Appendix B – Hydrology and Hydraulics

1 EXISTING CONDITIONS

1.1 HYDROLOGY AND HYDRAULICS

The Kaskaskia River Port District (KRPD) Terminal #2 (KRPD#2) is located along the right descending bank of the Kaskaskia River near RM 18. The study area includes two oxbows of the Kaskaskia River. The oxbow on which KRPD#2 is located is called the south oxbow in this report. The oxbow directly north of the south oxbow, approximately 1,200 feet from the existing port terminal on the north side of IL-154, is called the north oxbow in this report (**Figure B-1**).

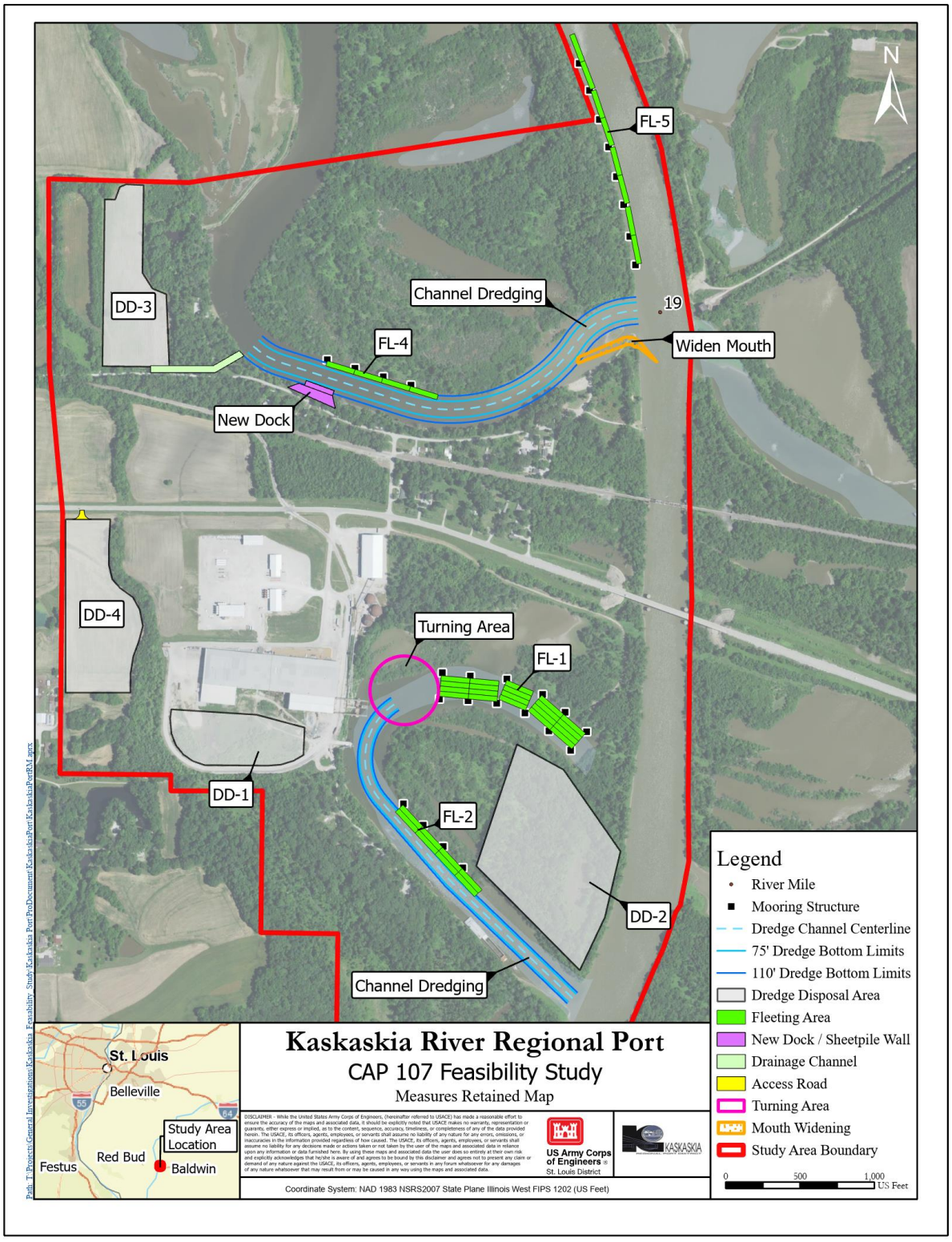

Figure B-1. Project Area with Measures Retained

The nearest upstream gage at Red Bud is at RM 19.3; the gage only reports a stage value. The gage zero at this location is elevation 299.63 ft NAVD 88 and flood stage is 74.00 ft. The highest stage at this location was 94.83 ft on 2 January 2016. A hydrograph is shown below in **Figure B-2Figure B-2**.

