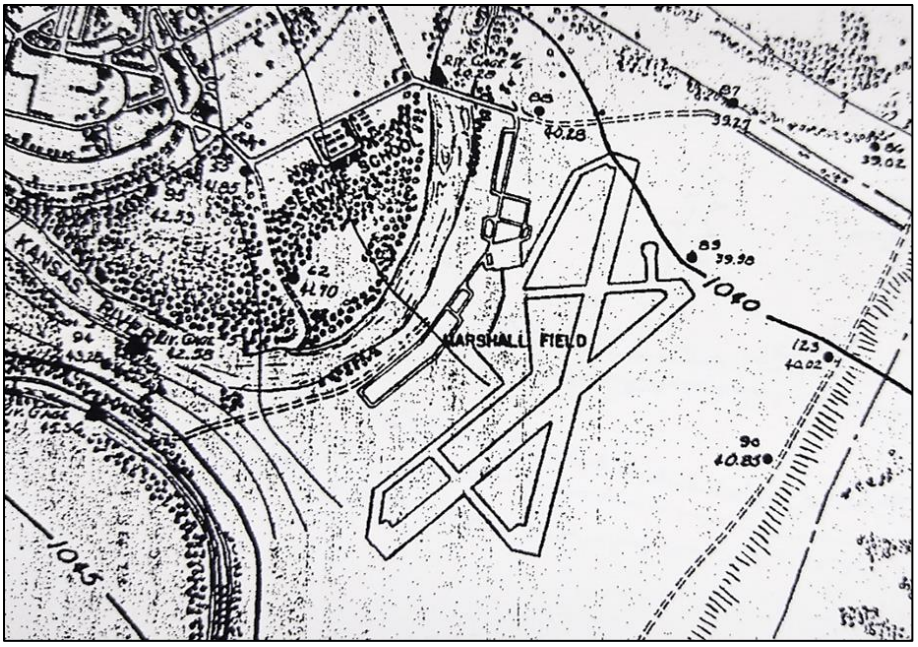
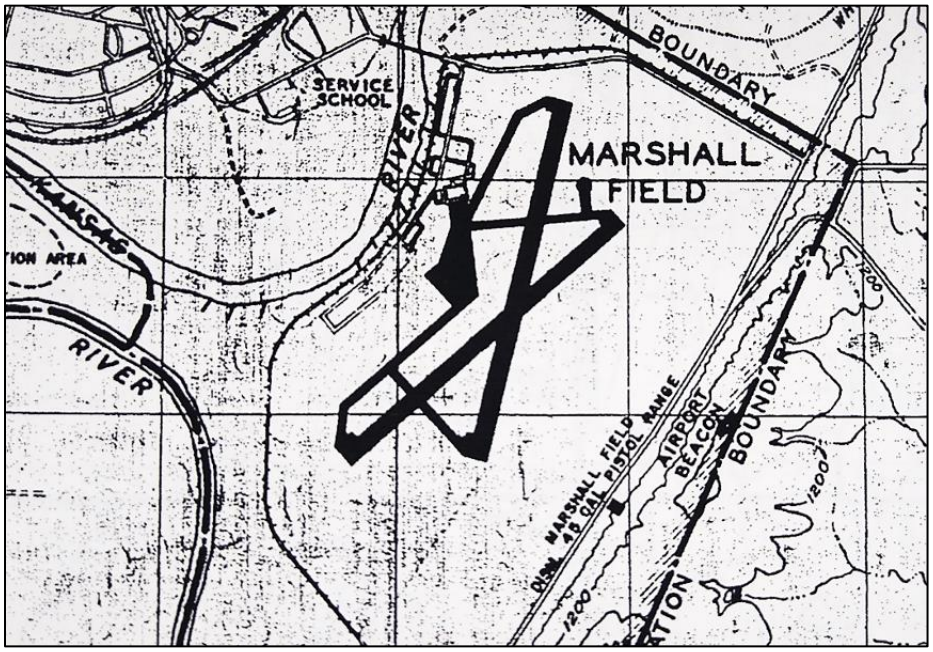


Figure 27. *Plan of the Military Reservation of Fort Riley, Kansas*, 1943. (Image from ERDC-CERL Landscape Lab collection. Public domain.)[69]



68. Widmer Engineering Company, *Fort Riley Reservation, General Map Ground Water Survey*, January 28, 1941, ERDC-CERL Landscape Lab collection.

69. Howard, Needles, Tammen & Bergendoff, *Plan of the Military Reservation of Fort Riley, Kansas*, March 27, 1943, ERDC-CERL Landscape Lab collection.

2.3 The Flood of 1951

The flood of 1951 was the most severe in Kansas history "both in terms of the peak flow and overall duration."[70] Heavy precipitation during the months of May and June caused widespread oversaturation in the soils, making the region vulnerable for a significant flooding event. The flood of 1951 transpired in three waves, the first two waves occurring at the end of June and causing relatively minor complications at Fort Riley.[71] The third wave, resulting from a persistent rainstorm over central Kansas between July 9 and July 13, finally overwhelmed the Kansas River basin and nearby Neosho River basin, dumping between 8 and 16 in. of precipitation on soils that had already reached their maximum level of absorption.[72] By the end of July, "stream flow in central Kansas was 70 times normal."[73] The result was a natural disaster that rivaled the flood of 1844.

2.3.1 The Flood of 1951: Regional Impacts

In Geary and Riley Counties, the worst phase of the flood began around 10 July when the Republican and Smoky Hill Rivers breached their banks. In Junction City, mass evacuations commenced before the two rivers crested on July 12 and 13. The flood quickly devastated the east side of the city, where several homes were damaged or swept from their foundations. Communication networks were compromised as the flood submerged roadways, washed out the US 77 bridge, and disconnected telephone lines. The convergence of the swollen Republican and Smoky Hill Rivers exacerbated flooding on the Kansas River, where communities such as Ogden became engulfed in water. To aid the city's residents, airlifts were launched to transport emergency food and supplies. After flood waters began receding on July 14, damage assessments in Junction City determined that 40 houses were "lost or rendered uninhabitable," another 120 were "inundated," and local businesses and industries suffered losses of around $250,000. In total, officials estimated damages in Geary County amounted

70. Gregory C. Ohlmacher, "Hydraulic Characteristics of the Kansas River," *Kansas Geological Survey*, 1998, http://www.kgs.ku.edu/Publications/KR/kr_hydro.html.

71. Marcus B. Bell to G. Gumby Jordan, July 19, 1951, Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

72. Juracek et al., *The 1951 Floods in Kansas Revisited*, 2.

73. "Rehabilitation of Flood-Stricken Areas," H.R. Rep. No. 82-1092, at 12 (1951).

to $3,500,000. The flood killed one person, a 12-year-old boy, who drowned when his boat capsized near the east side of Junction City. [74]

2.3.2 The Flood of 1951 at Fort Riley

Fort Riley was hit especially hard by the flood of 1951. Because of their vulnerable locations in the Kansas River valley, Marshall Airfield and Camp Funston suffered the worst effects. Personnel were able to contain the first two waves of flooding on June 28 and July 5, but heavy rainfall on July 9 prompted a third, more severe flood that overwhelmed the installment's resources and capabilities.[75] As waters rose along the Kansas River and threatened to breach the levee at Marshall Airfield, an effort was made to buttress the levee with sandbags (Figure 28). As conditions worsened, Brigadier General Marcus Bell eventually ordered all personnel to evacuate the field.[76]

74. "Three Disastrous Floods in the Past Half Century," *Junction City Daily Union*, June 24, 1953.

75. Bell to Jordan, July 19, 1951.

76. Marcus B. Bell, July 16, 1951, Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Figure 28. Personnel relay sandbags to fortify the levee at Marshall Airfield, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[77]

On July 11, an emergency flood memorandum reported that Marshall Airfield was "inaccessible and out of communication." It also stated that the Kansas River was rising at a rate of 2 in. per hour downstream at Camp Funston but indicated that the waters were not yet threatening to top the levee. Conditions remained stable at Camp Forsyth, where the levees were not in danger of failing.[78] The situation at Camp Funston, however, continued to worsen. Predicting that a major breach was imminent, Bell began evacuating some of the camp's personnel on July 11 while maintaining an emergency crew to sustain the Funston levee. An attempt was made to cap the structure with 18 in. of additional sandbags as the river came within a foot of breaching the levee (Figure 29).[79] As rain continued to fall and work proceeded into the night of July 11, crews soon ran out of sandbags and resorted to filling mattress covers and pillowcases. Preventative action became untenable by the morning of July 12, when the Kansas River began to overtop the levee. At 0900, Bell ordered a complete evacuation of Camp

77. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

78. Lewis A. Bonifay, "Emergency Flood Memorandum No. 1," Fort Riley, Kansas Headquarters, July 11, 1951, Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

79. Lewis A. Bonifay, "Emergency Flood Memorandum No. 2," July 1951, Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Funston, directing everyone to safety just a few hours before a substantial section of the levee disintegrated.[80] In total, evacuation procedures detached approximately 11,000 10th Division troops and 120 families from Camp Funston, who bivouacked on the nearby bluffs (Figure 30 and Figure 31).[81]

Figure 29. The 10th Division relay sandbags, likely in an effort to fortify the levee at Camp Funston, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[82]

80. Bell, July 16, 1951.

81. Lewis A. Bonifay and Brackney, telephone conversation, July 14, 1951; A.W. McConnell, "Conditions of Dependents Quarters," July 21, 1951; "The 1951 Flood," RILY 4819, n.p., Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

82. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Figure 30. Looking south at the 10th Division bivouacked on the bluffs overlooking the swollen Kansas River, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[83]

83. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Figure 31. Members of the 10th Division wait in line for hot food during bivouac, 1951. (Image from National Archives and Records Administration [NARA] at College Park, Public domain.)[84]

Aerial reconnaissance on the morning of July 13 determined that the break at the Funston levee occurred across from the motor school and measured approximately 40 ft.[85] The break caused the Kansas River to infiltrate a significant portion of Camp Funston, with waters ranging in depths between 3 and 15 ft.[86] In some parts, the water was so deep that it approached the second floor of the camp's buildings.[87] Out of the 11 battalion areas, 2 were practically unaffected, 3 sustained minor damage, and 3 sustained "considerable" damage. In the last three areas, the force of the flood exacted severe damage, even removing some buildings from their foundations.[88] The river "reached mess hall rooftops and the second floors of dependent housing," inundated theatre no. 3 with 4 ft of water, and removed the lower parade ground reviewing stand from its foundation and floated it

84. Book 526, Photo 373110, US Army Signal Corps Photographs of Military Activity during WWII and the Korean Conflict, Records of the Office of the Chief Signal Officer (SCA), Record Group 111 (RG 111), NARA at College Park, MD.

85. "Report of General Bell's Aerial Reconnaissance of the Fort Riley Area, 13 July 1951 – 1030 Hours," July 13, 1951, Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

86. Bonifay and Brackney, telephone conversation, July 14, 1951.

87. Charles T. Tench, telegram, July 14, 1951, Box: 1951 Flood-1993 Flood. Fort Riley Cavalry Museum Archives.

88. "Report of General Bell's Aerial Reconnaissance," July 13, 1951; Tench, Telegram, July 14, 1951.

hundreds of yards away.[89] Initial estimates itemized $3,000,000 to restore damaged buildings, $150,000 for road repair, and $80,000 for levee restoration (Figure 32–Figure 39).[90]

Figure 32. An oblique view of Camp Funston after the flood of 1951. Looking east, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[91]

89. "Tenth Division Takes Flood in Stride and Starts Anew," *Junction City Union*, August 7, 1951.

90. Breakdown of estimated damage for Fort Riley, July 1951, Box: 1951 Flood-1993 Flood. Fort Riley Cavalry Museum Archives.

91. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Figure 33. An aerial view looking southeast over Camp Funston showing a break in the center of the levee, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[92]

Figure 34. The force of the flood lifted several buildings off their foundations at Camp Funston. Here, the Kansas River pushed the roadside chapel in the 669th Truck Company area against nearby barracks, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[93]

92. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

93. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Figure 35. Once the levee broke, flood waters spread to the back of Camp Funston. Huebner Road is in the *foreground*. Looking south, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[94]

Figure 36. Buildings in the 87th Regiment caked in mud from the floodwaters, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[95]

94. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

95. "The 1951 Flood," RILY 4819, n.p., Box: 1951 Flood-1993 Flood. Fort Riley Cavalry Museum Archives.

Figure 37. Two buildings in the 10th Division area were driven together by the force of the Kansas River, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[96]

Figure 38. A view of submerged buildings at Camp Funston. Looking north, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[97]

96. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

97. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Figure 39. Floodwater enveloped Camp Funston, making it as far inland as Leonard Wood Drive on the north side of the cantonment. Looking south, 1951. (Image from 111-SCA-526, NARA at College Park. Public domain.)[98]

At Marshall Airfield, water crested over the south and north ends of the levee while the middle portion of the levee continued to hold back the river.[99] All personnel, including 37 families, evacuated the field before their escape routes became submerged.[100] The flood damaged most of the buildings at Marshall Airfield to some degree, severely deteriorating structures in and around the motor pool. The shops and hangers were among the only buildings that were not badly compromised.[101] The flood surrounded the dependent housing near the Kansas River and destroyed two spans of the nearby Engineering Bridge connecting Fort Riley and Marshall Airfield.[102] Officials estimated that $400,000 would be needed to repair buildings on the cantonment, $60,000 for sewage and drainage

98. Book 526, Photo 373102, RG 111, NARA at College Park, MD.

99. "Report of General Bell's Aerial Reconnaissance," July 13, 1951.

100. McConnell, "Conditions of Dependents Quarters," July 21, 1951.

101. Marcus B. Bell, meeting transcript, July 15, 1951, Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

102 D.H. Gabler, US Army Photograph 5A/47E, July 13, 1951, Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

repair, $60,000 for levee restoration, $90,000 to restore roads and runways, and $30,000 in electrical repair (Figure 40–Figure 45).[103]

Figure 40. An aerial view of Marshall Airfield after the flood of 1951. The Kansas River infiltrated the area from its south and north sides. Looking northeast, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[104]

103. Breakdown of estimated damage for Fort Riley, July 1951, Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

104. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Figure 41. An aerial view of Marshall Airfield shows that the levee immediately adjacent to the hangers remained largely intact during the flood. Looking south, 1951. (Image from 111-SCA-526, NARA at College Park. Public domain.)[105]

Figure 42. Aerial photograph over Marshall Airfield showing water surrounding the hangars. Looking north, 1951. (Image from 111-SCA-526, NARA at College Park. Public domain.)[106]

105. Book 526, Photo 374014, RG 111, NARA at College Park, MD.

106. Book 526, Photo 373101, RG 111, NARA at College Park, MD.

Figure 43. Captain Earl S. Wilson inspects damage to the battalion headquarters at Marshall Airfield, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[107]

Figure 44. The flood washed out a significant portion of the Engineering Bridge connecting Marshall Airfield with the Main Post. Looking north, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[108]

107. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

108. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

Figure 45. A view toward Marshall Airfield from the Engineering Bridge shows high water surrounding the dependent housing and a disintegrated portion of the levee. Looking east, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[109]

Flooding was not only confined to Camp Funston and Marshall Field, however. Damage also occurred at Fort Riley's lower post between the Kansas River and the Union Pacific railroad tracks. Here, the water rose to a depth ranging between 2 to 6 ft, inundating the Union Pacific station and damaging track between Fort Riley and the Republican River bridge at Junction City (Figure 46 and Figure 47).[110] The flood also restricted available supply routes into the fort. In an effort to keep supplies lines open, crews were dispatched to repair an 11-mile section of Morris Hill Road, which provided an alternate connection with US Highway 77 (Figure 48). Camp Forsyth was largely spared from the flood. Only minor flooding appears to have occurred there when a culvert tube along the levee malfunctioned. The issue was promptly remedied when members of the Officer Candidate School and 10th Division Soldiers constructed a sandbag coffer dam around the malfunctioned sector of the levee (Figure 49).[111]

109. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

110. "The 1951 Flood," RILY 4819, n.p., Box: 1951 Flood-1993 Flood. Fort Riley Cavalry Museum Archives.

111. "The 1951 Flood," RILY 4819, n.p., Box: 1951 Flood-1993 Flood. Fort Riley Cavalry Museum Archives.

Figure 46. The Union Pacific station at Fort Riley's lower post was surrounded by flood water from the Kansas River. Looking east, 1951. (Image from 111-SCA-526, NARA at College Park. Public domain.)[112]

Figure 47. The swollen Kansas River spread into the lower post (*foreground*), site of Fort Riley's Civilian Conservation Corps (CCC), Works Progress Administration (WPA), and Service School encampment during the interwar years, and Marshall Airfield (*background*). Looking east, 1951. (Image from 111-SCA-526, NARA at College Park. Public domain.)[113]

112. Book 526, Photo 373103, RG 111, NARA at College Park, MD.

113. Book 526, Photo 374019, RG 111, NARA at College Park, MD.

Figure 48. Crews work to repair a section of Morris Hill Road, which provided an alternate connection between Fort Riley and US Highway 77, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[114]

Figure 49. Members of the Officers Candidate School and 10th Infantry Division build a coffer dam around a failed culvert tube, likely at Camp Funston, 1951. (Image from 111-SCA-526, NARA at College Park. Public domain.)[115]

114. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

115. Book 526, Photo 373106, RG 111, NARA at College Park, MD.

2.3.3 Postflood Response

2.3.3.1 Restorative Measures at Camp Funston

In view of the extensive damage at Camp Funston, rumors began circulating that the cantonment was going to be abandoned. Such rumors were tempered when General Bell ordered plans for reoccupation. By July 17, 10th Division Soldiers commenced work to restore Camp Funston.[116] The first objective was using hand shovels and trucks to clean up the camp, much of which was blanketed in a thick layer of mud and silt left behind by the river (Figure 50). Initial clean-up efforts proceeded swiftly, and within a month, Camp Funston had resumed most regular operations.[117] Of the buildings that had been removed from their foundations, 80 were deemed fit for restoration.[118] Work continued at pace through the autumn; by September, the cantonment had finished 12 new buildings and restored most of its streets, and by October, it was reported that the camp had completed approximately half of its rehabilitation projects. That same month, Camp Funston received a "Superior" rating during its annual Fifth Army inspection. By March 1952, just eight months after the flood, Camp Funston's civilian engineer announced that the cantonment's rehabilitation was nearly complete. The restored camp contained "27 new buildings, 12 of which are new barracks; new classrooms; two new Confidence Courses . . . modernized service clubs; bigger and better training areas, and dozens of other new facilities."[119]

116. "The 1951 Flood," RILY 4819, n.p., Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives; Elston Brooks, "Camp Funston will Mark Anniversary of Flood Saturday," *Guidon*, July 9, 1952.

117. Lewiell Winkler, "What a Difference 8 Months Made, 240 Little Days," *Guidon*, March 12, 1952.

118. "May See Work of Engineers," *Junction City Union*, May 18, 1952.

119. Winkler, "What a Difference 8 Months Made, 240 Little Days," *Guidon*, March 12, 1952.

Figure 50. A thick layer of mud blanketed Camp Funston after the flood. Looking south, 1951. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[120]

2.3.3.2 Levee Repair and Reconstruction

Assessing Fort Riley's three levees after the flood, General Bell concluded that the levee at Camp Forsyth had sustained itself reasonably well and would not need extensive repairs. Assessing the levee at Marshall Airfield, which sustained significantly more damage than Camp Forsyth's levee, Bell surmised that it would be operational again after extensive repair. Damage to the levee at Camp Funston, however, was severe enough to necessitate large-scale replacement.[121] Funding for levee restoration at Fort Riley does not appear to be mentioned specifically in federal appropriation reports from the time. There is a possibility that some of the restoration was subsidized through military construction funds; Colonel James Moorhead, speaking on behalf of the Fifth Army during a session on military public works appropriations, speculated that some money for flood rehabilitation at Fort Riley came from military construction funds, with the

120. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

121. Marcus B. Bell, meeting transcript, July 15, 1951; Bell and Harold E. Eastwood, telephone conversation, no date, Box: 1951 Flood-1993 Flood. Fort Riley Cavalry Museum Archives.

possibility that it may have been abstracted from construction emergency funds from the previous appropriation.[122]

While officials had initially estimated $80,000 for levee restoration at Camp Funston, the undertaking ultimately resulted in a "new $2,000,000 horse shoe-shaped dyke embracing 10th Division on three sides."[123] Over 500 workers representing four engineer and construction battalions made rapid progress on the levee in order for it to be operational by the summer of 1952. In total, the revived levee ran a three-mile course around the west, south, and east sides of Camp Funston, with one and a half miles of the structure comprising restoration of the old levee and the remaining sections representing new construction. Plans called for creating a uniform levee with a 100-foot base and a 10-foot-wide crest outfitted with an access road. To satisfy this design, crews transported and shaped 650,000 yards of earth (Figure 51). As workers widened the base along existing sections of the Funston levee, they also raised the old feature by 4½ ft. In addition, plans called for an 18-inch layer of rip rap rock to blanket the levee, with the rock itself "tied in solidly with the ground through a four-foot-wide and four-foot-deep ditch which runs around the dike."[124] Finally, localized gaps in the levee permitted railroad and highway traffic to pass through on level ground. If flooding was imminent, the gaps could be infilled with sandbags.[125] Northwest of 4th Street, renovations on the east side of the levee were evidently minimal since the POW ditch adjacent to the levee does not appear to have been disturbed. If this section of the levee was widened after the flood, earth may have been added and shaped primarily on the west slope (Figure 52).

122. Committee on Appropriations, *Military Public Works Appropriations for 1952*, House of Representatives, 82nd Congress, First Session on Military Public Works Appropriations for 1952, part 1, (Washington DC: Government Printing Office, 1951), 766.