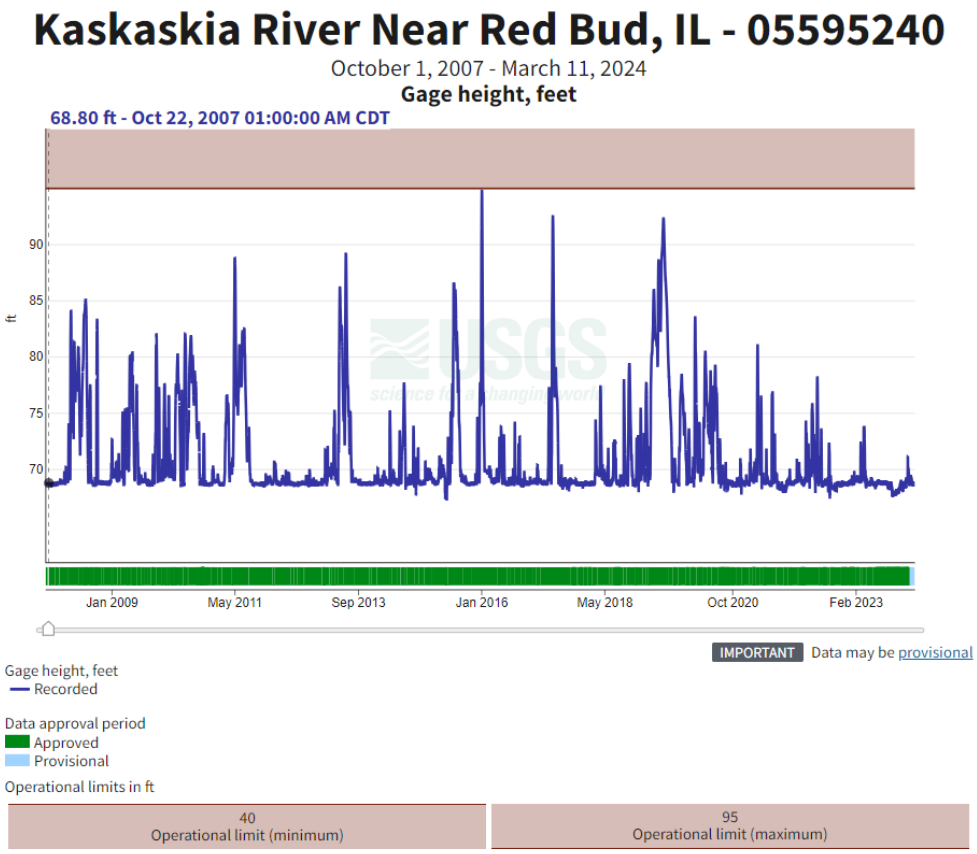

Figure B-2. Hydrograph at the Red Bud Gage, 2007 to 2024

1.2 SURVEYS

A bathymetric survey of the south oxbow was conducted on 04 February 2016. At that time, elevations ranged from approximately 353 to 366 ft NAVD 88. A second bathymetric survey was more recently conducted on 28 October 2021; these values range from 354 to 367 ft NAVD 88. **Figure B-3 Figure B-3** shows a surface difference of the survey data. The green areas are deeper since 2016 and the blue areas are shallower. The differences in depth in the five years between the 2016 and 2021 bathymetric surveys show that much of the outer curve (west bank) became shallower, including the area around the crane and docks, even after dredging occurred in 2018. The difference between the two surveys was also used to calculate a mean deposition rate for the parts of the surface difference that were depositional. The mean deposition amount was 0.68 ft, or 0.12 ft/yr. when converting to a rate based on the collection dates of the two surveys.

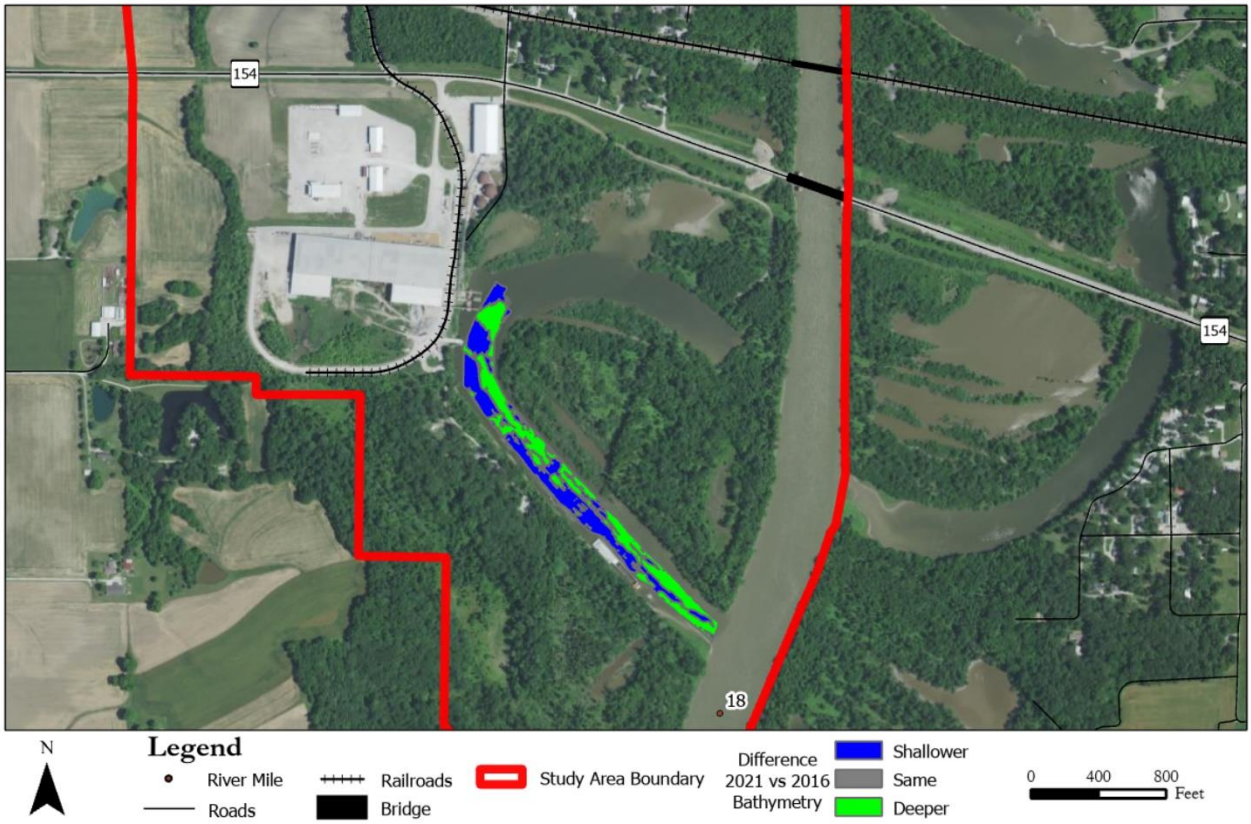

Figure B-3. 2021 vs 2016 South Oxbow Bathymetric Survey – Surface Difference

The width of the south oxbow navigation channel is approximately 45 feet, which leaves only 5 feet on either side of a barge for maneuvering within the oxbow. In the past, KRPD has dredged the channel at approximately ten-year intervals. In 2008 and 2018, dredging occurred at the mouth of the oxbow and other shallow problem areas. The material was trucked to the site south of the TMW building, less than half a mile away (the disposal site known as DD-1 in this study).

A bathymetric survey of the north oxbow was conducted in 2023.