123. Lewiell Winkler, "New Dyke May Save Another Extended Bivouac for Division," *Guidon*, March 6, 1952.

124. Winkler, "New Dyke May Save Another Extended Bivouac for Division."

125. Winkler, "New Dyke May Save Another Extended Bivouac for Division."

Figure 51. Postflood restoration of the Funston levee as depicted in the *Guidon*, 1952. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[126]

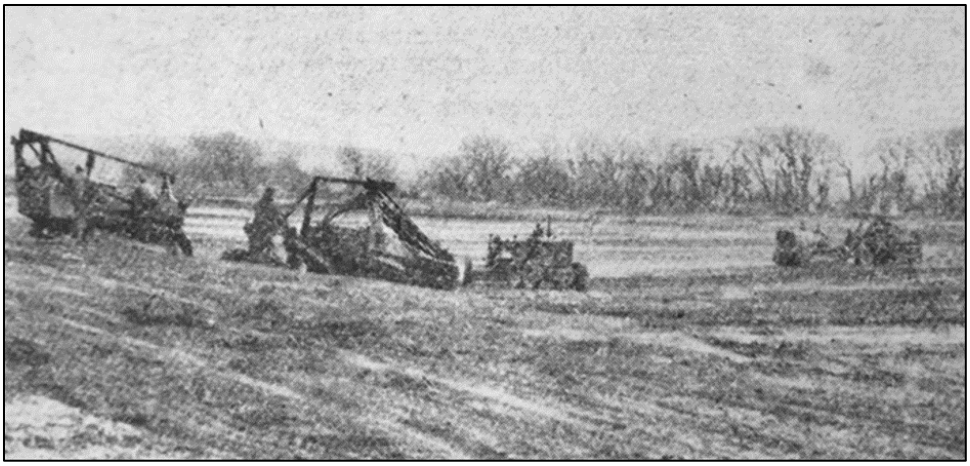
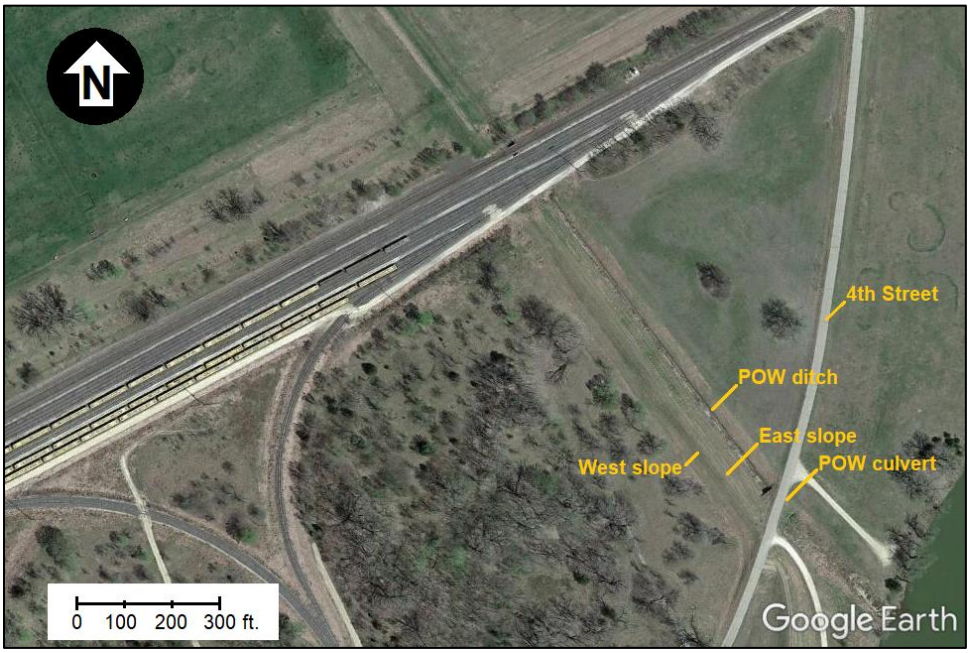


Figure 52. Satellite imagery showing the east side of the Funston levee northwest of 4th Street. (Map data: Google, 2019. Identification text, north arrow, and legend added by ERDC-CERL.)



The west side of the Funston levee "horseshoe" was finished in May 1952 by cutting a new channel for Three Mile Creek (which ran just to the west of Camp Funston), infilling the old channel, and building a new levee over the former streambed. When work concluded, the new channel followed a 3,000-foot course to the west of the old channel, allowing the new levee to be moved to the west too. This transposition increased training space at

126. Winkler, "New Dyke May Save Another Extended Bivouac for Division," *Guidon,* March 6, 1952, Fort Riley Cavalry Museum Archives.

Camp Funston and allowed crews to "straighten and shorten the dike by some 100 yards."[127]

Through the efforts of the 998th Engineer Construction Battalion, renovations on Marshall Airfield's levee were also underway during the summer of 1952. While the goal for repairing Marshall Airfield's levee was largely the same as at Camp Funston (such as raising the existing feature, widening its base, and making other repairs as necessary), the overall scope of damage was not as severe. The job included adding 300 ft to the levee's upstream end, widening the northeast side of the levee to 30 ft and placing a road on its crest, applying new riprap, and replacing concrete drainage pipes with metal piping.[128] In addition to repairing the levee, a temporary pontoon bridge was constructed to replace the washed-out Engineer Bridge connecting Marshall Airfield with the Main Post. On completion, the new structure became the longest pontoon bridge in the United States (Figure 53).[129]

Figure 53. Vehicles begin crossing the newly constructed pontoon bridge between Marshall Airfield and the Main Post, c. 1952. (Image from Fort Riley Cavalry Museum Archives. Public domain.)[130]

127. "Three Mile Creek Moves in New Channel," *Guidon*, May 7, 1952.

128. "Marshall Field Levee under Reconstruction," *Guidon*, June 18, 1952.

129. "Save Ponton Bridge from Flood Menace," *Junction City Union*, September 8, 1951.

130. Box: 1951 Flood-1993 Flood, Fort Riley Cavalry Museum Archives.

By February 1953, a report from Fifth Army Headquarters indicated that the levee work at Camp Funston and Marshall Airfield was nearly complete. Because members of the 998th Construction Battalion were sent overseas earlier in the month, workers from the Bayer Construction Company in Manhattan were assigned to finish the work. On completion, Camp Funston's new levee measured 17,600 linear feet (lin ft), and Marshall Airfield's restored levee measured 14,000 lin ft. The levees were raised an average of 4 ft above their former height.[131]

2.3.4 Levee Alterations After 1951

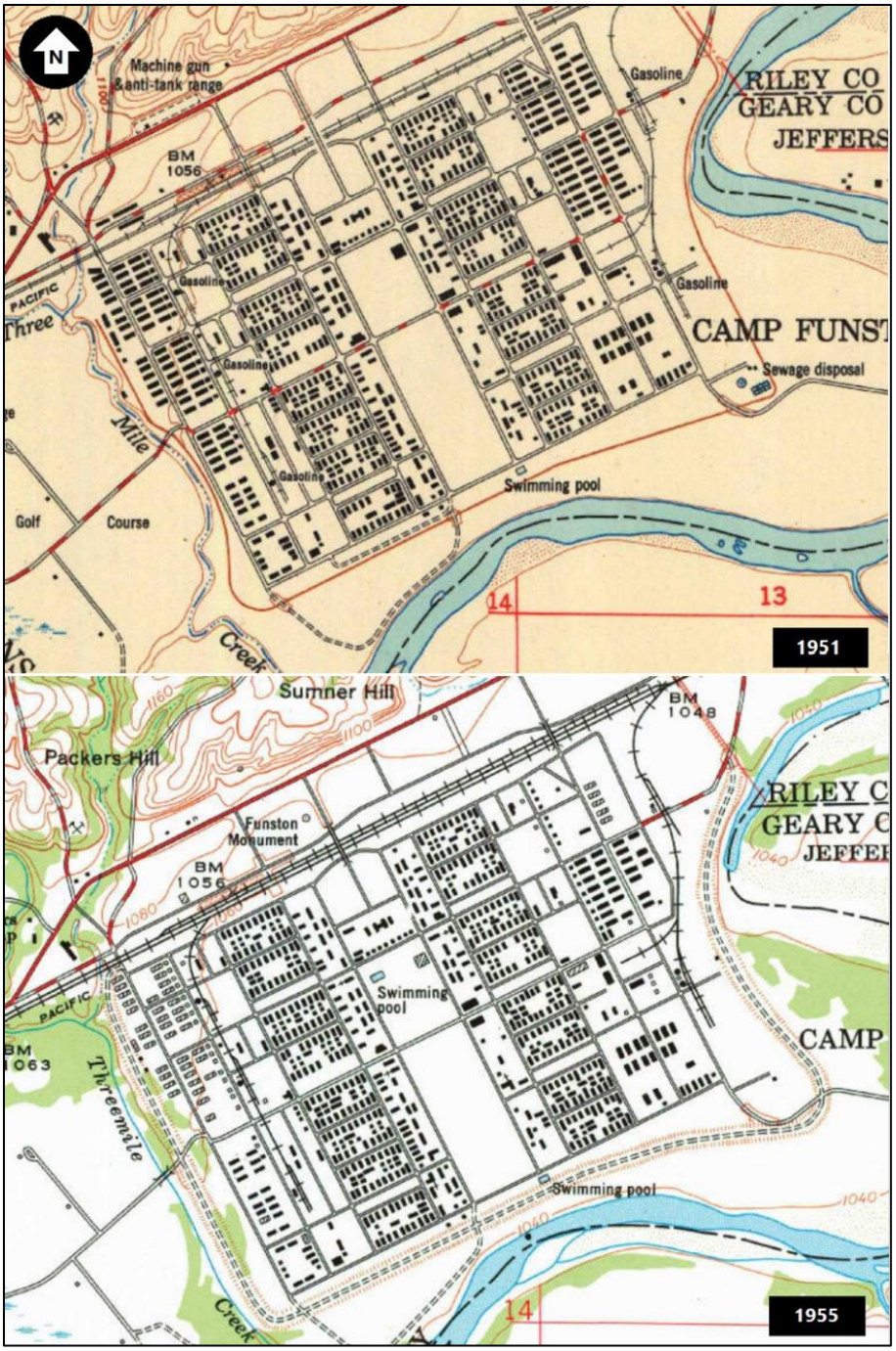
Cartographic evidence and real property records indicate that the levees at Fort Riley have been altered since the 1950s. After the flood of 1951, the levee surrounding Camp Funston was lengthened and straightened, but a 1955 USGS map indicates that the structure followed a path similar to its preflood arrangement (Figure 54). As part of a later renovation, the southeast corner of the levee was extended toward Highway 18, likely in the mid-1970s. In 1973, a resolution was passed to reposition Highway 18, which had until that time followed a route through Fort Riley. The new highway would be laid between I-70 and Ogden, bypassing Fort Riley, and pass in close proximity to the southeast corner of Camp Funston.[132] It is probable that the Funston levee was extended at this time to intersect the elevated roadbed of the new highway. This development seems to be depicted on a 1955 USGS map with 1978 annotations but does not show up on a 1974 topographic map, suggesting that the levee expansion may have taken place between 1974 and 1978 (Figure 55 and Figure 56). Around 2010, 12th Street between Camp Funston and Highway 18 was extended to the east to interact with a new interchange (Figure 57 and Figure 58).[133] This road is situated on an elevated grade that connects to the southeast corner of the Funston levee, but it is not apparent that this elevated roadbed is officially considered an extension of the levee itself.

131. "City Firm Will End Fort Flood Work in Month," *Manhattan Mercury*, February 18, 1953.

132. Kansas Department of Transportation, "Resolution for Relocation and Redesignation of Road in Geary County, Riley County," May 9, 1973, State Highway Commission of Kansas, https://kdotapp.ksdot.gov/RuralResolutions/RuralResolutions.aspx.

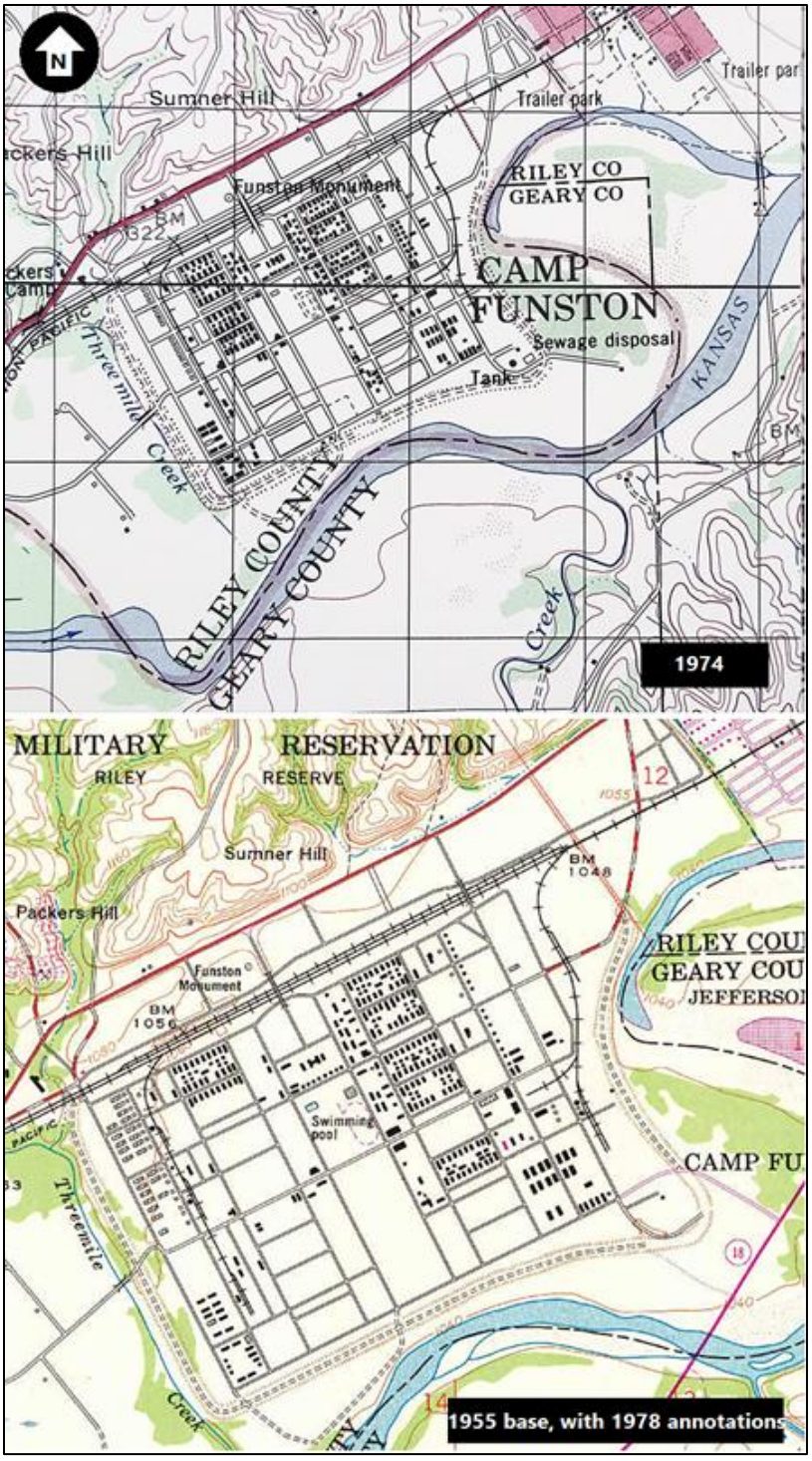
133. Kansas Department of Transportation. *Kansas Map Changes: 2010 Annual Report*, Interchange, Project K 6796-02, November 19, 2010, 9, https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burTransPlan/maps/mapchangehist/2010KSmapCHANGES.pdf.

Figure 54. *Ogden Quadrangle*, 1951 and 1955. (USGS 7.5-minute topographic map. Image from National Geologic Map Database. Dates and north arrow added by ERDC-CERL. Public domain.)[134]



134. USGS, *Ogden Quadrangle,* 1951; 1955, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

Figure 55. *Manhattan Quadrangle*, 1974. (Image from ERDC-CERL Landscape Lab collection. Public domain.) *Ogden Quadrangle*, 1978. (Image from National Geologic Map Database. Public domain.)[135]



135. USGS, *Manhattan Quadrangle,* 1974, 15-minute topographic map, Landscape Lab collection, CERL; USGS, *Ogden Quadrangle*, 1978, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

Figure 56. *Ogden Quadrangle*, 1982. (Image from National Geologic Map Database. Public domain.)[136]

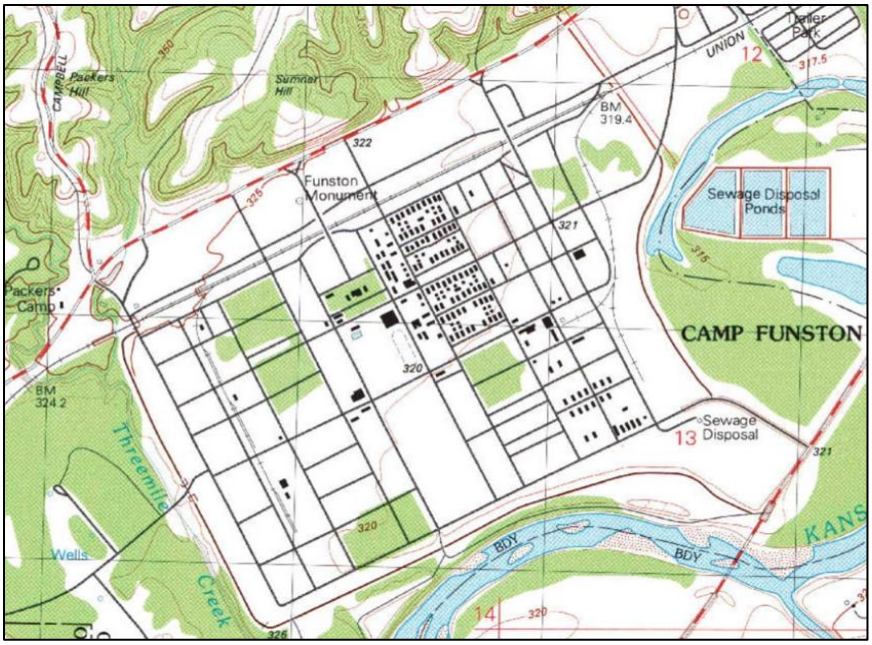
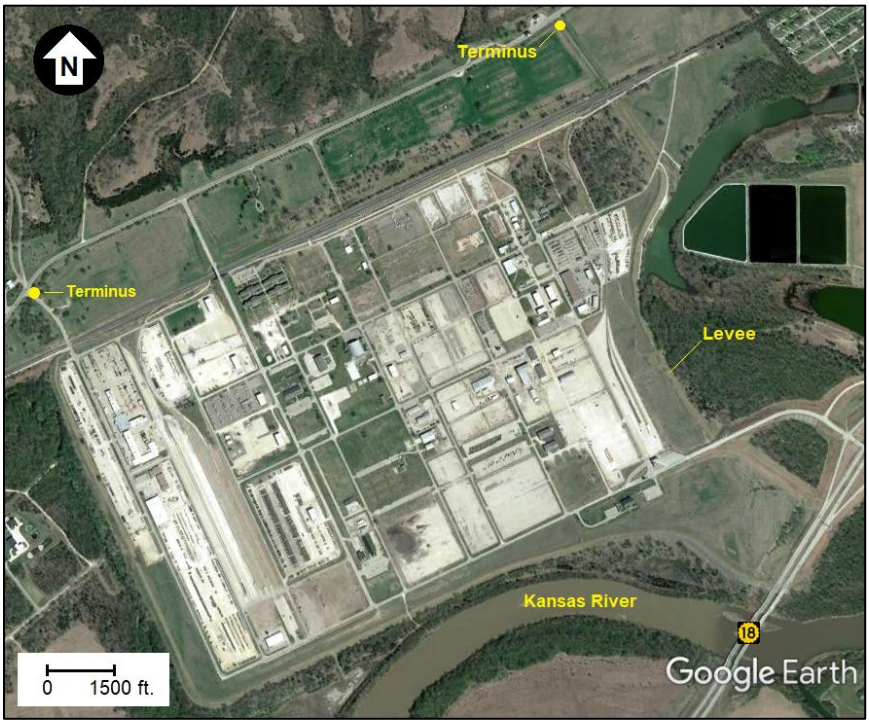
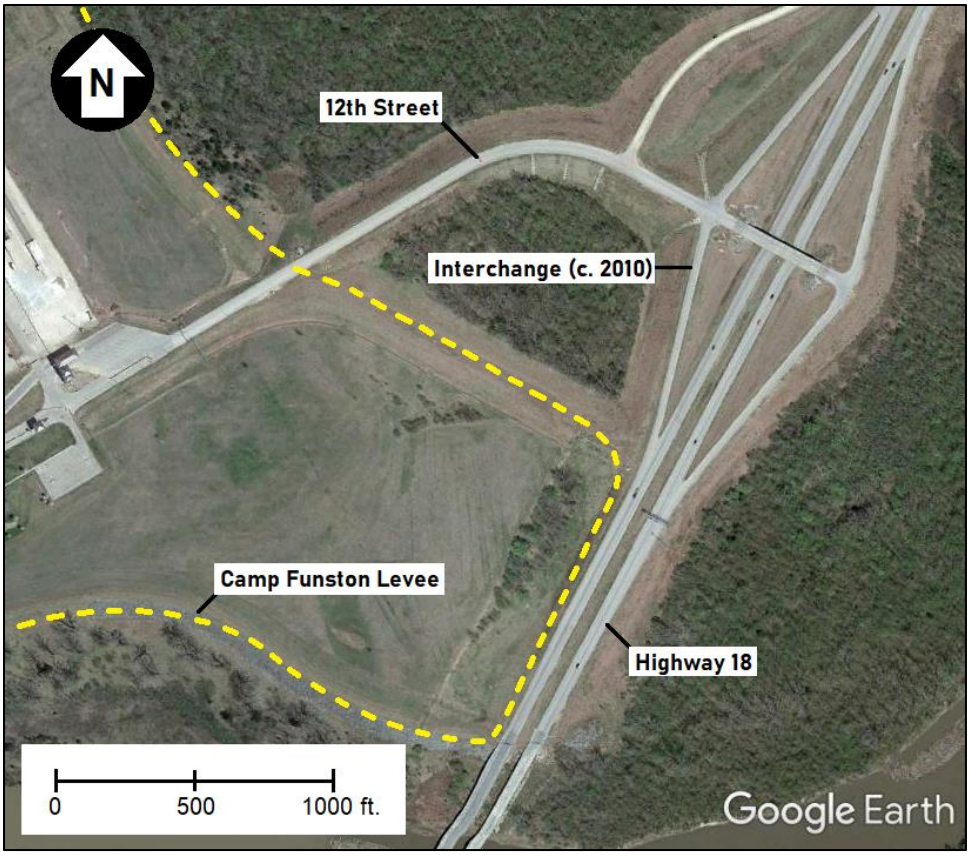


Figure 57. Satellite view depicting the present-day levee around Camp Funston. (Map data: Google, 2019. Modified by ERDC-CERL, 2023.)