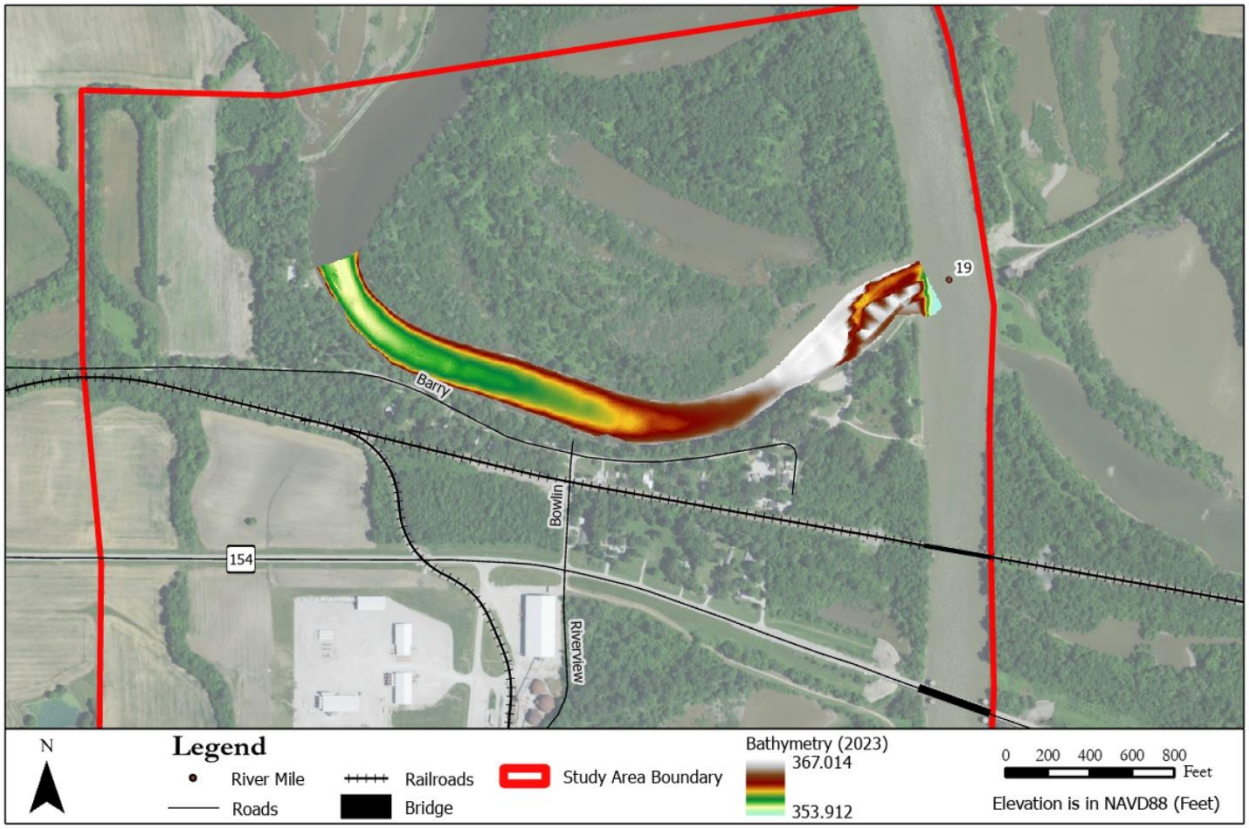

Figure B-4Figure B-4 shows the north oxbow bathymetry with elevations ranging from 354 ft to 367 ft NAVD 88. The north oxbow is shallower near the mouth. The white sections in