136. USGS, *Ogden Quadrangle*, 1982, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

Figure 58. Satellite view depicting the extension between 12th Street and the new Highway 18 interchange. (Map data: Google, 2019. Modified by ERDC-CERL, 2023.)



A real property voucher from 2002 (RP049-02) indicates that the Funston levee was enlarged by 1,240 lin ft in 1993 (readjusted in 2002 as 1,500 lin ft), but it is unclear from this document what the project entailed.[137] A real property voucher from 1993 (RP18-93) seems to bring some clarity to this apparent enlargement.[138] That year, two earthworks totaling 1,240 lin ft were constructed as a capital improvement project to retard flooding in the eastern portion of training area 26.[139] Sometime between 1993 and 2002, the total linear feet for the earthworks in training area 26 were incorpo-

137. Real property voucher RP049-02, July 29, 2002, Fort Riley real property records.

138. Real property voucher RP18-93, 1993, Fort Riley real property records.

139. Although these structures were labeled as dams in the 1993 property voucher, ostensibly, they did not meet the minimum qualifications to be considered as dams in the 2003 National Dam Inventory. Currently, only two structures are officially classified as dams at Fort Riley, Moon Lake dam and Breakneck Lake dam.

rated into the total linear measurement for all the levees on the installment. This increased the total from 47,800 lin ft of levees to 49,040 lin ft of levees, a change of 1,240 lin ft.

It seems the individuals who completed the real property voucher in 2002 did not realize the additional 1,240 lin ft were from the two earthworks constructed in training area 26. Instead, they evidently assumed that this 1,240 lin ft was a mistaken measurement of a segment added to the Funston levee between 12th Street and Highway 18. After measuring that segment of the levee as 1,500 lin ft in a field survey, they stated that "1,240 [lin ft] was an inadequate prior adjustment" and amended the total measure of levees on the installment to 49,300 lin ft instead of 49,040 lin ft. This confusion is understandable, given that the linear measurement of the earthworks was classified into the total lin ft figure for levees at some point between 1993 and 2002. In all probability, the increase of 1,500 lin ft measured in 2002 was not the result of work completed in 1993 but is actually attributable to the extension of the levee's southeast corner between 1974 and 1978. A real property record update from 2002 states that the Funston levee is currently 19,400 lin ft.[140]

Not only has the levee around Camp Funston been altered since the flood of 1951, but the built environment in Camp Funston itself has changed considerably over the past 70 years. While the gridded street layout has remained intact, most of the tightly packed, mobilization-type buildings that populated Camp Funston at the time of the flood have been removed by the early 1980s. Today, Camp Funston is largely characterized by open, paved lots and scattered service buildings.

In 2020, Geotechnology, Inc. conducted a series of borings near gravity drain 4 on the northeast segment of the Funston levee and near gravity drain 5 on the southeast segment. Borings at both locations terminated at approximately 30 ft, and encountered a mostly homogeneous composition of silt, clay, and sand. No features from Camp Funston's WWI-era cantonment were encountered during these probes.[141]

The path of the levee at Marshall Airfield has also been altered since the flood of 1951; cartographic evidence indicates that the southwest side of

140. "Dykes or Dams." General Ledger Account 1721. Fort Riley real property records.

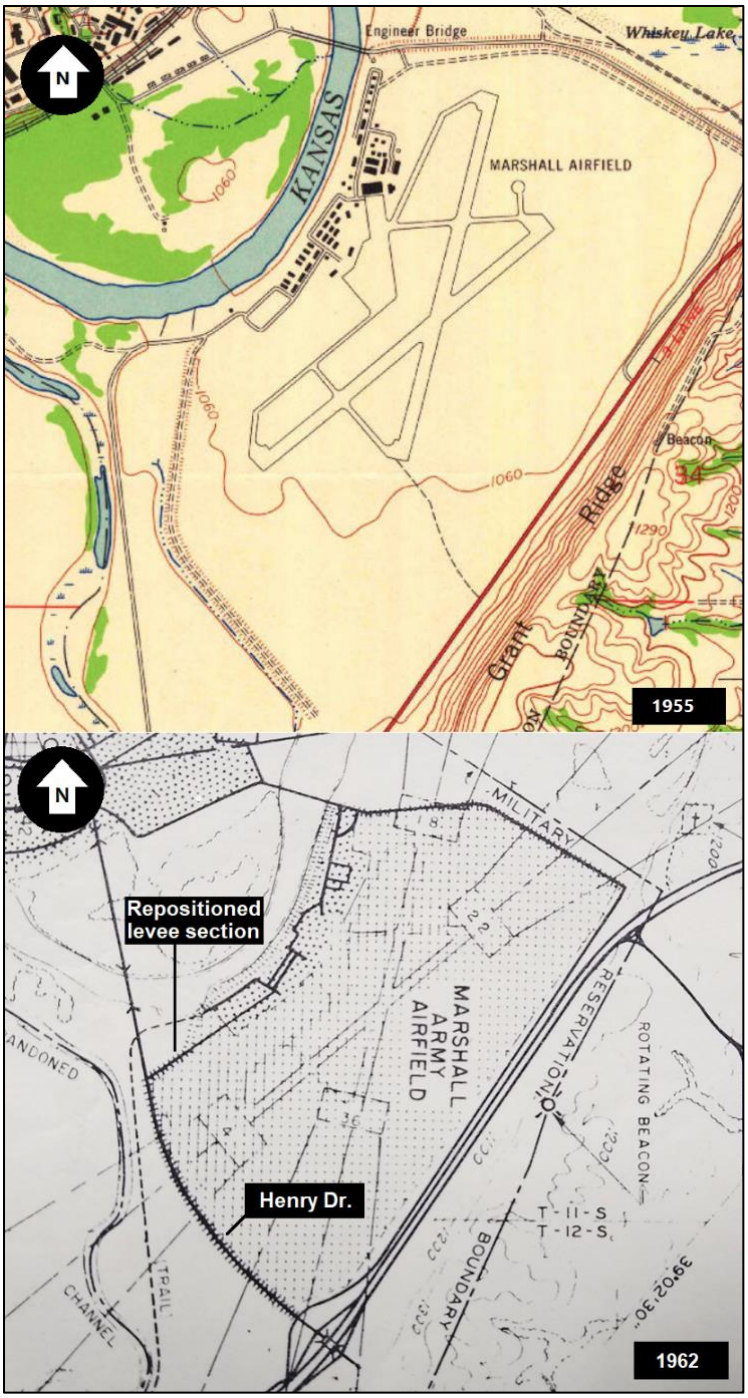
141. Gravity drains 4 and 5 boring locations, Logs of Borings B-26 through B-31, 2020. Fort Riley CRM.

the levee was incorporated into the elevated roadbed of Henry Drive between 1955 and 1962 (Figure 59). This modification to the levee likely occurred with the construction of I-70, which was completed to the southeast of Marshall Airfield between 1958 and 1960.[142] The I-70 interchange into Fort Riley (via Henry Drive on a raised roadbed) was likely completed with the interstate, prompting the levee alteration between 1958 and 1960. Today the levee continues to protect Marshall Airfield from three sides (Figure 60). Real property information states that Marshall levee is 15,100 lin ft (1988).[143]

142. Kansas Department of Transportation, *1957–58 Kansas State Highway Map*, 1958, https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burTransPlan/maps/HistoricStateMaps/1957-58Mapside.pdf; Kansas Department of Transportation, *1960–61 Kansas State Highway Map*, 1961, https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burTransPlan/maps/ HistoricState-Maps/1960Mapside.pdf.

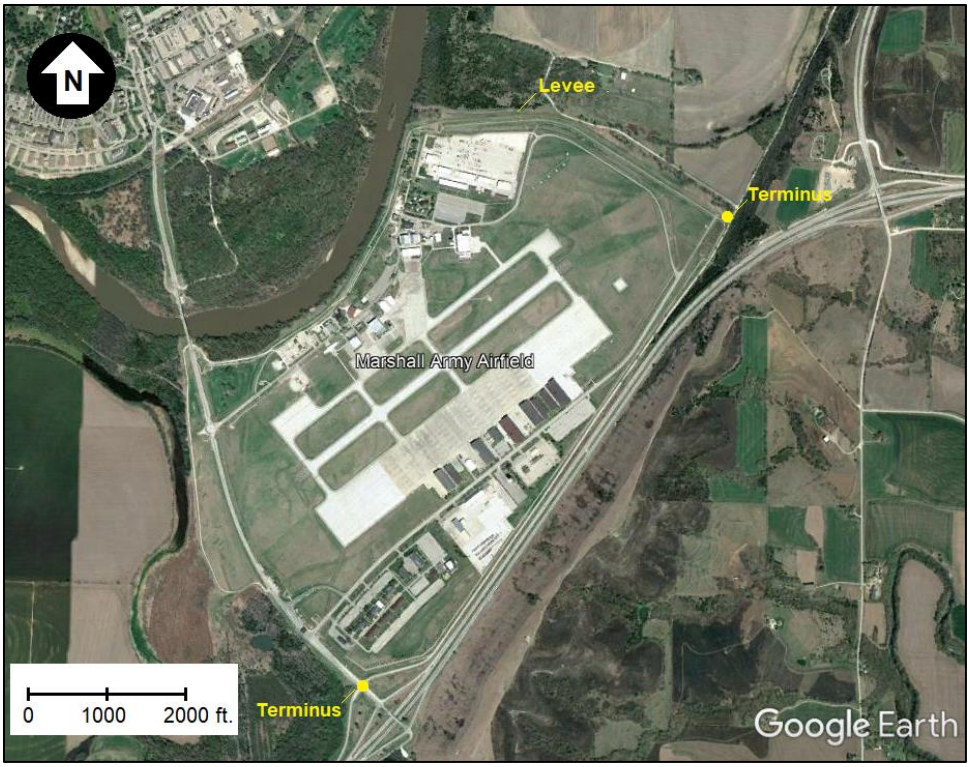
143. "Dykes or Dams," General Ledger Account 1721, Fort Riley real property records.

Figure 59. *Junction City Quadrangle*, 1955. (Image from National Geologic Map Database); *Reservation Boundary & Land Use Map*, 1962. (Image from Fort Riley Cavalry Museum Archives. Modified by ERDC-CERL, 2023. Public domain.)[144]



144. USGS, *Junction City Quadrangle*, 1955, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00; *Reservation Boundary & Land Use Map*, 1962, map collection, Fort Riley Cavalry Museum Archives.

Figure 60. Satellite view depicting the present-day levee around Marshall Airfield. (Map data: Google, 2019. Modified by ERDC-CERL, 2023.)



Though there was at least one proposal in the 1970s to reconfigure the eastern side of Camp Forsyth's levee around a water treatment plant, it appears that this plan never materialized (Figure 61). For the most part, the levee seems to maintain much of the same course as it did in the 1940s, although development within Camp Forsyth itself has changed the camp markedly over the years (Figure 62–Figure 64). Real property information states that the Forsyth levee is 14,800 lin ft (1988).[145]

Like Camp Funston, the built environment at Camp Forsyth has changed considerably over the past 70 years. While the gridded street layout has remained intact in some areas, the mobilization-type buildings that populated Camp Forsyth at the time of the flood have been removed. Today, Camp Forsyth encompasses the Fort Riley Main Exchange, a commissary, and a sizable residential sector containing newer duplexes.

145. "Dykes or Dams," General Ledger Account 1721, Fort Riley real property records.

Figure 61. *Future Development Plans, General Site Plan, Camp Forsyth East Area*, 1977. (Image from ERDC-CERL Landscape Lab collection. Public domain.)[146]

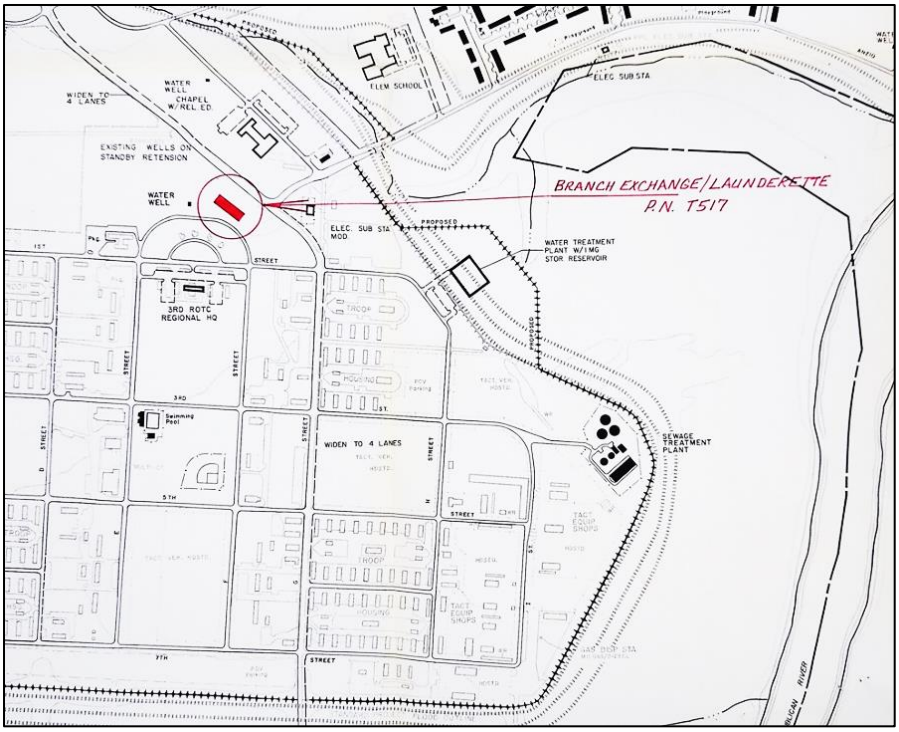
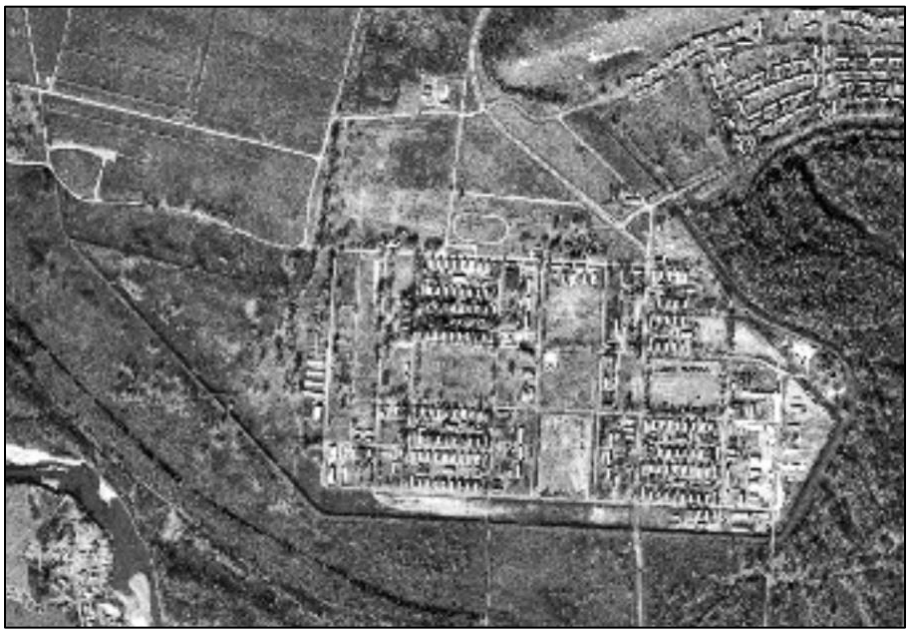


Figure 62. *Camp Forsyth 1978 Aerial*. (Image from Fort Riley DPW. Public domain.)



146. Higginbotham and Associates, *Future Development Plans, General Site Plan, Camp Forsyth East Area*, March 1, 1977, Drawing No. 18-04-08, ERDC-CERL Landscape Lab collection.

Figure 63. *Junction City Quadrangle*, 1982. (Image from National Geologic Map Database. Public domain.)[147]

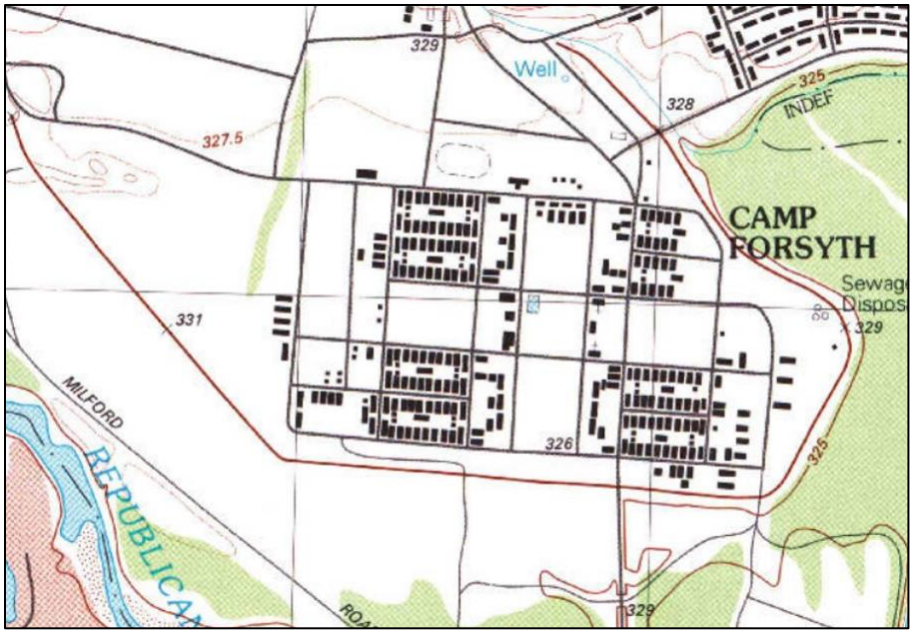


Figure 64. Satellite view depicting the present-day levee around Camp Forsyth. (Map data: Google, 2019. Modified by ERDC-CERL, 2023.)

147. USGS, *Junction City Quadrangle*, 1982, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

2.4 Fort Riley Dams

According to the *Federal Guidelines for Dam Safety*, a dam is generally considered an "artificial barrier . . . 25 ft or more in height from the natural bed of the stream . . . to the maximum water storage elevation or . . . has an impounding capacity at maximum water storage elevation of 50 acre ft or more."[148] In 2003, an installation inventory identified two dams at Fort Riley satisfying that definition, one at Breakneck Lake (LAK01) and the other at Moon Lake (LAK04).[149] In 1993, two additional earthworks (identified as dams in a real property voucher from the same year) were constructed on the east side of training range 26, creating Dale Pond (PND10) and Goens Pond (PND13).[150] Although labeled as dams in the 1993 property voucher, they ostensibly did not meet the minimum qualifications to be officially considered as dams when the 2003 installation inventory occurred (Figure 65).

148. FEMA (Federal Emergency Management Agency), *Federal Guidelines for Dam Safety* (Washington, DC: US Department of Homeland Security, 2004), 4.

149. National Dam Inventory, Fort Riley, Kansas, June 2003, 2, Fort Riley real property records.

150. Real property voucher RP18-93, 1993, Fort Riley real property records.

Figure 65. Satellite view depicting the two water control structures adjacent to Dale Pond and Goens Mile Pond in training area 26. (Map data: Google, 2019. Modified by ERDC-CERL, 2023.)

Newspaper articles indicate that Moon Lake and its accompanying dam were constructed during a hunting and fishing improvement campaign at Fort Riley in the late 1950s and early 1960s and primarily existed for recreational use rather than a means of flood control. Construction on Breakneck Lake and its accompanying dam likely began in 1950 and was initially intended for water conservation. Over the years, the resulting lake was employed for general recreation and periodic training purposes.

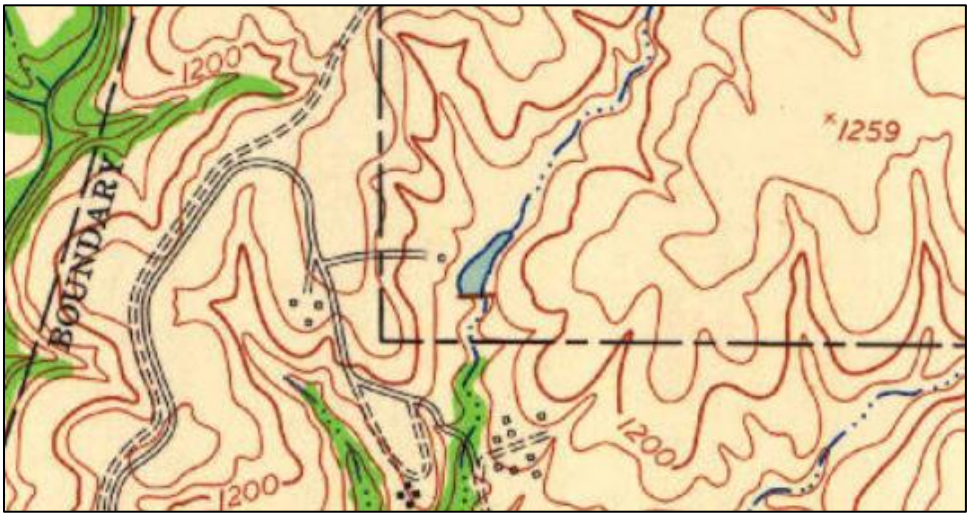
2.4.1 Breakneck Lake Dam (DAMBL), 1950

As with Moon Lake dam, real property records indicate that Breakneck Lake dam was put into service in 1952.[151] In actuality, the dam and its accompanying lake were constructed in 1950 as part of a water storage and conservation program at Fort Riley. Built by the 84th Engineer Construction Battalion, the dam was primarily composed of clay sand and measured 60 ft thick at its base and 12 ft thick at its crest. The completed dam was designed to front approximately 97,000 cubic yards of water. Approximately 14,800 cubic yards of earth were extracted to create an impervious clay basin for Breakneck Lake, which was filled by eight springs. The lake

151. Real Property Asset—20605 DAMBL, Fort Riley real property records.

was named after Breakneck Canyon. According to post historian Robert Smith, the canyon may have earned its name because cavalry troopers were required to descend its steep embankment to graduate cavalry school.[152] According to an article in the *Junction City Daily Union*, the lake was part of a "long range conservation scheme . . . for the construction of over half a dozen such reservoirs on the Post." The article also noted that the construction of reservoirs on the installation could help "fight the many brush fires that char the hillsides during dry spells and threatens military or civilian homes on the perimeter of the post."[153] A topographic map from 1955 depicts the completed dam and lake (Figure 66).