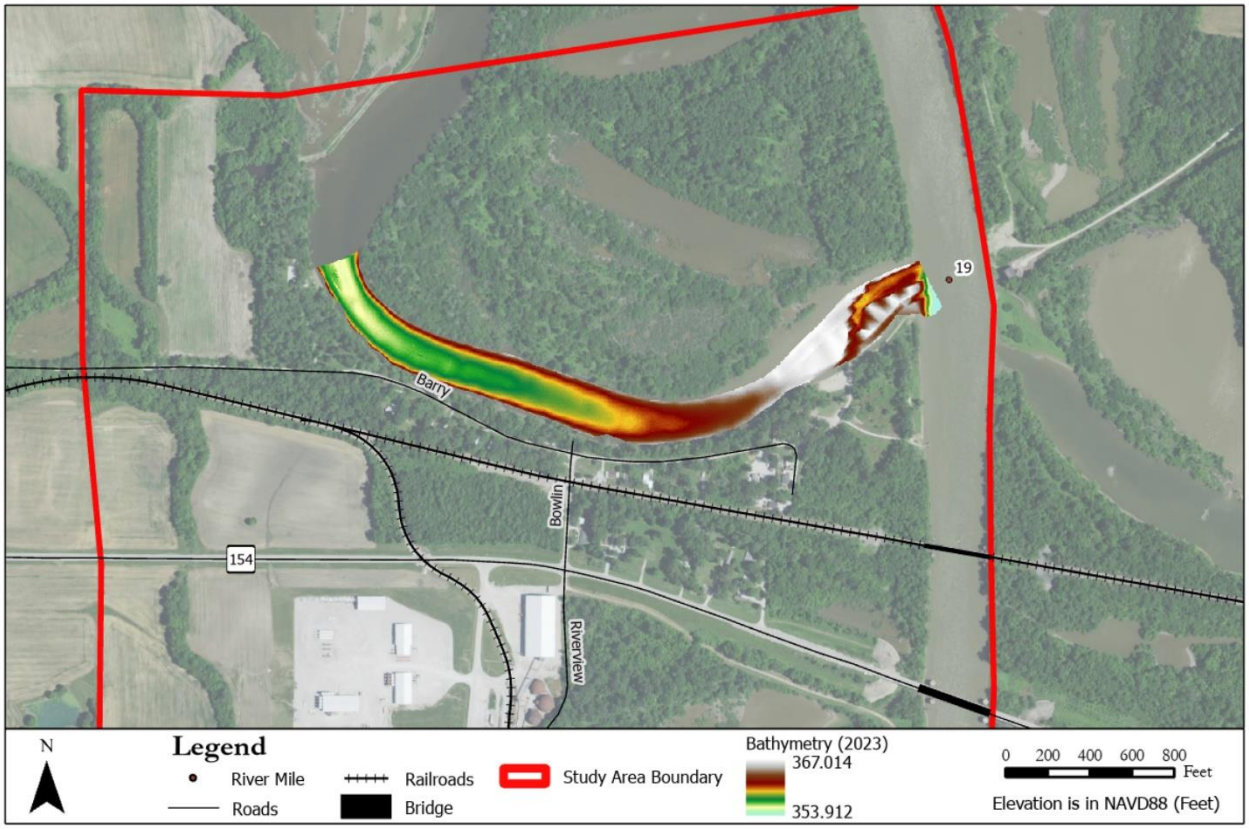

Figure B-4 indicates the highest part of the oxbow channel, indicating a buildup of deposition. The oxbow had not been surveyed prior to 2023, so there were no surveys that could be used for comparison.

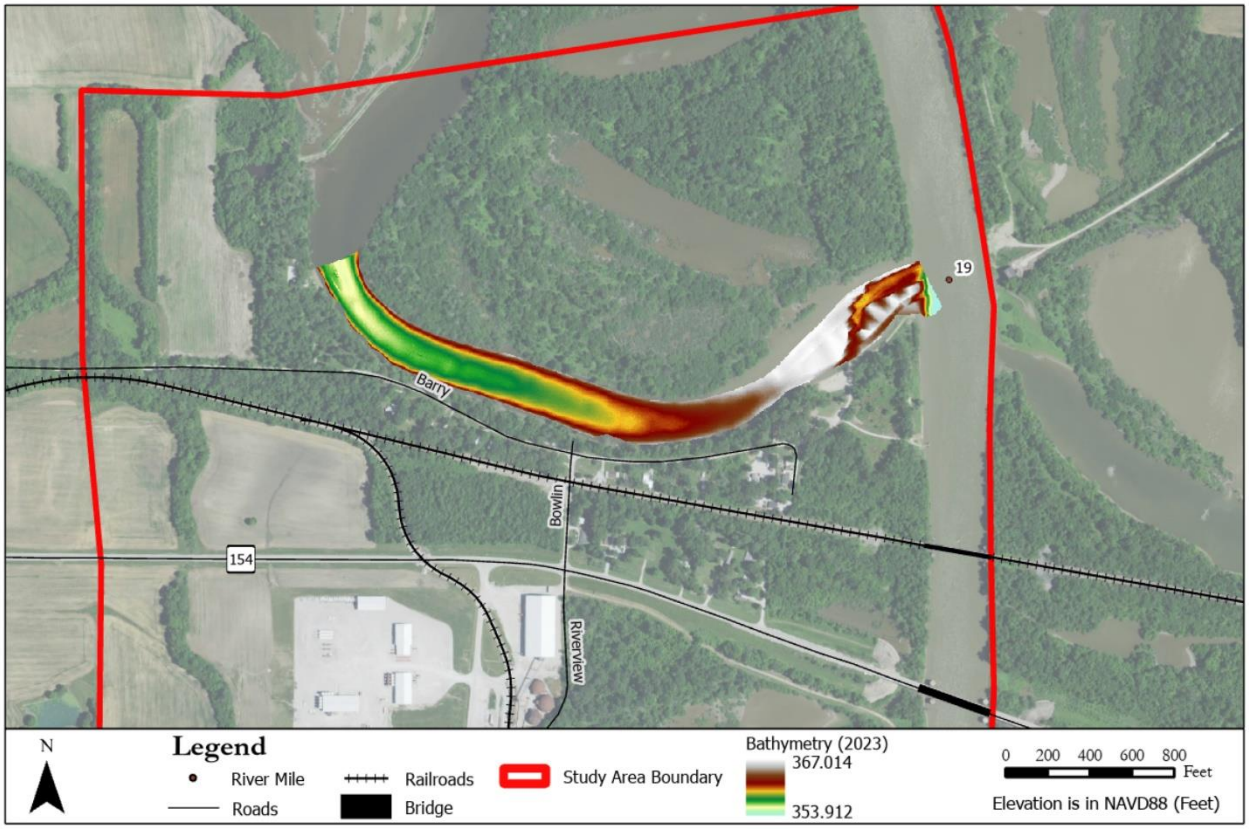

Figure B-4. North Oxbow Bathymetry from June 2023 Single Beam Survey

Comprehensive surveys of the Kaskaskia River main channel are single-beam surveys. The 2021 comprehensive survey consists of rangelines spaced approximately 200 ft apart. The centerline river depth at RM 19-18 is approximately 13 to 22 ft below minimum regulated pool; at the channel borders, the depths get as low as 8 ft below minimum regulated pool. Kaskaskia River flow and thus depth are impacted by releases from Carlyle Lake upriver.

1.3 PAST DREDGING EVENTS

Known information on past dredging events in the south and north oxbows is shown in **Table B-1**. An additional dredging contract in 2020 (Delivery Order # W912P920F0385) was found for dredging “oxboxs [sic] identified by the Government on the Kaskaskia River”, but the study team was not able to confirm whether this dredging included the oxbows in the study area.

Bridge height is a constraint on the type of dredge vessel used. The bridge that acts as the smallest possible opening downstream of KRPD2 is the Missouri Pacific Railroad Bridge at RM 1.8 on the Kaskaskia River, with vertical clearance of 39 ft above pool (U.S. Department of Homeland Security, U.S. Coast Guard, 2022). In the past, some dredges have been disassembled and reassembled on the Kaskaskia River, but this takes additional time and resources.

Table B-1. Summary of Past Dredging at the South Oxbow and North Oxbow Mouth
*(all work assumed completed)

Date	Location/Extent Dredged	Dredge Operator	Dredging method	Dredging Method and Disposal Location (if known)
2002	South & north oxbow mouth. Environmental side channel excavation. South oxbow mouth (location P-2961 (2016-506), Remnant Side Channel 21, right descending bank, approximate Kaskaskia RM 18.1). Extent: approximately 6 ft deep, 180 ft wide, 300 ft long, removing approximately 12,000 cubic yards of material. North oxbow mouth (location P-2958 (2016-503): Remnant Side Channel 18, right descending bank, approximate Kaskaskia RM 18.97). Extent: approximately 6 ft deep, 80 ft wide, 500 ft long, removing approximately 8,000 cubic yards of material.	USACE or contractor (Public Notice No. P-2953 to P-2963; Public Notice Date June 14, 2016)	Mechanical	Mechanical dredging. Excavated material "will be loaded into a hopper barge and transported to an existing KRPD offloading dock where the material will be placed in trucks and disposed into KRPD's existing upland disposal basin. No discharge or runoff from the previously approved and frequently utilized disposal basin will re-enter regulated waters."
2008	South oxbow channel & mouth. Dredging near the mouth of the oxbow and problem spots a little further in. Geotubes were used at other oxbows where possible; they weren't used on KRPD#2 side.	USACE (Service Base crew)	Mechanical dredging	Mechanical dredging. Containment barges were unloaded with overhead crane to dump trucks; material was trucked to DD-1.
2018	South oxbow channel & mouth. Dredging at mouth and other shallow spots.	Unconfirmed	Mechanical dredging	Mechanical dredging. Barges were unloaded to trucks which took material to DD-1. Opted