Figure 66. *Junction City Quadrangle*, 1955. (Image from National Geologic Map Database. Public domain.)[154]



The *Junction City Daily Union* published another article about the new lake on 27 June 1951—just two weeks before that summer's destructive flood. While this article mentions Breakneck Lake's usefulness as a water conservation resource, it also emphasizes that it was planned concurrently with another reservoir, Three Mile Lake, to expand recreational opportunities on the installation (it is uncertain if Three Mile Lake was ever completed). The article states that Breakneck Lake, "built by the 84th Engineers as a construction problem," was stocked in the summer of 1950 and would soon be ready for use.[155] For unknown reasons, the opening of Breakneck Lake for fishing use appears to have been delayed throughout

152. Email correspondence with Robert Smith, March 31, 2022.

153. "Build Lake at Fort," *Junction City Daily Union*, June 12, 1950.

154. USGS, *Junction City Quadrangle*, 1955, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

155. "Aid Fort Riley Game." *Junction City Daily Union*, June 27, 1951.

the decade. Newspaper articles suggest that Breakneck Lake was stocked again in 1959 and opened for fishing and other recreation in 1961.[156] The lake continues to be stocked annually with various kinds of fish.[157] In addition to recreational use, Breakneck Lake has also been employed for periodic water training exercises incorporating slides, rope bridges, and rope drops.[158]

Installation management specifications from 2003 indicate that Breakneck Lake dam has a structural height of 26 ft (one foot above the minimum height requirement for classification as a dam per the *Federal Guidelines for Dam Safety*) and is 375 ft in length (Figure 67).[159] An article in the *Junction City Daily Union* from 1971 indicates that work had been performed on the dam at least once before the 2003 specifications were documented. The piece mentions that Company C of the 97th Engineer Battalion restored the dam, which included the construction of an underground seepage drainage system and a spillway. This restoration allowed the water level at Breakneck Lake to be raised 2½ ft.[160] Additional outlet repairs were proposed for the dam in 2019 and 2020, including the installation of new erosion pipes, a concrete headwall, and concrete ditch liner.[161]

156. "New Lake Attracts Post Fishermen," *Fort Riley Post*, July 7, 1961.

157. Review comment, Theresa de la Garza. December 29, 2021.

158. "Engineer Units at Post Busy with Projects That Only They Can Do," *Junction City Union*, June 12, 1971; "Slide for Life," *Junction City Union,* June 30, 1971; "Fort Riley Unit Practicing Water Survival on Post," *Junction City Union*, May 14, 1974.

159. National Dam Inventory, Fort Riley, Kansas, June 2003, 2, Fort Riley real property records.

160. "Engineer Units at Post Busy with Projects That Only They Can Do," *Junction City Union*, June 12, 1971.

161. "Breakneck Dam Outlet Repairs," 2019–2020, Project No. F9-00010-9J, Fort Riley Directorate of Public Works.

Figure 67. Satellite view depicting Breakneck Lake and its accompanying dam. (Map data: Google, 2014. Modified by ERDC-CERL, 2023.)

2.4.2 Moon Lake Dam (DAMML), 1960

Fort Riley initiated a fish and game wildlife program in 1959, which, in part, placed "special emphasis on the construction of lakes for better fishing and the improvement of game habitat."[162] Hunting and fishing were popular pastimes on the installation; in 1960, for example, around 2,000 permits were issued to Fort Riley personnel for such activities.[163] As part of the wildlife improvement program, officials outlined a plan to construct a new 10-acre lake within the installation's boundaries each year until 1965.[164] Although real property records indicate that Moon Lake dam was installed in 1952, Fort Riley newspaper articles suggest that construction of the dam began in 1959 as a way of creating new fishing and hunting opportunities on the installation.[165] Crews finished Moon Lake in 1960.[166]

Construction of the lake and dam was spearheaded by A Company of the 1st Engineers. According to the *Fort Riley Post*, this company was "given the training mission of earth filling and the dam responsible for the lake

162. "Kansas State Game Commission Oks Hunting Seasons for Post Reservation," *Fort Riley Post*, September 1, 1961.

163. "Kansas State Game Commission Oks Hunting Seasons for Post Reservation," *Fort Riley Post*, September 1, 1961.

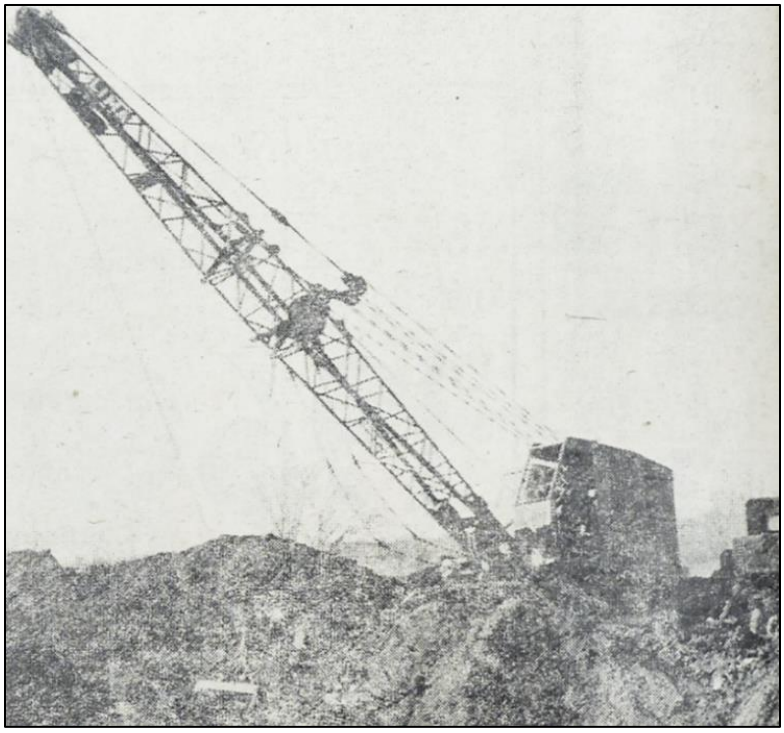
164. "New Lake Attracts Post Fishermen," *Fort Riley Post,* July 7, 1961.

165. Real Property Asset—20605 DAMML, Fort Riley real property records; "Lake Construction," *Fort Riley Post*, December 31, 1959.

166. "Camp Moon Offers Beauty, Seclusion," *Fort Riley Post*, June 29, 1962.

resulted" (Figure 68).[167] Plans called for the removal of approximately 80,000 yards of earth to create the lake, which would hold an estimated 20 million gallons of water.[168] Two years after its completion, Moon Lake reportedly contained a surface area of nine acres. By then, it was noted as one of seven fishing spots on the installation, which included three man-made bodies of water: Breakneck Lake (LAK01), Beaver Pond (PND02), and Rimrock Pond (PND21), and three oxbow lakes (Funston Lake [LAK02], Marshall Field Lake [LAK04], and Whitside Lake [LAK05]).[169]

Figure 68. Machinery shaping earth for Moon Lake dam, as seen in the 31 December 1959 edition of the *Fort Riley Post*. (Image from Fort Riley Cavalry Museum Archives. Public domain.)



167. "Camp Moon Offers Beauty, Seclusion," *Fort Riley Post*, June 29, 1962.

168. "Lake Construction," *Fort Riley Post*, December 31, 1959.

169. "New Fishing Lake Planned Here," *Fort Riley Post*, April 27, 1962.

Over the years, Moon Lake became a popular spot for various recreational activities. Through the remainder of the 20th century, the lake and its surrounding park has hosted Boy and Girl Scout activities, picnics, and community fishing events.[170]

According to 2003 installation management specifications, Moon Lake dam has a structural height of 25 ft (meeting the minimum height requirement for classification as a dam per the *Federal Guidelines for Dam Safety*) and is 500 ft in length.[171] The dam has been renovated since the 2003 specifications. A construction project in 2010 resulted in the addition of a 67-foot drainage ditch, spillway improvements, reshaping of the upstream and downstream dam faces, new piping, and new riprap (Figure 69).[172] Further general maintenance was proposed in 2019, including resealing joints, repairing riprap along the spillway, and removing unwanted debris and vegetation.[173]

170. "Site of Boy Scout Camporee Changed," *Junction City Union,* May 5, 1967; "General Visits Scouts," *Junction City Union*, July 19, 1963; "AUSA's Big Red One Week Picnic Tickets Available," *Junction City Daily Union,* May 21, 1979; "Fishing Clinic Set for Seniors," *Junction City Daily Union*, September 29, 1995.

171. National Dam Inventory, Fort Riley, Kansas, June 2003, 2, Fort Riley real property records.

172. Real Property Record, Moon Lake Dam, Project No. W912DQ-09D-1014, Fort Riley real property records.

173. "Moon Lake Dam Repairs," Project No. F2-00009-9J, 2019, Fort Riley DPW.

Figure 69. Satellite view depicting Moon Lake and its accompanying dam. Note the improved spillway branching off the southeast side of the dam. (Map data: Google, 2014. Modified by ERDC-CERL, 2023.)

2.4.3 Artificial Ponds and Associated Earthworks

There are 31 ponds in Fort Riley's real property inventory. (Figure 70–Figure 71). Specifications from a 1990s-era property card and satellite imagery suggest that several of these ponds were artificially constructed with small earthworks.[174] Because the 2003 inventory only mentions two dams at Fort Riley, the additional pond earthworks are ostensibly too small to be considered formal dams. Additionally, satellite imagery indicates that there may be more artificial ponds at Fort Riley than the 31 documented in the real property inventory. While the installation constructed several of the ponds, others in the inventory may have been constructed as farm ponds and become part of Fort Riley as the installation expanded in the 20th century. These features did not develop under circumstances related to the formal dams and levees found at Fort Riley. Therefore, a separate historic context is required to evaluate the development of artificial ponds and earthworks in detail.

174. "Facility No. PPDS90," General Ledger Account 1715, Fort Riley real property records.

Figure 70. Locations of inventoried ponds throughout Fort Riley. (Map data: Google, 2022. Modified by ERDC-CERL, 2023.)

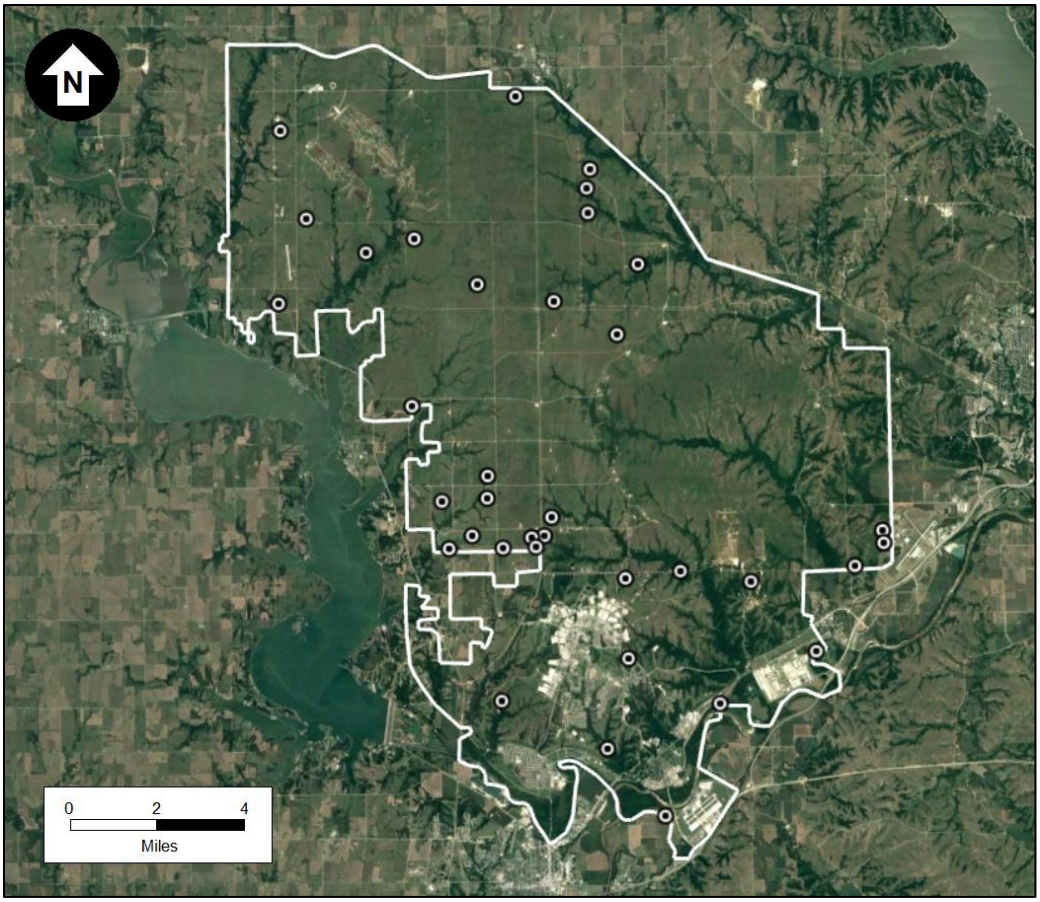


Figure 71. Nowlan Pond (PND18) is a typical example of the artificial ponds and earthworks found at Fort Riley. (Map data: Google, 2022. North arrow and legend added by ERDC-CERL.)

3 Current Conditions of Levees at Fort Riley

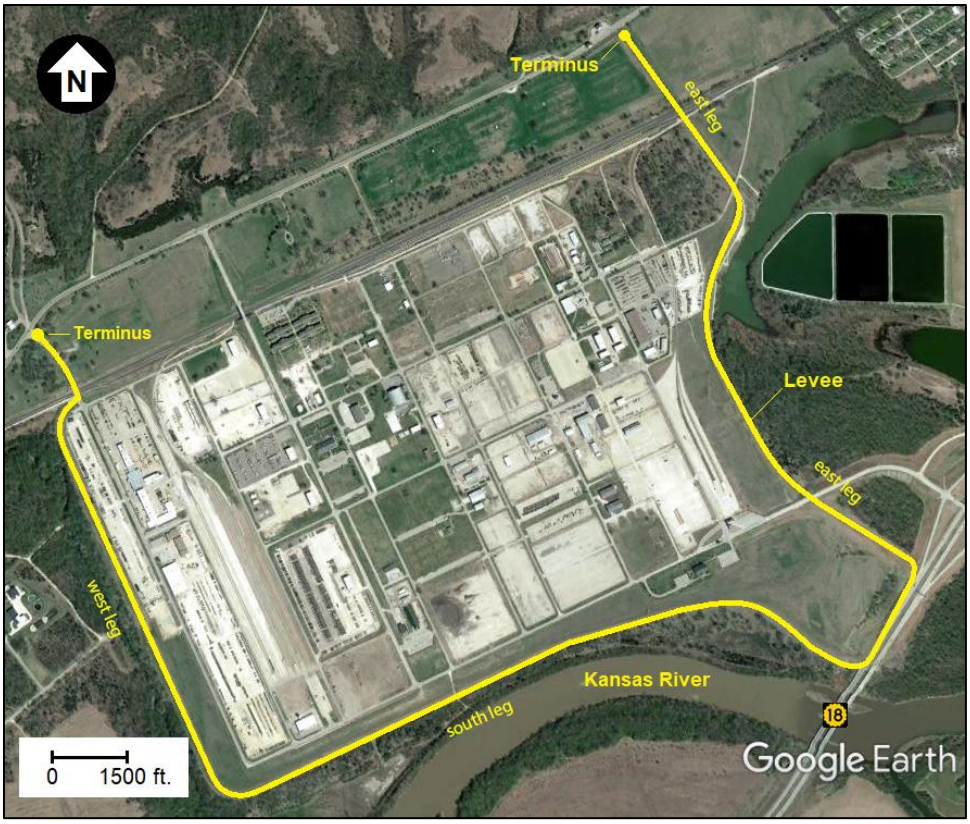
Three levees were inventoried and evaluated for the purpose of the report: the Camp Funston levee (1917–1981, 1941, and 1951), Marshall Airfield levee (1941), and Camp Forsyth levee (1941).

3.1 Camp Funston Levee

The massive flood of 1951 severely compromised the levee at Camp Funston, causing major damage to the cantonment. Following the disaster, the levee at Camp Funston was fortified to withstand another flood of equal magnitude. The following discussion is describing the current condition of the levee. The earthen, U-shaped Camp Funston levee wraps around Camp Funston and buffers the east bank of Three Mile Creek. The levee proceeds across the southern portion of Ogden Flats and continues northward near the bank of the Kansas River.

The east leg of the levee from Huebner Road to the Union Pacific railroad tracks is approximately 1,015 ft long. The east leg of the levee from the Union Pacific railroad tracks to 4th Street is approximately 837 ft long. The east leg of the levee from 4th Street (wrapping around the entire east side of Camp Funston) to 12th Street is approximately 3,530 ft long. The southeast portion of the levee that juts out from the Huebner gate and encompasses the land between the gate and Highway 18 and connects back to the south leg of the levee is approximately 5,280 ft long. The south leg of the levee is approximately 4,630 ft long. The west leg of the levee is approximately 4,460 ft long to the railroad track. The west leg of the levee that extends north of the Union Pacific railroad tracks toward Huebner Road and running adjacent to A Street is approximately 721 ft long. The levee has an approximate length of 20,473 lin ft (Figure 72).

Figure 72. Satellite view depicting the present-day levee around Camp Funston. (Map data: Google, 2019, with yellow text, yellow boundary line, north arrow, and legend added by ERDC-CERL.)



The majority of the levee is kept mowed with little hardwood vegetation or invasive vegetation on the levee to damage or imped the proper function of the levee. The northern termination point of the east leg is near the Huebner gate (Figure 73). The north section of the east leg has a chain-link boundary fence running parallel on the east side of the levee. The east leg is cut by the intersection of the Union Pacific railroad tracks (Figure 74). The crest of the east leg is wide enough for authorized vehicles, although not graveled or paved (Figure 75, Figure 76, and Figure 78). Fourth Street (extension) is a paved road that crosses over the south portion of the east leg (Figure 77). The east leg bends around Funston Lake (Figure 79). A gravel road runs at the base of the levee on the east side (Figure 80). After the bend, the east leg of the levee continues to the south with heavy forested vegetation on the east side (Figure 81). Near the south portion of the east leg on the east side of the levee is a newer drainage system (Figure 82).

Figure 73. Looking southwest toward the north end of the east leg of the Camp Funston levee, near the Ogden gate entrance. (Photo by ERDC-CERL, 2021.)

Figure 74. Looking southwest on the south side of the Union Pacific railroad tracks where the Camp Funston levee breaks. (Photo by ERDC-CERL, 2021.)

Figure 75. Looking southeast at the west side of the east leg of the Camp Funston levee. (Photo by ERDC-CERL, 2021.)

Figure 76. Looking southeast on top of the Camp Funston levee toward the river. (Photo by ERDC-CERL, 2021.)

Figure 77. Looking south toward the bend in the Camp Funston levee and where 4th Street (extension) crosses the east leg. (Photo by ERDC-CERL, 2021.)

Figure 78. Looking northwest from 4th Street toward the east leg of the Camp Funston levee. (Photo by ERDC-CERL, 2021.)

Figure 79. Looking south at the east side of the east leg of the Camp Funston levee. (Photo by ERDC-CERL, 2021.)

Figure 80. Looking southwest from the gravel road toward the river side of the south leg of the Camp Funston levee with Lake Funston to the *left*. (Photo by ERDC-CERL, 2021.)

Figure 81. Looking northeast near the railroad termination toward the south end of the east leg of the Camp Funston levee, which is in the *background* of this photo indicated by the *red arrows*. (Photo by ERDC-CERL, 2021.)

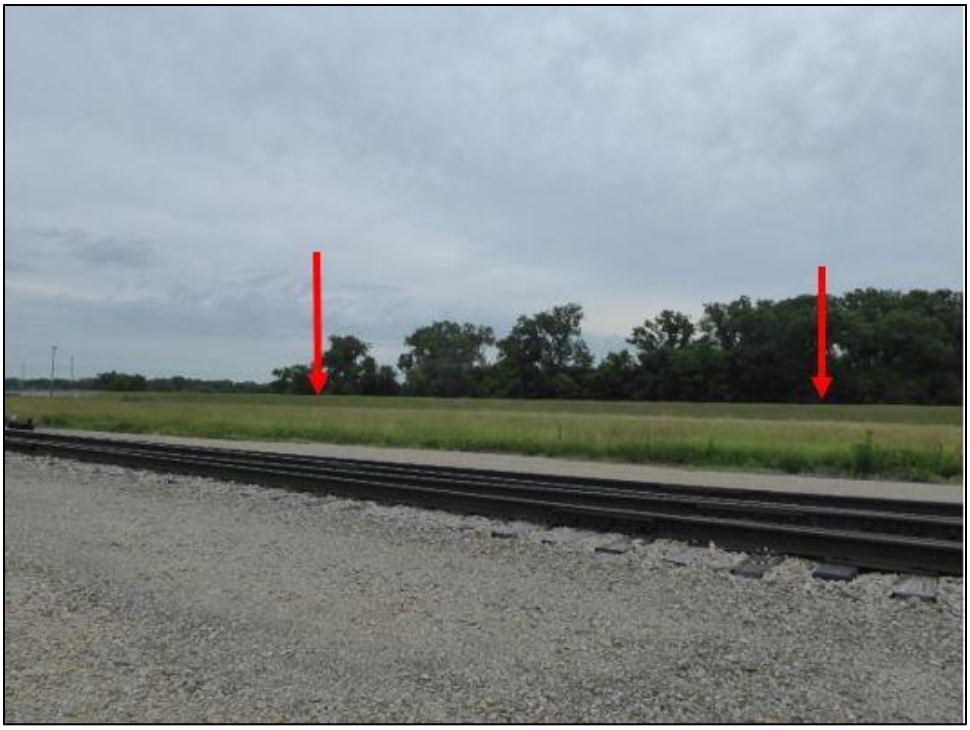
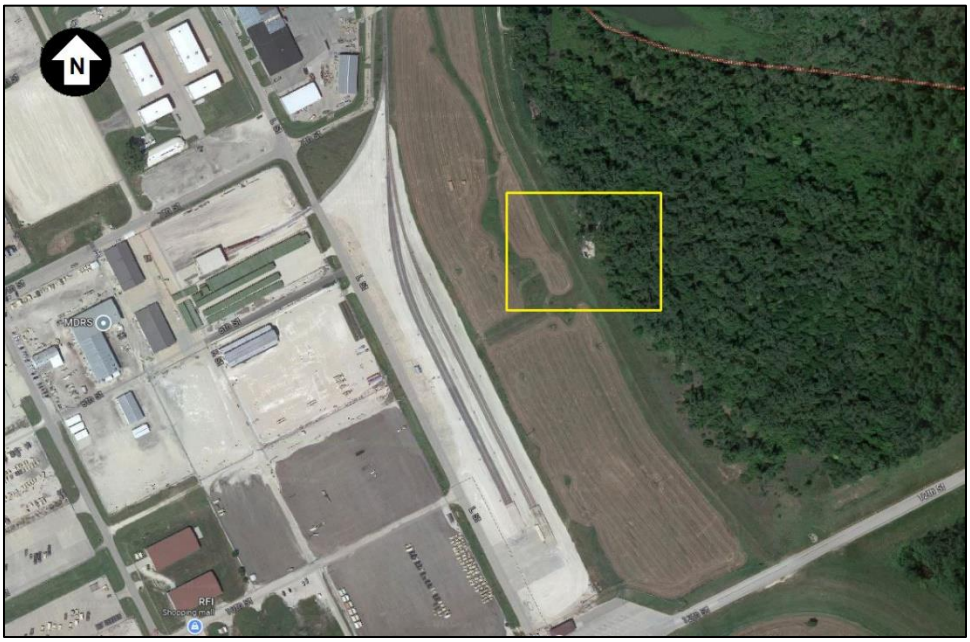


Figure 82. Satellite view depicting the present-day levee, showing the location of the drain system, culvert, and riprap on the east leg of the Camp Funston levee. (Map data: Google, 2019. Yellow line and north arrow added by ERDC-CERL.)