Date	Location/Extent Dredged	Dredge Operator	Dredging method	Dredging Method and Disposal Location (if known)
				not to use DD-2 because it was not ready to receive material (too overgrown with trees, no capacity to filter water before it reenters the river).
Summer 2021	South oxbow mouth. Details unconfirmed.	Southern Illinois Transfer Co	Mechanical dredging	Mechanical dredging. Longstick excavator on a barge placed material in a hopper barge, then material was moved by crane to trucks then deposited at DD-1.
September 2021 ("to be completed by 30 Dec 2021")	South oxbow mouth. Dredging from the mouth to 250 feet inward and 100 feet wide. Oxbows to be dredged include 18, 19, and 20, located between RM 17-20. Common names of the oxbows are: 18 (Joe's Landing), 19 (Wood Duck), and 20 (TMW).	USACE Contract to Jackson D Summers Envirotech (Delivery Order # W912P921F0305)	Mechanical dredging	Mechanical dredging. Containment barge and spud barge with crane used; material deposited at Dry Lake spoils site maintained and owned by IDNR and KRPD.
February 2021 ("to be completed by September 30 2021")	South oxbow mouth. Environmental Dredging. "Dredge oxboxs identified by the Government on the Kaskaskia River." Contract does not state whether north or south oxbows were included, however, USACE Operations stated dredging was done at south oxbow approximately 600 yards inward to 10 ft depth.	USACE Contract to Jackson D Summers Envirotech (Delivery Order # W912P921F0121)	Hydraulic dredging	Hydraulic dredging. Discharge tubing and a booster pump were used. Disposal site was not documented; USACE Operations recall it was DD-1 (pipeline placed across road and covered with gravel).
February 2022	South oxbow mouth. Dredging from the mouth to 250 feet inward and 100 feet	USACE Contract to Jackson D Summers Envirotech	Mechanical dredging	Mechanical dredging. Method not stated. Material deposited at Dry Lake spoils site

Date	Location/Extent Dredged	Dredge Operator	Dredging method	Dredging Method and Disposal Location (if known)
	wide. Oxbows to be dredged include 18, 19, and 20, located between RM 17-20. Common names of the oxbows are: 18 (Joe's Landing), 19 (Wood Duck), and 20 (TMW). USACE Operations confirmed oxbow 20 was dredged in 2022.	(Delivery Order # W912P922F0042)		maintained and owned by IDNR and KRPD.
September 2022 ("work to be completed by 31 Jan 2023")	South oxbow mouth. Dredging from the mouth to 200 feet inward and 50 feet wide, to a minimum depth of 4 ft, removing 35,000 cy of material per oxbow. Peacock Site (RM 25), Smithy's (RM 23.75), Doza Creek (RM 20.5), Joe's Landing (RM 20), and TMW (RM 18). USACE Operations confirmed oxbow 20 was dredged in 2022.	USACE Contract to Jackson D Summers Envirotech (Delivery Order # W912P922F0198)	Hydraulic dredging	Hydraulic dredging. Discharge tubing; other equipment (Spoil site referenced for TMW oxbow is "BB", which is not described further in the document) Spoil site for oxbow 20 was DD-1 (confirmed by USACE Operations)

1.4 FLOODING IN NORTH OXBOW AND LOCK AND DAM SHUTDOWN

The study team wished to determine how often flood conditions occur at KRPD#2 causing shipping to stop. For both the north and south oxbows, shipping stops when the Jerry F. Costello Lock and Dam is closed. According to the KRPD#2 Port operator, this means that flooding shuts down shipping at KRPD#2 when flow on the Kaskaskia River is 7,000 cfs or higher.

The closest flow gage to the north oxbow is the USACE gage at Venedy Station (RM 57.2). The USACE contracts with the USGS to take flow measurements at this gage; the USGS lists this gage as #05594100. The daily discharge record for the USGS gage near Venedy Station began in October 1969. There is another flow USGS gage on the Kaskaskia River between Venedy Station

and the north oxbow at New Athens, IL (USGS 05595000). The flow record at the New Athens gage began in April 2009.

Based on the length of flow data record available, the USGS gage for the Kaskaskia River Near Venedy Station, IL was used for analysis. There are tributaries that join the Kaskaskia River between Venedy Station and the oxbow, resulting in the actual flow past the oxbow mouth being higher than the reported flow at Venedy Station.