The southeast corner of the levee was extended toward Highway 18 to intersect the elevated roadbed of the new highway. Twelfth Street, which extends from Camp Funston to Highway 18 is situated on an elevated grade that connects to the southeast corner of the Funston levee, but it is not apparent that this elevated roadbed is officially considered an extension of the levee itself (Figure 83).

Figure 83. Looking southeast toward the 1970s horseshoe-shaped levee expansion at Camp Funston. (Photo by ERDC-CERL, 2021.)

The south leg of the levee faces a forested area of hardwoods that fronts the north side of the Kansas River. There is an access road located near the intersection of 12th Street and F Street that provides access to the crest of the south leg and a gravel road on the south side of the levee (Figure 84–Figure 86). A newer concrete culvert has been poured on the west end of the north side of the south leg (Figure 87).

Figure 84. Looking east near 12th Street toward the cantonment side of the south leg of the Camp Funston levee. (Photo by ERDC-CERL, 2021.)

Figure 85. View looking south toward the access road over the south leg of the Camp Funston levee, near the intersection of 12th Street and F Street. (Photo by ERDC-CERL, 2021.)

Figure 86. View from crest of the south leg of the Camp Funston levee at the access road across the levee, looking southwest. (Photo by ERDC-CERL, 2021.)

Figure 87. Looking southwest at the new concrete culvert along 12th Street on the north side of the south leg of the Camp Funston levee. (Photo by ERDC-CERL, 2021.)

A gravel access road runs along the crest of the west leg of the levee. There is an earthen mound covering a pumping system located in the west leg of the levee (Figure 88). A forested area buffers the west side of the west leg of the levee from Three Mile Creek (Figure 89). The west leg of the levee terminates near the intersection of A Street and 1st Street close to the railroad line (Figure 90).

Figure 88. Close-up of the earthen mound covering a pumping system located in the west leg of the Camp Funston levee. (Photo by ERDC-CERL, 2021.)

Figure 89. Looking southeast toward the Three Mile Creek side (west side) of the west leg of the Camp Funston levee. (Photo by ERDC-CERL, 2021.)

Figure 90. Looking southeast across the railroad tracks at the north end of the west leg of the Camp Funston levee. (Photo by ERDC-CERL, 2021.)

A notable feature of the Camp Funston levee is a drainage ditch and culvert that are located on the east side of the levee. These stone structures were built using POW labor during WWII. This work either constituted the construction of a new ditch or the resurfacing of an existing ditch. In addition, POWs constructed a limestone culvert where the ditch passed under 4th Street.[175] The ditch and culvert are still extant (Figure 91 and Figure 92).[176]

Figure 91. Looking northwest at the channel side of the east leg of the Camp Funston levee with drainage ditch and culvert constructed of POW stonework. (Photo by ERDC-CERL, 2021.)

175. "WWII POW Camp Funston Culvert," Kansas Archeological Site Inventory 14RY8144, May 18, 2015, Fort Riley DPW.

176. In 2023, ERDC-CERL completed a project that provided a historic context for the German prisoner-of-war (POW) experience at Fort Riley, Kansas, and an inventory of stonework features constructed using POW labor during WWII. The purpose of this historic context and inventory was to determine the stonework's eligibility for listing in the NRHP. In ERDC-CERL TR-23-28, it was determined that there is a potential noncontiguous historic district at Fort Riley. This "German POW Stonework Historic District" at Fort Riley is composed of three linear segments: one concentrated around a stone drainage ditch at Camp Forsyth, one concentrated on a series of stone check dams at Camp Whitside, and one concentrated on a stone levee ditch and culvert at Camp Funston. For a complete history and description of the stonework and culvert please refer to Aaron R. Schmidt et al., *Fort Riley German POW Stonework Historic Context and National Register of Historic Places (NRHP) Evaluation*, ERDC/CERL TR-23-28 (Champaign, IL: ERDC-CERL, 2023).

Figure 92. Detail of the northwest wall of Camp Funston's stone culvert, looking south. (Photo by ERDC-CERL, 2021.)

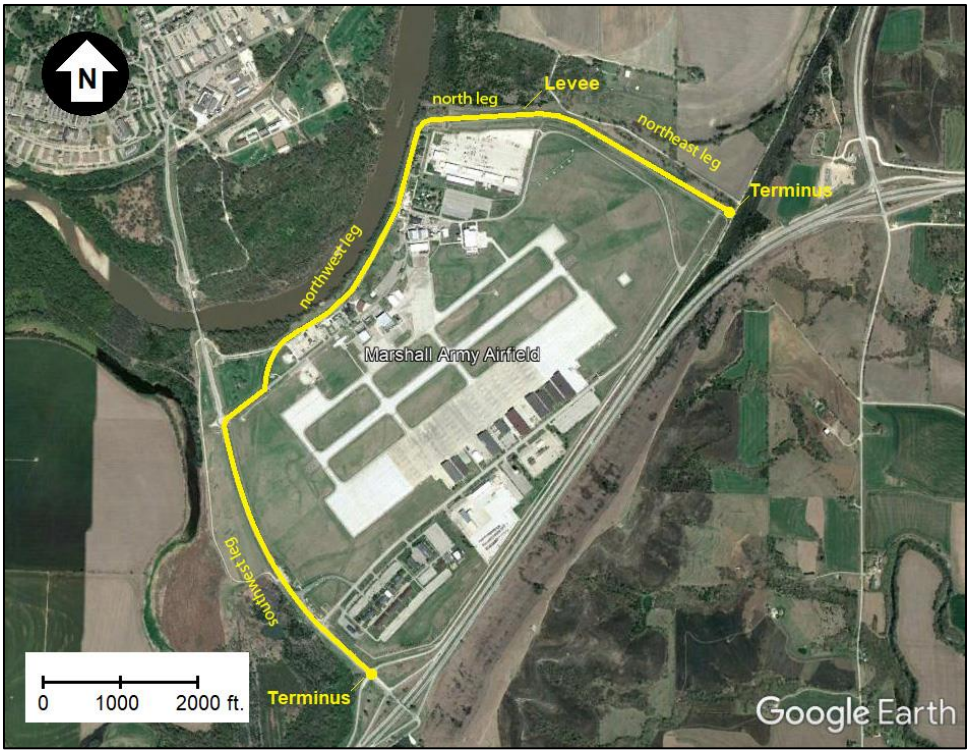
3.2 Marshall Airfield Levee

The massive flood of 1951 severely compromised the levee at Marshall Airfield, causing major damage to the area. Following the disaster, the levee was fortified to withstand another flood of equal magnitude. Marshall Airfield was a U-shaped structure, protecting Marshall Airfield's southwest, northwest, and northeast sides.

The southwest leg of the levee is incorporated into the renovated and elevated Henry Road. The levee stretches from the north roundabout at the intersection of Henry Road and Ray Road with the south terminus point of the leg located at the intersection of Henry Road and Whiskey Lake Road and is approximately 4,200 ft long. The west end of the northwest leg of the levee runs parallel to Ray Road and then juts north a bit to follow the curvature of the Kansas River. The length of this leg is approximately 5,200 lin ft. The north leg of the levee is approximately 1,100 lin ft. The northeast leg of levee measures approximately 2,900 lin ft and terminates at the intersection of Whiskey Lake Road. According to real property information from 1988, Marshall levee is 15,100 lin ft (Figure 93).[177]

177. "Dykes or Dams," General Ledger Account 1721, Fort Riley real property records.

Figure 93. Satellite view depicting the present-day levee around Marshall Airfield. (Map data: Google, 2019. Modified by ERDC-CERL, 2023.)



The majority of the levee is kept mowed with little hardwood vegetation or invasive vegetation on the levee to damage or imped the proper function of the levee. The southeast termination point of the southwest leg is just southeast of the gate entry at the intersection of Henry Drive and Marshall Drive (Figure 94). The crest of the levee was widened when the new pavement was expanded for Henry Drive, which runs along the crest of the southwest leg of the levee. A new roundabout was constructed at the apex of the northern end of the southwest leg and the west end of the northwest leg of the levee (Figure 95 and Figure 96). New drainage systems were incorporated into the levee when this construction occurred (Figure 95).

Figure 94. Looking southwest toward the southwest leg of the levee nearest the main gate at Henry Drive. (Photo by ERDC-CERL, 2021.)

Figure 95. Satellite view depicting the present-day levee, showing a portion of the modern road improvements, which incorporate the southwest and northwest legs of the Marshall Airfield levee. The new concrete culverts and drainage systems of the levee are outlined in *yellow*. (Map data: Google, 2019. Yellow boundary line and north arrow added by ERDC-CERL.)

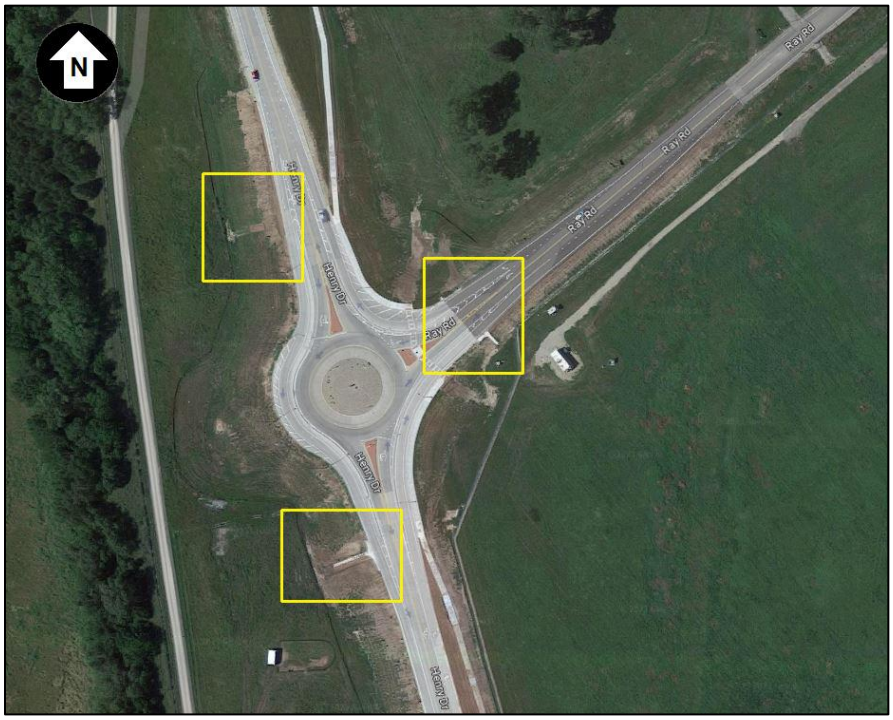


Figure 96. Looking southwest toward the intersection of Henry Road and Ray Road where the southwest leg meets the northwest leg and the levee bends around. (Photo by ERDC-CERL, 2021.)

The west end of the northwest leg curves slightly north from the new roundabout toward the tree line bordering the Kansas River, where a gravel road runs along the base of the levee and a paved access road begins to ascend the crest of the levee (Figure 97). The paved access road runs for approximately 1,200 lin ft along the crest before it cuts back down across a gravel road and off the crest (Figure 98 and Figure 100). A partially gravel drive picks up where the paved road stops at the crest of the levee. The northwest side of the northwest leg overlooks vegetation that borders the Kansas River (Figure 99). There is a culvert drainage system in the north-west leg (Figure 100).

Figure 97. Looking east along the gravel road that borders the tree line adjacent to the Kansas River. The northwest leg of the levee is in the *background* of the photo. (Photo by ERDC-CERL, 2021.)

Figure 98. Looking northeast along the paved access road on the crest of the northwest leg of the Marshall Airfield levee. (Photo by ERDC-CERL, 2021.)

Figure 99. Looking east on the northwest side of the northwest leg of the levee. The levee is on the *right*, while the tree-lined border of the Kansas River is on the *left*. (Photo by ERDC-CERL, 2021.)

Figure 100. Satellite view depicting the present-day levee, showing a portion of the northwest leg of the levee with the paved access road on the crest of the levee and the culvert, drainage system, and riprap outlined in *yellow*. (Map data: Google, 2019. Yellow boundary line and north arrow added by ERDC-CERL.)

Roughly, in the middle of the length of the northwest leg, the chain-link boundary fence intersects and runs along the crest of the levee, stretching toward the north boundary of Marshall Airfield (Figure 101 and Figure 102). Gravel covers this portion of the crest of the levee. A concrete drainage system, culvert, and riprap are placed in the northwest leg (for location reference, this is close to building 760) (Figure 103–Figure 104 and Figure 105). A newer drainage culvert stretches along the southeast side at the base of the levee near the north end of the leg (Figure 106). The inner base of the levee runs parallel to Ray Road and the quarters on the north end of the northwest leg (Figure 107).

Figure 101. Looking north toward the southeast side of the northwest leg of the Marshall Airfield levee. The *yellow box* indicates where the chain-link for the boundary begins to stretch along the crest of the levee. (Photo by ERDC-CERL, 2021.)

Figure 102. Looking north where the boundary fence crosses the north leg of the Marshall Airfield levee. (Photo by ERDC-CERL, 2021.)

Figure 103. Close-up of a gate well on the northwest leg of the Marshall Airfield levee. (Photo by ERDC-CERL, 2021.)

Figure 104. Satellite view depicting the present-day levee, showing a portion of the northwest leg of the levee with the drainage system, culvert, and riprap outlined in *yellow*. (Map data: Google, 2019. Yellow outline and north arrow added by ERDC-CERL.)

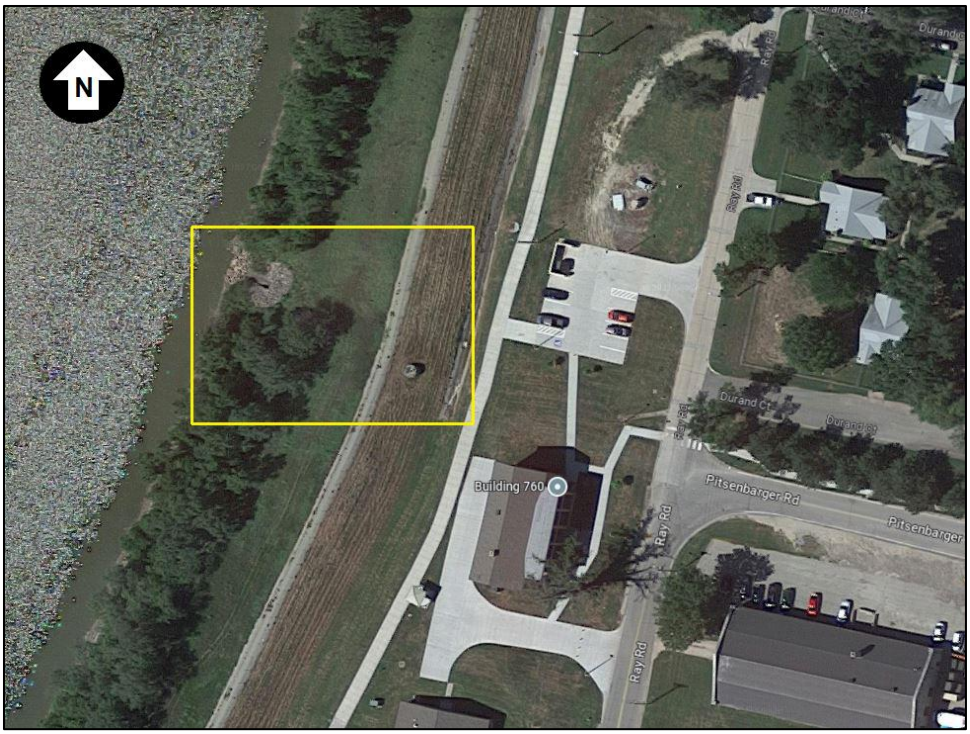


Figure 105. Close-up of the gate well on the northwest leg of the Marshall Airfield levee. (Photo by ERDC-CERL, 2021.)

Figure 106. Looking south at the southeast side of the northwest leg of the levee. Note the newer concrete drainage ditch and chain-link boundary fence on the crest of the levee. (Photo by ERDC-CERL, 2021.)

Figure 107. Looking north at the southeast side of the northwest leg from Ray Road near the quarters. (Photo by ERDC-CERL, 2021.)

There is a bend in the levee where the northwest leg and north leg of the levee connect and where the chain-link boundary fence moves off the crest of the levee (Figure 108). A gravel access road stretches along the crest of the north leg. A system of culverts, drains, and riprap is located at the west end of the north leg of the levee (Figure 109). Another drainage system is located on the east end of the north leg (Figure 109). There are also two more drainage systems that are constructed into the north leg of the levee (Figure 133 and Figure 111).

Figure 108. Looking at the bend where the northwest leg and north leg of the levee connect and where the chain-link boundary fence moves off the crest of the levee. (Photo by ERDC-CERL, 2021.)

Figure 109. Satellite view depicting the present-day levee, showing a portion of the north leg of the levee with the drainage system, culverts, and riprap outlined in *yellow*. (Map data: Google, 2019. Yellow line and north arrow added by ERDC-CERL.)

Figure 110. Satellite view depicting the present-day levee, showing the west end portion of the north leg of the levee with the drainage system and culverts outlined in *yellow*. (Map data: Google, 2019. Yellow boxes and north arrow added by ERDC-CERL.)

Figure 111. Looking at the concrete culvert and drainage system under the north leg of the levee. (Photo by ERDC-CERL, 2021.)

The northeast leg of the levee is grass covered and has a gravel road running along the crest (Figure 112). The chain-link boundary fence is on the southwest side, and a gravel road is at the base of the levee on the northeast side (Figure 114). Marshall Drive terminates near the terminus of the levee (Figure 113).

Figure 112. Looking northeast at the northeast leg of the Marshall Airfield levee. (Photo by ERDC-CERL, 2021.)

Figure 113. Looking northeast at the termination of Marshall Drive and to the southwest side of the northeast leg of the levee. (Photo by ERDC-CERL, 2021.)

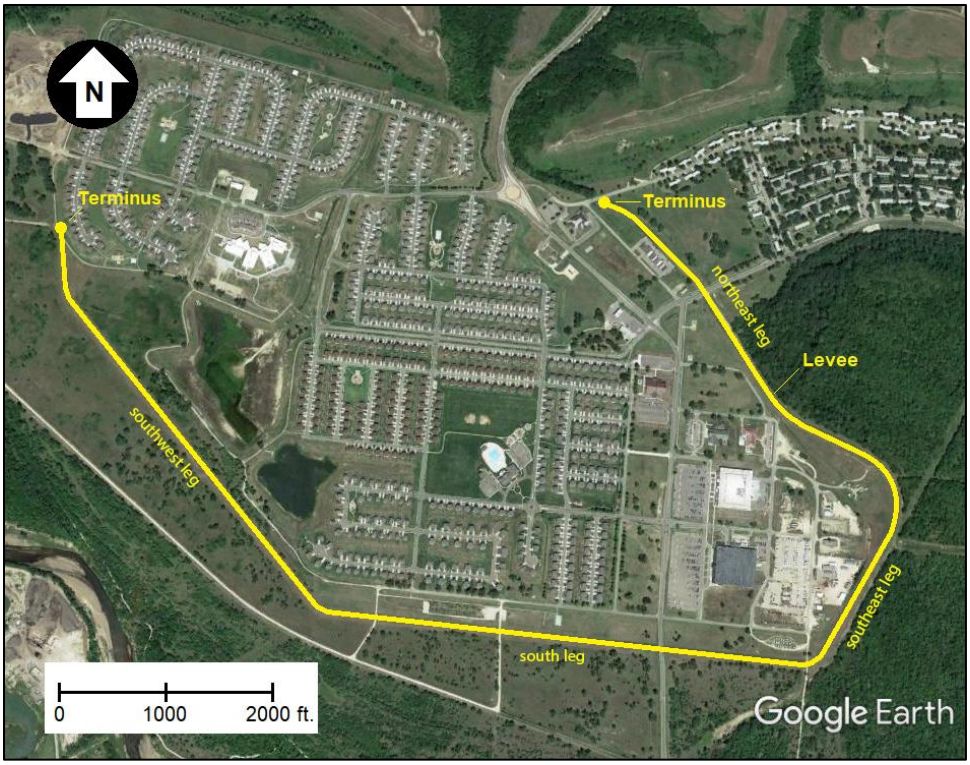
Figure 114. The termination point for the northeast leg, view looking northwest. (Photo by ERDC-CERL, 2021.)

3.3 Camp Forsyth Levee

Camp Forsyth was largely spared from the flood. Only minor flooding appears to have occurred there when a culvert tube along the levee malfunctioned and did not need extensive repairs.

The north terminus point of the northeast leg is near the intersection of Venable Drive and G Street. The north portion of this leg is approximately 900 lin ft until McCormick Road intersects the crest of the levee. The northeast leg continues south for approximately 1,125 lin ft before it bends toward the southeast for approximately 1,290 lin ft. The southeast leg of the levee is approximately 1,750 lin ft. The east end of the south leg of the levee is approximately 1,350 lin ft before it is intersected by Trooper Drive. The levee is approximately 1,400 lin ft between Trooper Drive and a gravel access road then another 1,100 lin ft between the access road and another gravel access road. The remainder of the south leg is approximately 500 lin ft before the levee bends northwest toward the northwest leg, which is approximately 4,300 lin ft. The southwest leg of the levee is approximately 4,200 lin ft with the northern terminus near a gravel access road that runs behind a row of houses off Dakota Drive (Figure 115).

Figure 115. Satellite view depicting the present-day levee around Camp Forsyth. (Map data: Google, 2019. Yellow text, yellow boundary line, north arrow, and legend added by ERDC-CERL.)



The north end of the east leg is kept mowed. There is a small creek bed with some hardwood vegetation on the east side of the levee (Figure 116 and Figure 117). McCormick Road intersects the levee (Figure 118). A gravel access road runs along the east side of the leg adjacent to a large, forested area (Figure 119 and Figure 120). There are two separate concrete box drainage systems on the southwest side of the northeast leg of the levee (Figure 121–Figure 123).

Figure 116. Looking south at the northeast side of the northeast leg near the terminus at Venable Road. (Photo by ERDC-CERL, 2021.)

Figure 117. Looking east from G Street toward the southwest side of the north end of the northeast leg of the Camp Forsyth levee. (Photo by ERDC-CERL, 2021.)

Figure 118. Satellite view depicting the present-day Camp Forsyth levee, showing the north end of the northeast leg and where McCormick Road intersects the levee, indicated by the *red box*. (Map data: Google, 2019. Yellow line, north arrow, and red box added by ERDC-CERL.)

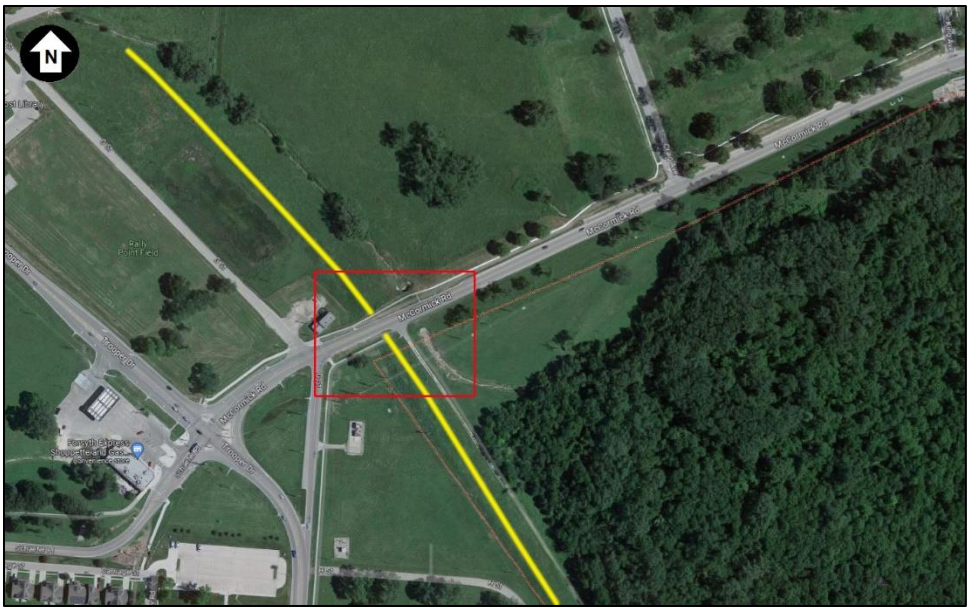


Figure 119. Looking north from the gravel road on the east side of the northeast leg of the levee toward McCormick Road. (Photo by ERDC-CERL, 2021.)

Figure 120. Looking north from the gravel road on the east side of the northeast leg of the levee where it bends slightly. (Photo by ERDC-CERL, 2021.)

Figure 121. Satellite view depicting the present-day Camp Forsyth levee outlined in *yellow* with the location of two concrete drainage systems on the southwest side of the northeast leg, indicated by the *red boxes*. (Map data: Google, 2019. Yellow line, north arrow, and red boxes added by ERDC-CERL.)

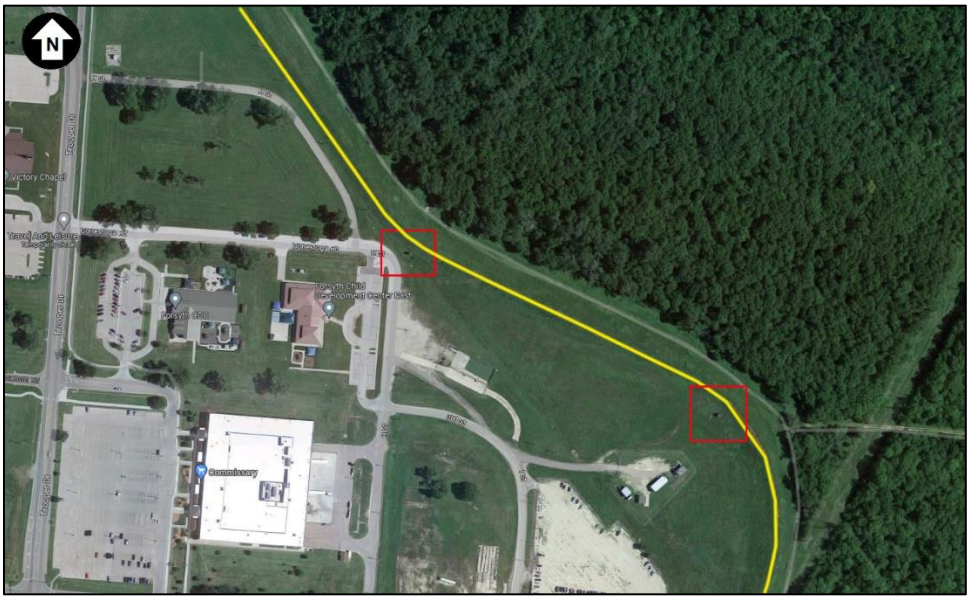


Figure 122. One of two exposed concrete drainage systems on the southwest side of the northeast leg of the Camp Forsyth levee. (Photo by ERDC-CERL, 2021.)

Figure 123. Second of two exposed concrete drainage systems on the southwest side of the northeast leg of the Camp Forsyth levee. (Photo by ERDC-CERL, 2021.)

The levee bends from the northeast leg into the southeast leg of the levee. The sides of the levee are grass covered, and the gravel road from the northeast leg of the levee continues around on the southeast side of the levee (Figure 124–Figure 128). There is a concrete box drainage system on the southeast side of the leg (Figure 129 and Figure 130).

Figure 124. Looking north at the southwest side of the northeast leg of the levee near the intersection of H Street and Conestoga Road. (Photo by ERDC-CERL, 2021.)

Figure 125. Looking north from the gravel road on the east side of the northeast leg of the levee, showing the bend in the levee where the northeast leg meets the southeast leg. (Photo by ERDC-CERL, 2021.)

Figure 126. Looking northeast from the gravel road on the southeast side of the southeast leg of the Camp Forsyth levee. (Photo by ERDC-CERL, 2021.)

Figure 127. Looking northeast at the east side of the southeast leg of the Camp Forsyth levee. (Photo by ERDC-CERL, 2021.)

Figure 128. View from the crest at the gravel access road looking east from the crest of the levee toward the bend between the southeast leg and south leg. (Photo by ERDC-CERL, 2021.)

Figure 129. Satellite view depicting the present-day Camp Forsyth levee outlined in *yellow* with the location of a concrete drainage system on the southeast side of the southeast leg indicated by the *red box*. (Map data: Google, 2019. Yellow line, north arrow, and red box added by ERDC-CERL.)

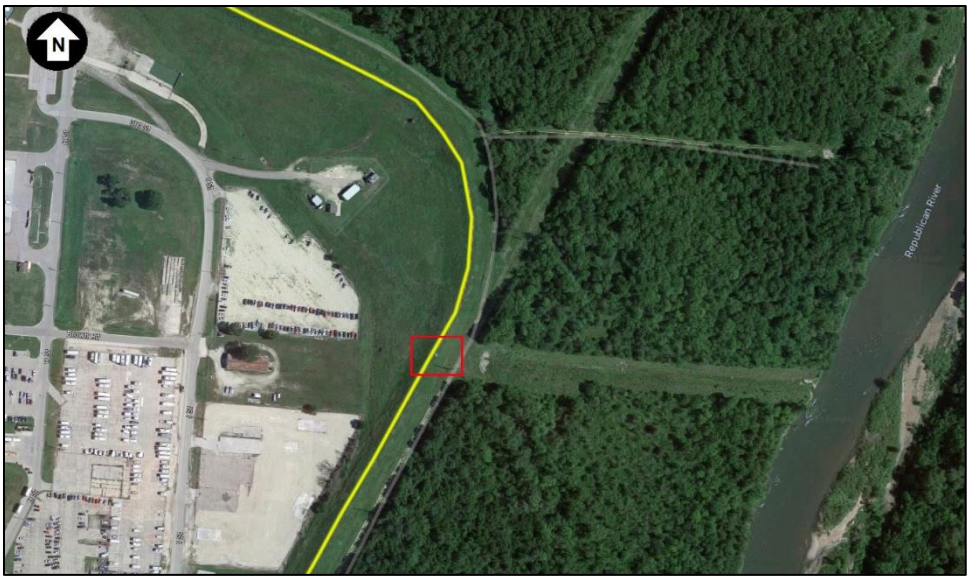


Figure 130. Drainage feature on the north end of the southeast leg of the Camp Forsyth levee. (Photo by ERDC-CERL, 2021.)

The south leg of the levee is straight and kept mowed, with little hardwood vegetation (Figure 131, Figure 132, Figure 136, Figure 137). There are three gravel access roads and Trooper Drive (which is a main access point into

Camp Forsyth) that cross over the south leg of the levee (Figure 134–Figure 135). One gravel road is located on the east end of the leg and provides access south into a forested area (Figure 133). A second gravel road (marked as D Street on the map) is located near the center of the south leg and adjacent a dog park (Figure 138). This access road crosses the levee and provides access to a gravel road that circles around the western perimeter of Camp Forsyth. A third gravel access road is located on the west end of the south leg (Figure 139 and Figure 140).

Figure 131. Looking west at the crest of the south leg toward Trooper Drive in the *background*. (Photo by ERDC-CERL, 2021.)

Figure 132. View from River Road looking southwest at the north side of the south leg of the levee toward the intersection with Trooper Road. (Photo by ERDC-CERL, 2021.)

Figure 133. Looking south at the south leg of the levee and the gravel access road that goes across it. (Photo by ERDC-CERL, 2021.)

Figure 134. Looking north at the bend in the levee, the connection between the southwest leg (*right*) and the south leg (*left*) separated by a gravel access road that goes over the crest of the Camp Forsyth levee. (Photo by ERDC-CERL, 2021.)

Figure 135. View from Trooper Drive looking south where the road crosses the south leg of the levee. (Photo by ERDC-CERL, 2021.)

Figure 136. View from River Road looking southeast toward the north side of the south leg of the levee. (Photo by ERDC-CERL, 2021.)

Figure 137. Looking east toward the south side of the south leg of the levee. (Photo by ERDC-CERL, 2021.)

Figure 138. Looking north toward the south side of the south leg of the levee and the larger gravel access road. (Photo by ERDC-CERL, 2021.)

Figure 139. Looking south toward the south leg of the levee and a gravel access road. (Photo by ERDC-CERL, 2021.)

Figure 140. Looking north toward the south side of the south leg of the levee at the western gravel access road. (Photo by ERDC-CERL, 2021.)

The levee bends around from the south toward the northwest leg (Figure 141). The sides of the leg are grass covered with little hardwood vegetation, with the exception of the northern end of the leg where the vegetation is denser (Figure 142–Figure 145). The north terminus point of the east leg is near the intersection of Venable Drive and G Street.

Figure 141. Looking east at the bend in the levee where the south leg meets the southwest leg. (Photo by ERDC-CERL, 2021.)

Figure 142. View from the crest of the south leg looking west toward the northwest leg of the levee. (Photo by ERDC-CERL, 2021.)

Figure 143. Looking northeast toward the south side of the levee near the bend in the levee where the south leg connects to the northwest leg. (Photo by ERDC-CERL, 2021.)

Figure 144. View looking northeast toward the southwest leg of the levee, indicated by the *red arrows*. (Photo by ERDC-CERL, 2021.)

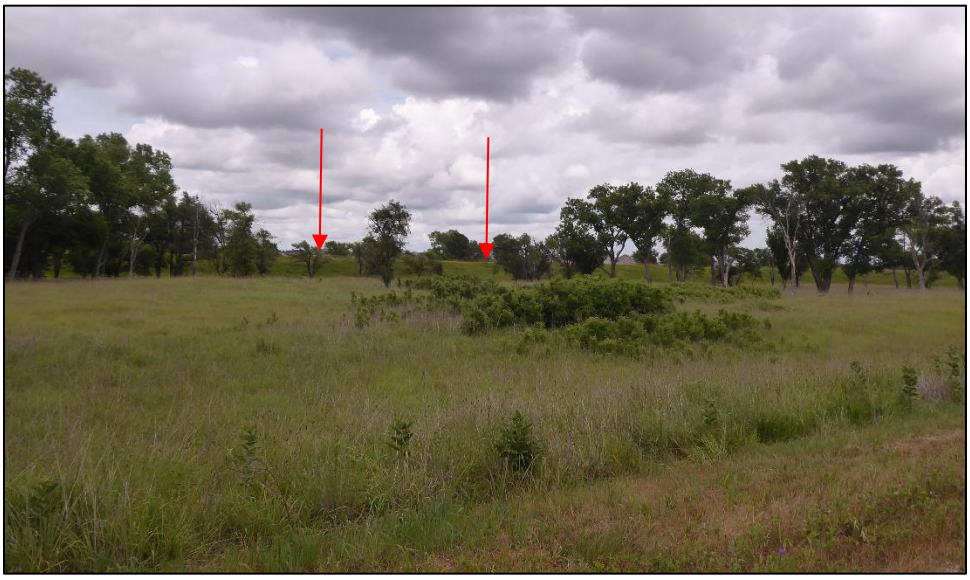


Figure 145. Looking northeast toward the southwest side of the northwest leg of the levee where the vegetation is denser. (Photo by ERDC-CERL, 2021.)

A notable feature of the Camp Forsyth levee is a stone drainage ditch and culvert located on the east side of the levee. These features were constructed by POW labor during WWII. This work either constituted the construction of a new ditch or the resurfacing of an existing ditch. German POWs worked on a stone-lined drainage ditch near the south side of Camp Forsyth. The ditch, which is still extant, is oriented from east to west and runs in a straight line between Trooper Drive and I Street (Figure 146 and Figure 147). It parallels River Road approximately 250 ft north of a levee that protects the south side of Camp Forsyth.[178] From the east edge of Trooper Drive to the western edge of I Street, the ditch is approximately 1,300 ft long.[179]

178. Fiona Price, "POW Built Features," October 21, 2020, Fort Riley DPW.

179. Measurement from Google Earth.

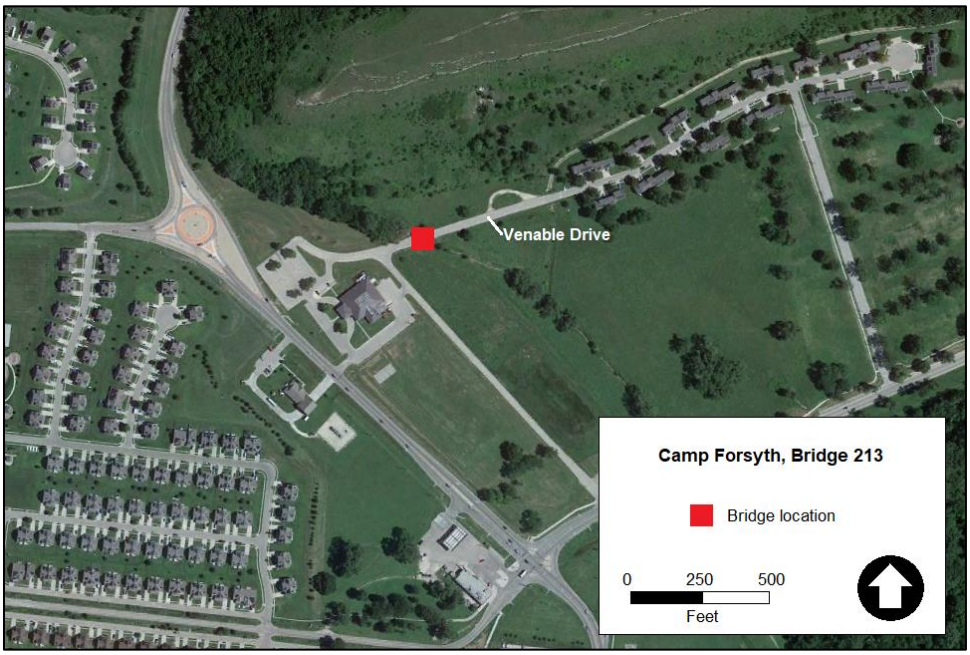
Figure 146. A diagonal view of the drainage ditch, looking west toward the H Street culvert. (Photo by ERDC-CERL, 2021.)

Figure 147. A close-up view of the stones between H Street and I Street, which exhibit tooling striations and flat faces. Looking south. (Photo by ERDC-CERL, 2021.)

Bridge 213, which may have been constructed with German POW labor, is located near the intersection of Venable Drive and G Street in the northern portion of Camp Forsyth adjacent to the north terminus point of the east leg of the Camp Forsyth levee. The structure is a vehicular bridge, spanning three concrete pipe culverts with a stone head and wing walls (Figure 148–Figure 150). Although it cannot be confirmed that this bridge was

built with POW labor in the absence of documentation or structural inscriptions, it is known that POWs were engaged in various erosion and drainage control projects throughout Fort Riley, and the segmented construction of this culvert's headwalls resembles the POW culvert located at Camp Funston.[180] Additionally, the square cuts and tooled planes exhibited on many of the stones is similar to other POW stonework features at Camp Forsyth.[181]

Figure 148. Location of bridge 213 in Camp Forsyth. (Map data: Google, 2023. Modified by ERDC-CERL, 2023.)[182]



180. Colonel William R. Irvin to Commanding General, Headquarters Seventh Service Command, May 30, 1945, 9–10, 12.

181. Schmidt et al., *Fort Riley German POW Stonework Historic Context and NRHP Evaluation*, 125–126.

182. Schmidt et al., *Fort Riley German POW Stonework Historic Context and NRHP Evaluation*, 126.

Figure 149. South headwall and pipe culverts at bridge 213. Looking southwest.
(Photo by ERDC-CERL, 2021.)

Figure 150. North headwall and pipe culverts at bridge 213. Looking northeast.
(Photo by ERDC-CERL, 2021.)

4 Current Conditions of Two Dams at Fort Riley

In addition to its three levees, Fort Riley maintains two dams (as defined by the *Federal Guidelines for Dam Safety* and real property records): one at Breakneck Lake and the other at Moon Lake.

4.1 Breakneck Lake Dam (DAMBL)

Breakneck Lake dam is located north of Camp Forsyth and west of Custer Hill and is accessible via a gravel road that spurs off Governor Harvey Road (Figure 151). A heavy forested area is located on the south side closest to the dam, while hardwood vegetation is sporadic around the north, east, and west sides of the lake. A gravel road stretches along the western edge of the lake. A gravel access road also stretches across the crest of the dam on the south side.

Figure 151. Satellite view depicting Breakneck Lake dam and the accompanying lake. (Map data: Google, 2014. North arrow and legend added by ERDC-CERL.)

Breakneck Lake dam is a 25 ft high, 375 ft long earthen embankment structure. It controls water from a stream flowing into the Republican River, creating a lake with a surface area of approximately 5 acres. A small spillway on the south side of the structure allows a controlled portion of

water to continue its course toward the Republican River.[183] Figure 152–Figure 159 show the current conditions of Breakneck Lake dam and the accompanying lake.

Figure 152. Looking east toward Breakneck Lake from the gravel access road via Governor Harvey Road. (Photo by ERDC-CERL, 2021.)

183. John Murphy et al., "Periodic Dam Inspection Report Breakneck Lake Dam Fort Riley, Kansas, PIR-RIL-19-Dambl," Installation Management Command (IMCOM) Army Transportation Infrastructure Inspection Program (ATIIP), 2019, 3. *This is a controlled report that is unavailable to the public*.

Figure 153. Looking northeast across Breakneck Lake near the spillway for the dam that is located on the south side of the lake. (Photo by ERDC-CERL, 2021.)

Figure 154. Looking north across Breakneck Lake from the crest of the dam. (Photo by ERDC-CERL, 2021.)

Figure 155. Looking east across the crest of the dam. (Photo by ERDC-CERL, 2021.)

Figure 156. Looking at the south side of the dam, the downslope. (Photo by ERDC-CERL, 2021.)

Figure 157. Unlined and uncontrolled channel on the downstream side of the dam. (Photo by ERDC-CERL, 2021.)

Figure 158. The primary spillway consists of two 36-inch diameter concrete pipes. The two pipes are located on the south side of the dam. (Photo by ERDC-CERL, 2021.)

Figure 159. Looking south across Breakneck Lake toward the dam. (Photo by ERDC-CERL, 2021.)

4.2 Moon Lake Dam (DAMML)

Moon Lake dam and the accompanying lake are located within the Fort Riley Military Reservation boundaries, west of Main Post, east of Camp Forsyth, and south of the housing area (Figure 160). The recreation area around the lake and dam includes a hiking trail, three playground areas, three pavilions, two latrines, and a disc golf course. A paved road encircles the lake and provides access to the recreation facilities. A pedestrian bridge crosses over an arm of the lake located on the northwest side of the lake. The area is accessible via Barrett Drive.

Figure 160. Satellite view depicting Moon Lake dam and the accompanying lake. Note the improved spillway branching off the southeast side of the dam. (Map data: Google, 2014. North arrow and legend added by ERDC-CERL.)

Moon Lake dam is a 26 ft high, 500 ft long earthen embankment structure. It controls water from a stream flowing into the Kansas River, creating a lake with a surface area of approximately 10 acres. Three spillways on the south side of the structure allow a controlled portion of water to flow toward the Kansas River.[184] Figure 161–Figure 179 show the current conditions of Moon Lake dam and its accompanying lake.

184. John Murphy et al., "Periodic Dam Inspection Report Moon Lake Dam Fort Riley, Kansas, PIR-RIL-19-Damml," Installation Management Command (IMCOM) Army Transportation Infrastructure Inspection Program (ATIIP), 2019, 3. *This is a controlled report that is unavailable to the public*.

Figure 161. Looking southeast toward the dam at Moon Lake. (Photo by ERDC-CERL, 2021.)

Figure 162. Looking east toward Moon Lake and the paved road on the crest of the dam. (Photo by ERDC-CERL, 2021.)

Figure 163. Looking west at the paved access road on the crest of the dam. (Photo by ERDC-CERL, 2021.)

Figure 164. Looking north across Moon Lake from the crest of the dam. (Photo by ERDC-CERL, 2021.)

Figure 165. Looking east at the downslope of the dam. (Photo by ERDC-CERL, 2021.)

Figure 166. A pipe extends through the embankment and outlets at the downstream tow into a riprap-lined stilling basin on the south side of the dam. (Photo by ERDC-CERL, 2021.)

Figure 167. Looking south at the downstream flowing off the riprap-lined stilling basin. (Photo by ERDC-CERL, 2021.)

Figure 168. Looking west across the paved crest of the dam. (Photo by ERDC-CERL, 2021.)

Figure 169. The third spillway is a shallow concrete weir located on the south side of the dam crest. (Photo by ERDC-CERL, 2021.)

Figure 170. A weir connects into a concrete-lined channel, which transitions into a lined riprap channel. (Photo by ERDC-CERL, 2021.)

Figure 171. View looking south at lined riprap channel on the south side of the dam. (Photo by ERDC-CERL, 2021.)

Figure 172. View looking southwest toward the dam. (Photo by ERDC-CERL, 2021.)

Figure 173. View looking southwest across Moon Lake toward the dam. (Photo by ERDC-CERL, 2021.)

Figure 174. Close-up of the riprap bank on the upstream of the dam. (Photo by ERDC-CERL, 2021.)

Figure 175. A spillway consisting of a vertical inlet pipe with a trash rack and antivortex plate. (Photo by ERDC-CERL, 2021.)

Figure 176. Looking northwest across Moon Lake. (Photo by ERDC-CERL, 2021.)

Figure 177. View looking south across Moon Lake and the dam. (Photo by ERDC-CERL, 2021.)

Figure 178. Looking north at the "arm" of the lake located on the northwest corner of the lake. (Photo by ERDC-CERL, 2021.)

Figure 179. A pedestrian bridge over the “arm” of the lake. (Photo by ERDC-CERL, 2021.)

5 Determination of Significance

5.1 Categories of Historic Properties

The identification of historically significant properties is achieved only through the evaluation of their position within the larger historic context. According to the NRHP, historic contexts are defined as "the patterns, themes, or trends in history by which a specific occurrence, property, or site is understood, and its meaning (and ultimately its significance) within prehistory or history is made clear."[185] A historic property is determined significant or not significant based on the application of standardized NRHP criteria within the property's historical context. To qualify as historic, a property must have an association with a relevant historic context as well as having retained its physical integrity through which its historic significance is conveyed. The NRHP categorizes significant properties as buildings, sites, districts, structures, or objects, defined as follows:

> **Building:** A building is created principally to shelter any form of human activity. Examples of buildings include: administration building, house, barn, stable, train station, church, or shed.
>
> **Structure:** Structures are distinguished from buildings by being functional constructions made for purposes other than creating human shelter. Examples of structures include: aircraft hangars, bandstands, bridges, canals, fences, kilns, or windmills.
>
> **Object:** The term object is used to distinguish from buildings and structures those constructions that are primarily artistic in nature or are relatively small in scale and simply constructed. Although it may be, by nature or design, movable, an object is associated with a specific setting or environment. Examples of objects include boundary markers, fountains, monuments, sculptures or statues.

185. National Park Service, *How to Apply the National Register Criteria for Evaluation*, National Register Bulletin #15 (US Department of the Interior, National Park Service, 1997), 7.

Site: A site is the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archeological value regardless of the value of any existing structure. Examples of sites include: battlefield, campsite, ceremonial site, designed landscape, rock shelter, or village site.

District: A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development. A district can comprise both features that lack individual distinction and individually distinctive features that serve as focal points. A group of features lacking in individual distinction may even be considered eligible if the grouping achieves significance as a whole within its historic context. While a district derives its importance from being a unified entity, it can contain buildings, structures, sites, objects, or open spaces that do not contribute to the significance of the district if these properties do not adversely affect the district's integrity.[186]

5.2 National Register of Historic Places (NRHP) Definitions and Criteria

One of the objectives of this chapter is to determine the NRHP status of levees and dams at Fort Riley.[187] The NRHP criteria for evaluation describes how properties and districts are significant for their association with important events or persons (Criteria A and B), for their importance in design or construction (Criterion C), or for their information potential (Criterion D). The following is a brief description of each of the four criterions (excerpted from National Register Bulletin #15: *How to Apply the National Register Criteria for Evaluation*):

186. National Park Service, *How to Apply the National Register Criteria for Evaluation*, National Register Bulletin #15 (US Department of the Interior, National Park Service, 1997), 9.

187. The following paragraph was taken verbatim from Adam Smith et al., *Fort Leonard Wood German POW Stonework Context and Survey*, ERDC-CERL SR-06-30 (Champaign, IL: ERDC-CERL, 2006), 69.

A. Event—associated with events that have made a significant contribution to the broad patterns of our history; or

B. Person—associated with the lives of persons significant in our past; or

C. Design/Construction—embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. Information Potential—yielded, or is likely to yield, information important in prehistory or history.[188]

A property that has achieved significance within the past fifty years can be evaluated only when sufficient historical perspective exists to determine that the property is exceptionally important. The necessary perspective can be provided by scholarly research and evaluation and must consider both the historic context and the specific property's role in that context.[189]

5.3 Significance of Levees at Fort Riley

Kansas has a long history of widespread flooding events. In particular, some of the state's more notable floods have historically affected the waterways within the Kansas River basin. This basin's principal tributary is the namesake Kansas River, a latitudinal channel in the east-central portion of the state created by the confluence of the Republican and Smoky Hill Rivers near Junction City. Some of the most devastating floods to impact the Kansas River basin occurred in 1844, 1903, 1935, and 1951.

During the first 60 years of its existence, the majority of Fort Riley's built environment was contained in the Main Post, which was located on high ground and not especially vulnerable to flooding. Consequently, there does

188. National Park Service, *How to Apply the National Register Criteria for Evaluation*, 2.

189. National Park Service, *How to Apply the National Register Criteria for Evaluation*, 2.

not seem to have been an impetus to construct flood intervention structures, such as levees, at Fort Riley until the installation expanded into the surrounding Republican and Kansas River floodplains. Consequently, efforts to construct flood intervention structures did not become a necessity until the establishment of Camp Funston, where crews constructed the installation's first levee between 1917 and 1918. In the 1940s, the renovation of the levee at Camp Funston and the construction of subsequent levees around the new Cavalry Replacement Training Center (Camp Forsyth) and Marshall Field brought the total number of levees at Fort Riley up to three. Designed to protect each respective area from typical flooding events, Fort Riley's levees faced an unprecedented test during the flood of 1951. In particular, the massive flood severely compromised the levees at Marshall Airfield and Camp Funston, causing major damage at both areas. Following the disaster, the levees at Marshall Airfield and Camp Funston were fortified to withstand another flood of equal magnitude. Fort Riley continues to maintain levees at Camp Forsyth, Marshall Airfield, and Camp Funston today.

5.4 Final Recommendation of Significance for Levees at Fort Riley

The overall time period investigated for this report was from 1844 through the present day. Through researching the archival records and using the historic context developed in Chapter 2 of this report, the researchers determined that there were two periods of significance for levees at Fort Riley:

1. 1917–1953 for Camp Funston levee
2. 1941–1953 for Marshall Airfield levee and Camp Forsyth levee

The period of significance extends through 1953, reflecting the time period by which significant development and improvements were completed at the three levees in response to the flood of 1951. Both periods of significance were used for this survey, depending on the levee's age. The following section details findings regarding the historical significance of the three levees.

5.4.1 Camp Funston Levee

Criterion A—Event

Camp Funston's levee has had periodic alteration and stabilization, specifically in response to the flood of 1951; however, it continues to serve its intended purpose, to protect the flat lands of the Camp Funston cantonment. Because of the levee's association with flood control in this area of Fort Riley, it is recommended to retain significance under Criterion A.

Criterion B—Person

The Camp Funston levee does not appear to be associated with persons significant in local, state, or national history. Therefore, it is recommended as not eligible under Criterion B.

Criterion C—Design

Although the Camp Funston levee has functioned adequately since the flood of 1951, the structure does not appear to represent an innovative design or method of construction, nor does it contain novel design elements that transformed the practice of levee construction. Additionally, due to modifications in the early 1950s and the 1970s, the levee does not reflect the appearance it had in 1917, when it was originally constructed to protect Camp Funston during WWI, or in 1941, when it was modified to protect Camp Funston during WWII. Therefore, the Camp Funston levee is recommended not eligible under Criterion C.

Criterion D—History

Finally, the structure is not a likely source of information potential. Because the levee was constructed by amassing soils and rocks with heavy machinery, any precontact artifacts encountered in the levee itself will be in a disturbed profile, complicating analysis of provenience. Additionally, probes of the structure itself are not likely to contribute meaningful insight into the construction of 20th century levees. For these reasons, the Camp Funston levee is recommended not eligible under Criterion D.

5.4.2 Marshall Airfield Levee

The massive flood of 1951 severely compromised the levees at Marshall Airfield, causing major damage. Following the disaster, the levee at Marshall Airfield was fortified to withstand another flood of equal magnitude. Fort Riley continues to maintain the levee at Marshall Airfield today.

Criterion A—Event

According to photographic evidence, construction of the earliest levee adjacent to Marshall Airfield likely occurred between 1941 and 1942. Before that time, a series of spur dikes existed along the east bank of the Kansas River, which were likely installed after the flood of 1935 to prevent bank erosion. It does not appear that a levee was introduced, however, until Marshall Airfield expanded for wartime use in the early 1940s. Cartographic evidence suggests that construction of the levee occurred between 1941 and 1943. The levee has had periodic alteration and stabilization, specifically in response to the flood of 1951; however, it continues to serve its intended purpose to protect the flat lands of Marshall Airfield. Because of the levee's association with flood control in this area of Fort Riley, it is recommended to retain significance under Criterion A.

Criterion B—Person

Marshall Airfield levee does not appear to be associated with persons significant in local, state, or national history. Therefore, it is recommended as not eligible under Criterion B.

Criterion C—Design

The levee at Marshall Airfield was a U-shaped structure, protecting the area's southwest, northwest, and northeast sides. The levee sustained significant damage and required extensive repair to be operational again.

Renovations on Marshall Airfield's levee were underway during the summer of 1952, which included raising the existing feature, widening its base, and making other repairs as necessary. The path of the levee at Marshall Airfield has also been altered since the flood of 1951; cartographic evidence indicates that the southwest side of the levee was incorporated into the elevated roadbed of Henry Drive between 1955 and 1962. This modification to the levee likely occurred with the construction of I-70, which was completed to the southeast of Marshall Airfield between 1958 and 1960.[190] The I-70 interchange into Fort Riley (via Henry Drive on a raised roadbed) was

190. Kansas Department of Transportation, *1957–58 Kansas State Highway Map*; Kansas Department of Transportation, *1960–61 Kansas State Highway Map*.

likely completed with the interstate, prompting the levee alteration between 1958 and 1960.

Although Marshall Airfield levee has functioned adequately since the 1951 flood, the structure does not appear to represent an innovative design or method of construction, nor does it contain novel design elements that transformed the practice of levee construction. Additionally, due to modifications in the early 1950s and the 1960s, the levee does not reflect the appearance it had in the 1940s, when it was originally constructed to protect Marshall Airfield during the airfield's wartime expansion. Therefore, the Marshall Airfield levee is recommended not eligible under Criterion C.

Criterion D—History

Finally, the structure is not a likely source of information potential. Because the levee was constructed by amassing soils and rocks with heavy machinery, any precontact artifacts encountered in the levee itself will be in a disturbed profile, complicating analysis of provenience. Additionally, probes of the structure itself are not likely to contribute meaningful insight into the construction of 20th century levees. For these reasons, Marshall Airfield levee is recommended not eligible under Criterion D.

5.4.3 Camp Forsyth Levee

Criterion A—Event

In 1941 crews began constructing a levee to protect Camp Forsyth. This cantonment was largely spared from the flood of 1951 and did not need extensive repairs. The levee retains its original layout and alignment, along with the original starting and stopping termini. The levee continues to serve its intended purpose to protect the flat lands of Camp Forsyth cantonment. Because of the levee's association with flood control in this area of Fort Riley, it is recommended to retain significance under Criterion A and is recommended eligible for the NRHP listing under Criterion A.

Criterion B—Person

Camp Forsyth levee does not appear to be associated with persons significant in local, state, or national history. Therefore, it is recommended as not eligible under Criterion B.

Criterion C—Design

Construction began in January 1941 on the levee in the Republican Flats, and it followed the same general specifications as the renovated levee at Camp Funston.[191] The finished structure exhibited a horseshoe shape, skewed to the northwest, that protected the cantonment on its west, south, and east sides. With minor changes, this is the path the levee has assumed since the late 1940s, although development within Camp Forsyth itself has changed considerably over the past 70 years. The structure does not appear to represent an innovative design or method of construction, nor does it contain novel design elements that transformed the practice of levee construction. Therefore, the Camp Forsyth levee is recommended not eligible under Criterion C.

Criterion D—History

Finally, the structure is not a likely source of information potential. Because the levee was constructed by amassing soils and rocks with heavy machinery, any precontact artifacts encountered in the levee itself will be in a disturbed profile, complicating analysis of provenience. Additionally, probes of the structure itself are not likely to contribute meaningful insight into the construction of 20th century levees. For these reasons, Camp Forsyth levee is recommended not eligible under Criterion D.

5.5 Final Determination of Significance for Lake Dams at Fort Riley

The following section details findings regarding the historical significance of the two lake dams constructed between 1950 and 1960 at Fort Riley. Both Breakneck Lake dam and Moon Lake dam were not constructed for flood control purposes but as part of a water conservation effort on Fort Riley. Through researching the archival records and using the historic context developed in Chapter 2 of this report, the researchers determined that there were two periods of significance for these dams at Fort Riley:

1. 1952: the date construction was completed at Breakneck Lake dam
2. 1960: the date construction was completed at Moon Lake dam

191. "Flood Barriers Finished at Fort," *Manhattan Mercury*, May 8, 1941.

5.5.1 Breakneck Lake Dam (DAMBL)

Construction on Breakneck Lake dam and the accompanying lake likely began in 1950 and was initially intended for water conservation. According to an article in the *Junction City Daily Union*, the lake was part of a "long range conservation scheme . . . for the construction of over half a dozen such reservoirs on the Post."[192] Over the years, the resulting lake was employed for general recreation and periodic training purposes.

Criterion A—Event

There is no significant event associated with Breakneck Lake dam. Therefore, the property is not eligible under Criterion A.

Criterion B—Person

There is no significant person associated with Breakneck Lake dam. Therefore, the property is not eligible under Criterion B.

Criterion C—Design

The design and construction of Breakneck Lake dam could not be linked to a specific architect. The properties do not embody a distinctive characteristic of a type, period, or method of construction; do not represent the work of a master; and do not possess high artistic values. The construction of the lake and dam was not part of a large program of military construction funding. Therefore, the property is not eligible under Criterion C.

Criterion D—History

The available historical records provided no indication that the Breakneck Lake dam has yielded, or is likely to yield, any information important to history. Therefore, the property is not eligible under Criterion D.

5.5.2 Moon Lake Dam (DAMML)

Moon Lake dam and the accompanying lake were constructed during a hunting and fishing improvement campaign at Fort Riley in the late 1950s and early 1960s and primarily existed for recreational use rather than as a

192. "Build Lake at Fort," June 12, 1950, *Junction City Daily Union*.

means of flood control. Over the years, Moon Lake became a popular spot for various recreational activities.

Criterion A—Event

There is no significant event associated with Moon Lake dam. Therefore, the property is not eligible under Criterion A.

Criterion B—Person

There is no significant person associated with Moon Lake dam. Therefore, the property is not eligible under Criterion B.

Criterion C—Design

The design and construction of Moon Lake dam could not be linked to a specific architect. The properties do not embody a distinctive characteristic of a type, period, or method of construction; do not represent the work of a master; and do not possess high artistic values. The construction of the lake and dam was not part of a large program of military construction funding. Therefore, the property is not eligible under Criterion C.

Criterion D—History

The available historical records provided no indication that the Moon Lake dam has yielded, or is likely to yield, any information important to history. Therefore, the property is not eligible under Criterion D.

5.6 Historic District

None of the levees or dams were found to be related to any existing historic district, and none of them were found to comprise a historic district related to the two periods of significance.

5.7 National, State, or Local Significance

The researchers evaluated the dams for significance at the federal, state, and local levels and determined there was none.

6 Aspects of Integrity

In addition to possessing historical significance, properties must also retain sufficient physical integrity of features to convey their significance and be eligible for the NRHP.[193] Integrity has very specific connotations in defining historic and cultural resources. Integrity is the authenticity of physical characteristics from which resources obtain their significance. Historic properties convey their significance through their integrity. Historic properties either retain both their integrity and convey their significance, or they retain neither.

6.1 Seven Aspects of Integrity

The NRHP recognizes seven aspects or qualities of a property that define the concept of integrity. To retain historic integrity, a property must possess several, and usually most, of the seven aspects. The retention of specific aspects of historic integrity is paramount for a property to convey its significance. Determining which of these aspects are most important to a particular property requires knowing why, where, and when the property is significant. The seven aspects of integrity are listed in National Register Bulletin #15: *How to Apply the National Register Criteria for Evaluation* and summarized below:

193. National Park Service, *How to Apply the National Register Criteria for Evaluation*, 44–45.

1. *Location* is the place where the historic property was constructed, or the place where the historic event occurred.

2. *Design* is the combination of elements that create the form, plan, space, structure, and style of a property. It results from conscious decisions made during the original conception and planning of a property (or its significant alteration) and applies to activities as diverse as community planning, engineering, architecture, and landscape architecture. Design includes such elements as organization of space, proportion, scale, technology, ornamentation, and materials.

3. *Setting* is the physical environment of a historic property. Setting refers to the character of the place in which the property played its historical role. It involves how, not just where, the property is situated and its relationship to surrounding features and open space.

4. *Materials* are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.

5. *Workmanship* is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.

6. *Feeling* is a property's expression of the aesthetic or historic sense of a particular time period.

7. *Association* is the direct link between an important historic event or person and a historic property.[194]

To retain historic integrity, a property must possess several, if not most, of the seven aspects. The retention of specific aspects of historic integrity is paramount for a property to convey its significance. Determining which of

194. National Park Service, *How to Apply the National Register Criteria for Evaluation*, 44–45.

these aspects are most important to a particular property requires knowing why, where, and when the property is significant.[195]

Properties in a historic district are classified as either "contributing" or "noncontributing" resources. Contributing resources date from the historic period of significance established for the district. They contribute to the significance and character of the district through their historical associations and architectural values. Noncontributing resources are those that, owing to the date of construction, alterations, or other factors, do not contribute to the district's historic significance or character.[196]

6.2 Integrity Evaluation for Levees and Dams at Fort Riley

The Camp Funston levee and Marshall Airfield levee do not retain integrity because the layout and alignment of each levee has been modified and altered and the built environment for which each levee protects no longer exists or has greatly changed from 1953. Because of the loss of integrity throughout the historic built environment, both the Camp Funston and Marshal Airfield levees' significance as a component of each area is greatly diminished. For these reasons, the Camp Funston levee and Marshall Airfield levee are recommended not eligible for the NRHP listing under Criterion A.

Camp Forsyth levee maintains its original alignment, start and stopping termini, and overall width. Thus, the levee retains overall good integrity of location, design, materials, workmanship, setting, feeling, and association. However, the built environment for which the levee was constructed for has greatly changed from 1953.

The aspects of integrity were not evaluated and were not applicable for Breakneck Lake dam and Moon Lake dam due to the lack of significance for these properties.

195. National Park Service, *How to Apply the National Register Criteria for Evaluation*, 44–45.

196. National Park Service, *How to Apply the National Register Criteria for Evaluation*, 44–45.

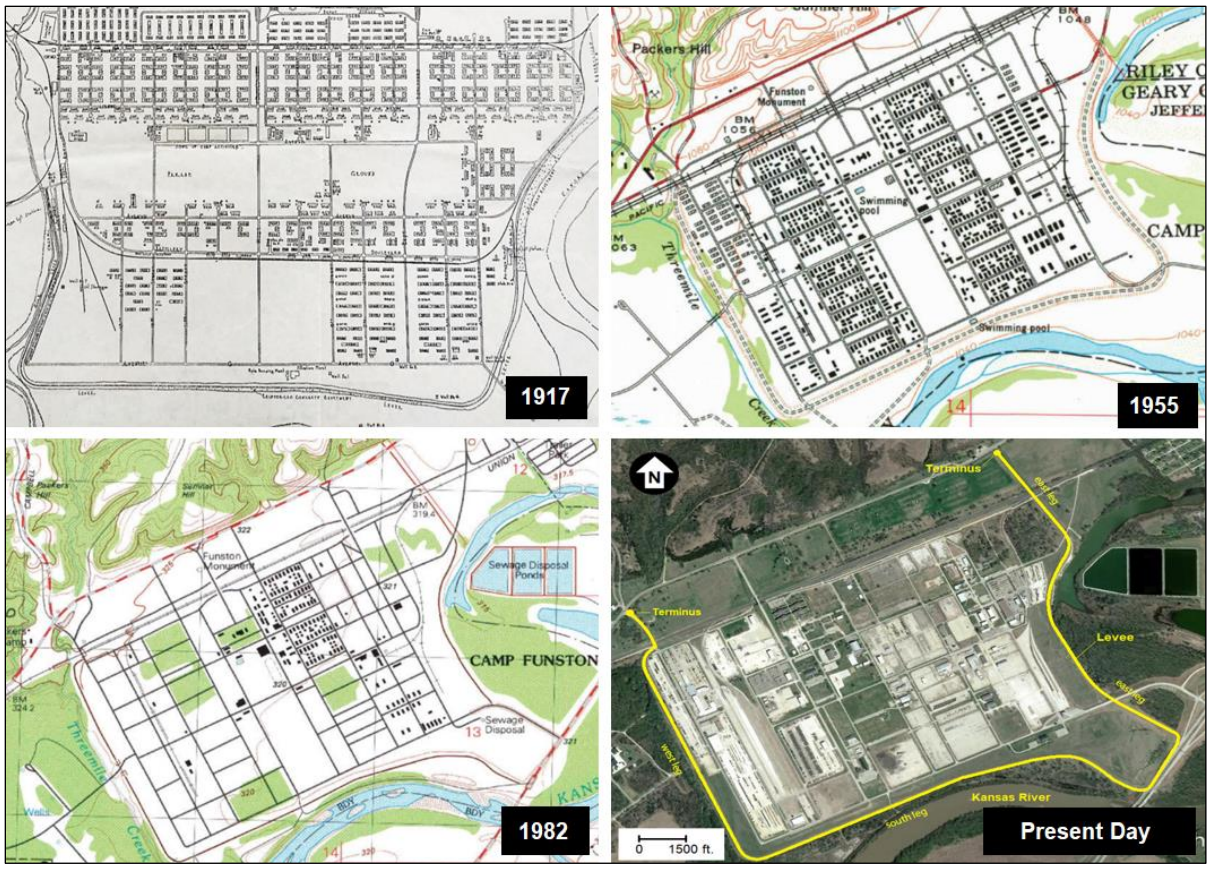
7 Conclusions

It is the recommendation of the authors of this report that the three levees are significant under Criterion A with a period of significance for the Camp Forsyth and Marshall Airfield levees from 1941 (WWII) through 1953 (response to the flood of 1951) and for the Camp Funston levee from 1917 (WWI) through 1953 (response to the flood of 1951). The Camp Funston and Marshall Airfield levees retain no integrity due to the realignment and modifications to the levees over time, more specifically in response to the flood of 1951. Refer to the comparison images of the Camp Funston levee (Figure 180) and Marshall Airfield levee (Figure 181). Therefore, the Camp Funston levee and Marshall Airfield levee are recommended not eligible to the NRHP. These properties should be marked "Determined Not Eligible" (DNE) once consultation is complete (Table 1).

The Camp Forsyth levee was the least affected by the flood of 1951, and it retains its integrity of layout and alignment from 1917 through 1953 with minimal modifications (Figure 182). Therefore, it is recommended eligible for the NRHP under Criterion A.

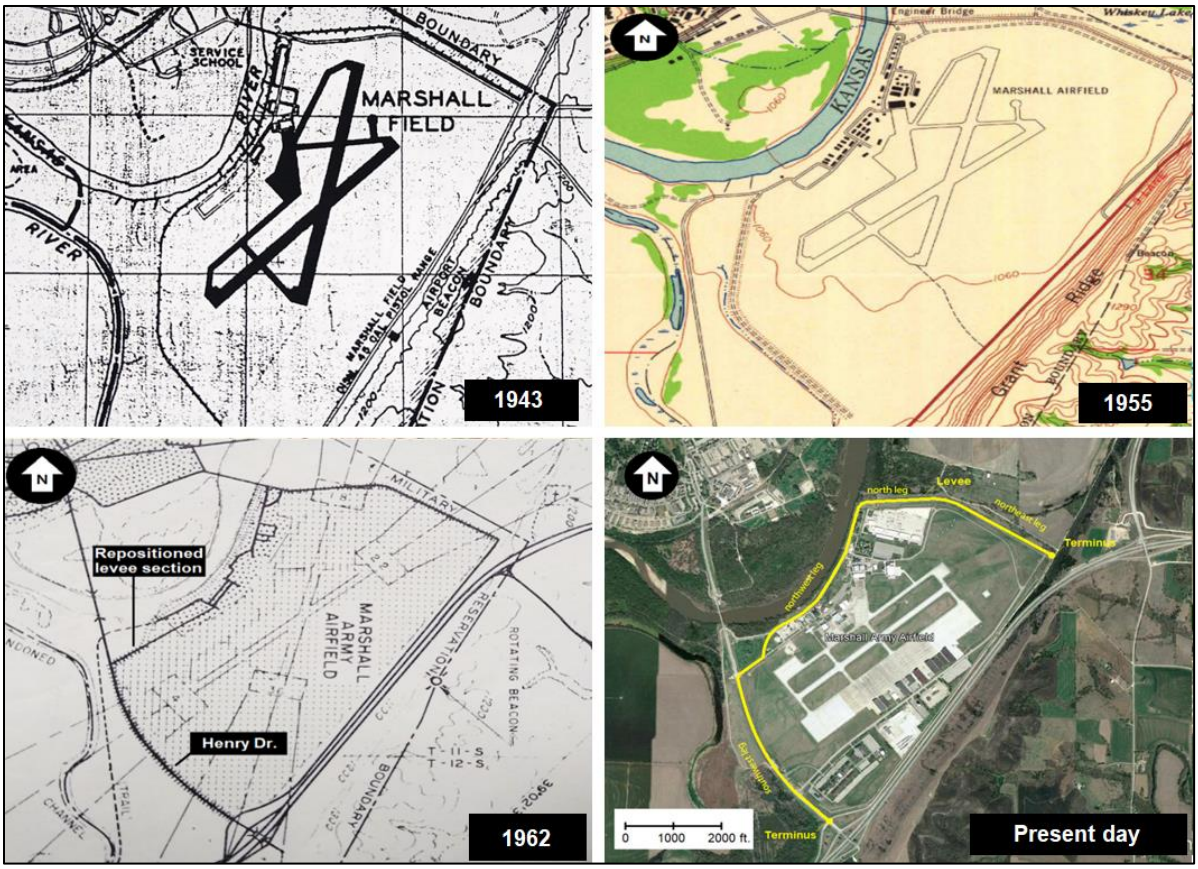
Breakneck Lake dam and Moon Lake dam are NOT eligible for the NRHP because of the lack of significance at the national level and the lack of significance for the construction and the design of the individual levees and lake dams. These properties should be marked DNE once consultation is complete.

Figure 180. Four comparison images from 1917, 1955, 1982, and 2019 showing the evolution of the alignment of the Camp Funston levee and the built environment that it was constructed to protect. (*Bottom right*, map data: Google, 2019. Image modified by ERDC-CERL, 2023.)[197]



197. *Map of Camp Funston*, 1917, SD 125 Collection on Ft. Riley (1 of 18), Series 1—Materials on Camp Funston, 1917–1920, Fort Riley Cavalry Museum Archives; USGS, *Ogden Quadrangle,* 1955 and 1982, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

Figure 181. Four comparison images from 1943, 1955, 1962, and 2019 showing the evolution of the alignment of the Marshall Airfield levee and the built environment that it was constructed to protect. (*Bottom right*, map data: Google, 2019. Modified by ERDC-CERL, 2023.)[198]



198. Howard, Needles, Tammen & Bergendoff, *Plan of the Military Reservation of Fort Riley, Kansas*, March 27, 1943, ERDC-CERL Landscape Lab collection; USGS, *Junction City Quadrangle*, 1955, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00; *Reservation Boundary & Land Use Map*, 1962, map collection, Fort Riley Cavalry Museum Archives.

Figure 182. Three comparison images from 1947, 1955, and 2019 showing the evolution of the alignment of the Camp Forsyth levee and the built environment that it was constructed to protect. (*Bottom*, map data: Google, 2019. Modified by ERDC-CERL, 2023.)[199]

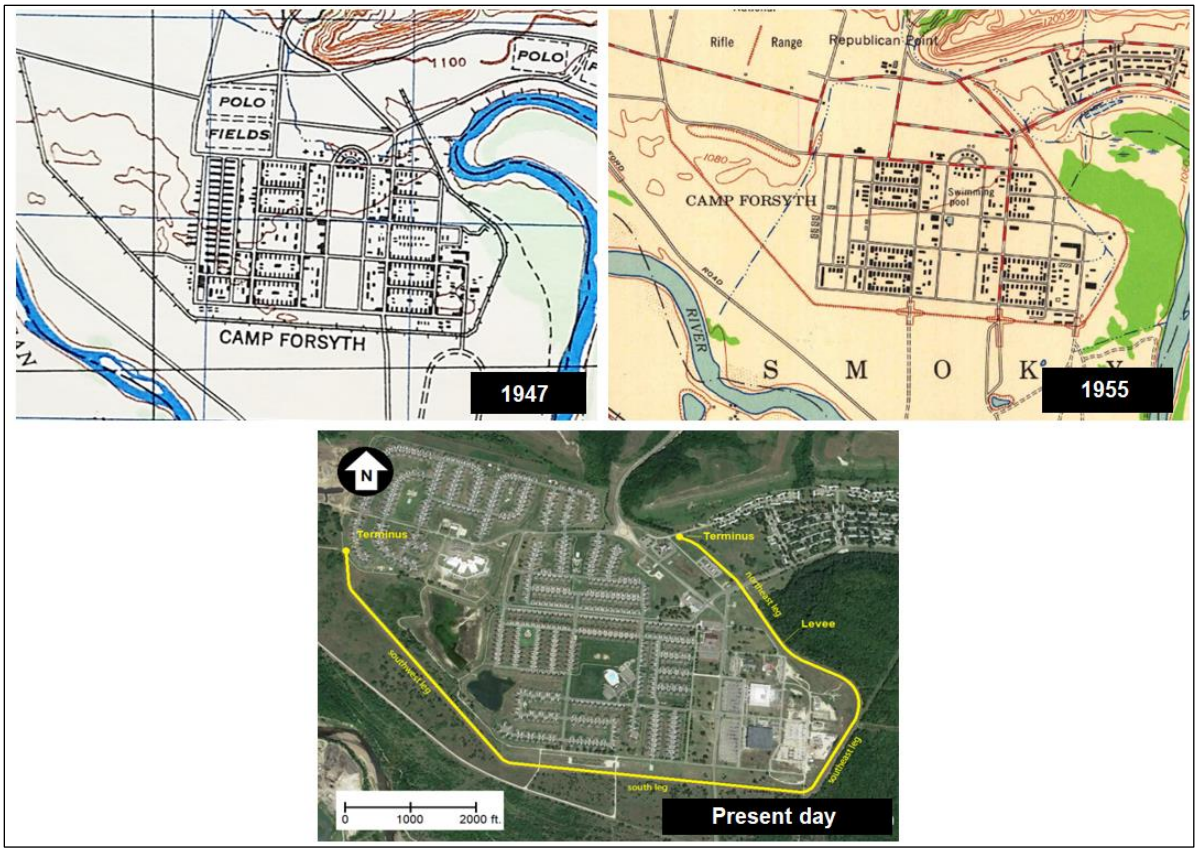


Table 1. List of properties and determination of their National Register of Historic Places (NRHP) eligibility.

Facility Number	Built Date and Modification Dates	Name	NRHP Significance	Integrity	Eligible for the NRHP
Not Applicable (NA)	1917–1918 1941 1953 Mid-1970s	Camp Funston Levee	Criterion A	No	No
NA	1941 1953 1958–1960	Marshall Airfield Levee	Criterion A	No	No
NA	1941	Camp Forsyth Levee	Criterion A	Yes	Yes
DAMBL	1950	Breakneck Lake Dam	No	NA	No
DAMML	1960	Moon Lake Dam	No	NA	No

199. USGS, *Fort Riley and Vicinity*, 1947, 7.5-minute topographic map, map collection, Fort Riley Cavalry Museum Archives; USGS, *Junction City Quadrangle*, 1955, 7.5-minute topographic map, National Geologic Map Database, https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

Bibliography

Annual Reports of the Secretary of War. Volume III. Washington DC: Government Printing Office, 1903.

Combs, Lanna J., and Charles A. Perry. *The 1903 and 1993 Floods in Kansas—The Effects of Changing Times and Technologies*. US Geological Survey (USGS), 2003. https://pubs.usgs.gov/fs/2003/0019/report.pdf.

Committee on Appropriations. *Military Public Works Appropriations for 1952*. House of Representatives, 82nd Congress, First Session on Military Public Works Appropriations for 1952, part 1. Washington DC: Government Printing Office, 1951.

Department of the Army. *Fort Riley: Its Historic Past*. Washington, DC: Government Printing Office, 1984.

Enscore, Susan I., Ellen R. Hartman, and Julie L. Webster. *Fort Riley Building Inventory, 1964–1974*. ERDC/CERL TR-17-28. Champaign, IL: ERDC-CERL, 2017.

ERDC-CERL Landscape Lab collection.

FEMA (Federal Emergency Management Agency). *Federal Guidelines for Dam Safety*. Washington: US Department of Homeland Security, 2004.

FEMA (Federal Emergency Management Agency). *History of Levees*. FEMA, n.d. https://www.fema.gov/sites/default/files/2020-08/fema_history-of-levees_fact-sheet_0512.pdf.

Follansbee, Robert, and J. B. Spiegel. *Flood on the Republican and Kansas Rivers, May and June 1935*. Washington DC: Government Printing Office, 1937. https://pubs.usgs.gov/wsp/0796b/report.pdf.

Fort Riley Cavalry Museum Archives, Fort Riley Kansas.

Fort Riley Department of Public Works (DPW). Fort Riley, Kansas.

Fort Riley Post (Fort Riley, KS). "Camp Moon Offers Beauty, Seclusion." June 29, 1962.

Fort Riley Post. "Kansas State Game Commission Oks Hunting Seasons for Post Reservation." September 1, 1961.

Fort Riley Post. "Lake Construction." December 31, 1959.

Fort Riley Post. "New Fishing Lake Planned Here." April 27, 1962.

Fort Riley Post. "New Lake Attracts Post Fishermen." July 7, 1961.

Fort Riley real property records, Fort Riley, Kansas.

Guidon (Fort Riley, KS). "Marshall Field Levee Under Reconstruction." June 18, 1952.

Guidon. "Three Mile Creek Moves in New Channel." May 7, 1952.

Herman, Frederick J. "Completion Report of Camp Funston: Fort Riley, Kansas." Box 107–108. Construction Completion Reports. Records of the Office of the Chief of Engineers, Record Group 77 (RG 77). NARA at Washington, DC.

Junction City Daily Union (Junction City, KS). "Aid Fort Riley Game." June 27, 1951.

Junction City Daily Union. "At Work on the Dikes." June 6, 1918.

Junction City Daily Union. "AUSA's Big Red One Week Picnic Tickets Available." May 21, 1979.

Junction City Daily Union. "Build Lake at Fort." June 12, 1950.

Junction City Daily Union. "Engineer Units at Post Busy With Projects that Only They Can Do." June 12, 1971.

Junction City Daily Union. "Fishing Clinic Set for Seniors." September 29, 1995.

Junction City Daily Union. "Flood Sweeps Down Republican." June 3, 1935.

Junction City Daily Union. "Flood Warning Issued Today." June 11, 1919.

Junction City Daily Union. "Fort Riley Unit Practicing Water Survival on Post." May 14, 1974.

Junction City Daily Union. "General Visits Scouts." July 19, 1963.

Junction City Daily Union. "High Waters Recede Here." June 5, 1935.

Junction City Daily Union. "May See Work of Engineers." May 18, 1952.

Junction City Daily Union. "Save Ponton Bridge from Flood Menace." September 8, 1951.

Junction City Daily Union. "Site of Boy Scout Camporee Changed." May 5, 1967.

Junction City Daily Union. "Slide for Life." June 30, 1971.

Junction City Daily Union. "Tenth Division Takes Flood in Stride and Starts Anew." August 7, 1951.

Junction City Daily Union. "The Smoky Is on a Rampage." March 17, 1919.

Junction City Daily Union. "Three Disastrous Floods in the Past Half Century." June 24, 1953.

Junction City Daily Union. "Will Dike the Kaw." September 14, 1917.

Juracek, Kyle E., Charles A. Perry, and James E. Putnam. *The 1951 Floods in Kansas Revisited*. USGS, 2001. https://pubs.usgs.gov/fs/2001/0041/report.pdf.

Kansas Historical Society. s.v. "Flood of 1903." *Kansapedia*, last modified May 2016, https://www.kshs.org/kansapedia/flood-of-1903/17221.

Kansas Historical Society. s.v. "Fort Riley." *Kansapedia*, last modified February 2013. https://www.kshs.org/kansapedia/fort-riley/17809.

Kansas Historical Society. s.v. "Weather in Kansas." *Kansapedia*, last modified July 2011. https://www.kshs.org/kansapedia/weather-in-kansas/14281.

Kansas Department of Transportation. *1957–58 Kansas State Highway Map*. 1958. https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burTransPlan/maps/HistoricStateMaps/1957-58Mapside.pdf.

Kansas Department of Transportation. *1960–61 Kansas State Highway Map*. 1961. https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burTransPlan/maps/HistoricStateMaps/1960Mapside.pdf.

Kansas Department of Transportation. *Kansas Map Changes: 2010 Annual Report*. Interchange, Project K 6796-02. Kansas Department of Transportation, 2010. https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burTransPlan/maps/mapchangehist/2010KSmapCHANGES.pdf.

Kansas Department of Transportation. "Resolution for Relocation and Redesignation of Road in Geary County, Riley County." May 9, 1973. State Highway Commission of Kansas. https://dmsweb.ksdot.org/AppNetProd/docpop/PdfPop.aspx. http://dmsweb.ksdot.org/AppNetProd/docpop/pdfpop.aspx?KT142_0_0_0=003709534&clienttype=html&doctypeid=114.

Manhattan Mercury (Manhattan, KS). "City Firm Will End Fort Flood Work in Month." February 18, 1953.

Manhattan Mercury. "Dikes Planned for Fort Riley." January 9, 1941.

Manhattan Mercury. "Flood Barriers Finished at Fort." May 8, 1941.

McCauley, James R. "Development and General Geology of the Kansas River Corridor." *Kansas Geological Survey*, 1998. http://www.kgs.ku.edu/Publications/KR/kr_geol.html.

Murphy, John, Jeffrey D. Ellis, Shaun Stanton, Xavier Rivera-Hernandez, and Ron Elliston. "Periodic Dam Inspection Report Breakneck Lake Dam Fort Riley, Kansas, PIR-RIL-19-Dambl." Installation Management Command (IMCOM) Army Transportation Infrastructure Inspection Program (ATIIP), 2019. *This is a controlled report that is unavailable to the public.*

Murphy, John, Jeffrey D. Ellis, Shaun Stanton, Xavier Rivera-Hernandez, and Ron Elliston. "Periodic Dam Inspection Report Moon Lake Dam Fort Riley, Kansas, PIR-RIL-19-Damml." Installation Management Command (IMCOM) Army Transportation Infrastructure Inspection Program (ATIIP), 2019. *This is a controlled report that is unavailable to the public.*

1928 Flood Control Act, Pub. L. 391, 45 Stat. 534 (1928). https://uscode.house.gov/statviewer.htm?volume=45&page=534.

Ohlmacher, Gregory C. "Hydraulic Characteristics of the Kansas River." *Kansas Geological Survey*, 1998. http://www.kgs.ku.edu/Publications/KR/kr_hydro.html.

Ottawa Herald (Ottawa, KS). "An Eight-Foot Tall Concrete Dike." September 14, 1917.

Pride, Woodbury F. *The History of Fort Riley*. Fort Riley: Cavalry School Book Dept, 1926.

"Rehabilitation of Flood-Stricken Areas," H.R. Rep. No. 82-1092 (1951).

Schmidt, Aaron R., Kayley R. Schacht, Sunny E. Adams, and Adam D. Smith. *Fort Riley German POW Stonework Historic Context and National Register of Historic Places (NRHP) Evaluation*. ERDC/CERL TR-23-28. Champaign, IL: ERDC-CERL, 2023.

Shortridge, James R. *Our Town on the Plains: J. J. Pennell's Photographs of Junction City, Kansas, 1893–1922*. Lawrence: University Press of Kansas, 2000.

Smith, Adam, Sunny Stone, Susan Enscore, Marcia Harris, Christella Lai, Jacqueline Wolke, and William Meyer. *Fort Leonard Wood German POW Stonework Context and Survey*. ERDC-CERL SR-06-30. Champaign, IL: ERDC-CERL, 2006.

Riley County Historical Museum. "Summary History of Riley County." Riley County, Kansas (website). https://www.rileycountyks.gov/DocumentCenter/View/1534/F---Summary-History.

US Army. "History of Fort Riley and 1st Infantry Division." US Army Fort Riley. https://home.army.mil/riley/index.php/about/history.

USGS (US Geological Survey). *Junction City Quadrangle*. 1955, 1982. 7.5-minute topographic map. National Geologic Map Database. https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

USGS. *Ogden Quadrangle*. 1951, 1955, 1978, 1982. 7.5-minute topographic map. National Geologic Map Database. https://ngmdb.usgs.gov/topoview/viewer/#4/40.00/-100.00.

Winkler, Lewiell. "New Dyke May Save Another Extended Bivouac for Division." *e Guidon,* March 6, 1952.

Winkler, Lewiell. "What a Difference 8 Months Made, 240 Little Days." *Guidon,* March 12, 1952.

Abbreviations

ATIIP	Army Transportation Infrastructure Inspection Program
CCC	Civilian Conservation Corps
CERL	Construction Engineering Research Laboratory
CRM	Cultural resource manager
DAMBL	Breakneck Lake dam
DAMML	Moon Lake dam
DPW	Directorate of Public Works
ERDC	Engineer Research and Development Center
FEMA	Federal Emergency Management Agency
IMCOM	Installation Management Command
lin ft	Linear feet
NARA	National Archives and Records Administration
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
POW	Prisoner of war
USACE	US Army Corps of Engineers
WPA	Works Progress Administration
WWI	World War I
WWII	World War II

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14. ABSTRACT

This project provides a historic context and inventory for the levees and dams constructed at Fort Riley, Kansas. The purpose of this historic context and inventory is to determine the levees and dams' eligibility for listing in the National Register of Historic Places (NRHP). Determinations of eligibility to the NRHP are then made based on the significance of the levees and dams and the degree to which they retain their integrity for conveying that significance. The authors inventoried and evaluated three levees and two lake dams on the installation. Based on the historic context and inventory, researchers for this project have determined that none of the levees and dams are eligible for the inclusion in the NRHP nor was there enough evidence for a noncontiguous historic district at Fort Riley.

15. SUBJECT TERMS

Camp Forsyth; Camp Funston; Fort Riley, levees, dams, flood of 1951; Marshall Airfield; National Register of Historic Places

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