The Hydrologic Engineering Center's (HEC) Data Storage System Visual Utility Engine (DSSVue) was used for duration analysis. From the flow duration analysis, a flow of 7,000 cfs was exceeded 18% of the time from October 1969 – April 2023. A flow of 7,000 cfs has been exceeded annually since 1969, except in 1981.

Data for the Jerry F. Costello Lock and Dam pool stage was provided by the USACE St. Louis District Water Control Operations office. Based on the standard operating procedure at Jerry F. Costello Lock and Dam, the lock operation will continue up until the pool water surface elevation is above 380.0 ft NAVD 88. According to the Assistant Operations Manager overseeing Jerry F. Costello Lock and Dam, it is possible that the lock will continue operating 6-8 inches above 380.0 ft if the miter gate recesses are hosed out. Based on daily data from November 1973 to April 2023, an elevation of 380.0 ft NAVD 88 has been exceeded approx. 2.7% of the time. **Table B-2** shows the number of days the elevation has been above 380.0 ft from 1974-2022.

Table B-2. Days Above Water Surface Elevation of 380.0 ft NANVD 88 to Close Lock at Jerry F. Costello Lock and Dam, Based on Daily Data 1974-2022

Year	Days Above 380.5 ft	Year	Days Above 380.5 ft
1974	0	1999	0
1975	0	2000	0
1976	0	2001	3
1977	0	2002	13
1978	0	2003	0
1979	9	2004	0
1980	0	2005	0
1981	0	2006	0
1982	7	2007	0
1983	21	2008	29
1984	1	2009	3
1985	11	2010	17
1986	15	2011	21
1987	0	2012	0
1988	0	2013	31

Year	Days Above 380.5 ft	Year	Days Above 380.5 ft
1989	0	2014	0
1990	4	2015	31
1991	0	2016	7
1992	0	2017	13
1993	98	2018	0
1994	5	2019	99
1995	31	2020	0
1996	15	2021	0
1997	2	2022	0
1998	4		

Total Days above 380.0 ft NAVD 88: 490 days
Total Days (1974-2022): 17,897 days
% of time 380.0 ft exceeded: 2.7%

2 FUTURE WITH PROJECT CONDITIONS

This section includes relevant hydrologic and hydraulic analysis associated with measures included in the initial array of alternatives.

2.1 SOUTH OXBOW DREDGING QUANTITIES

2.1.2 Background

The following measures (**Figure B-1**) involving dredging in the south oxbow were proposed:

- Channel dredging, to one-or two-way traffic width
- New turning area
- New fleeting area 1 (FL-1)
- New fleeting area 2 (FL-2)

This analysis focuses on estimating the dredge quantities that would correspond with the measures.

2.1.3 Assumptions

The navigation pool on the Kaskaskia River is maintained by hinge point control, meaning that there is a gage in the pool, “the hinge”, with a set range that the pool elevation must stay within by adjusting flow through Jerry F. Costello Lock and Dam, until flows increase to the point that staying within that range can no longer be maintained. The hinge point elevation is read from the Kaskaskia River near Red Bud, IL gage, off the State Route 154 bridge near river mile 18.5. At low flows, water is released through the dam to maintain the maximum pool elevation at the dam. As flows begin to increase, additional gates are opened at the dam to

draw down the water surface at the dam, leading to a slope in the pool's water surface and keeping the water surface elevation within limits at the hinge. This drawdown continues until reaching the minimum stage allowed at the dam under the operations plan, a point called maximum drawdown. At Red Bud, the hinge point operation elevations range between 367.63 – 369.63 ft NAVD 88, with 367.63 ft NAVD 88 being the lowest hinge point elevation to maintain navigation in the vicinity of KRPD#2.

The 2021 comprehensive bathymetric survey was used to analyze the dredging volumes necessary for the dredging measures and alternatives. Surfaces were developed that each featured an outlined measure or measures providing a desired depth below the Red Bud hinge point minimum elevation (367.63 ft NAVD 88) (see **Figure B-5Error! Reference source not found.** for an example measure surface). For these measures, side slopes of 1V:3H outside of the specific measure extents were assumed for a side slope resulting from dredging. These measure surfaces were then compared to a combined surface of the 2021 comprehensive bathymetric survey combined with the 2012 Randolph County, IL LIDAR (to capture both bathymetry and topography) to determine the volume necessary to excavate to achieve the alternative at the desired depth.

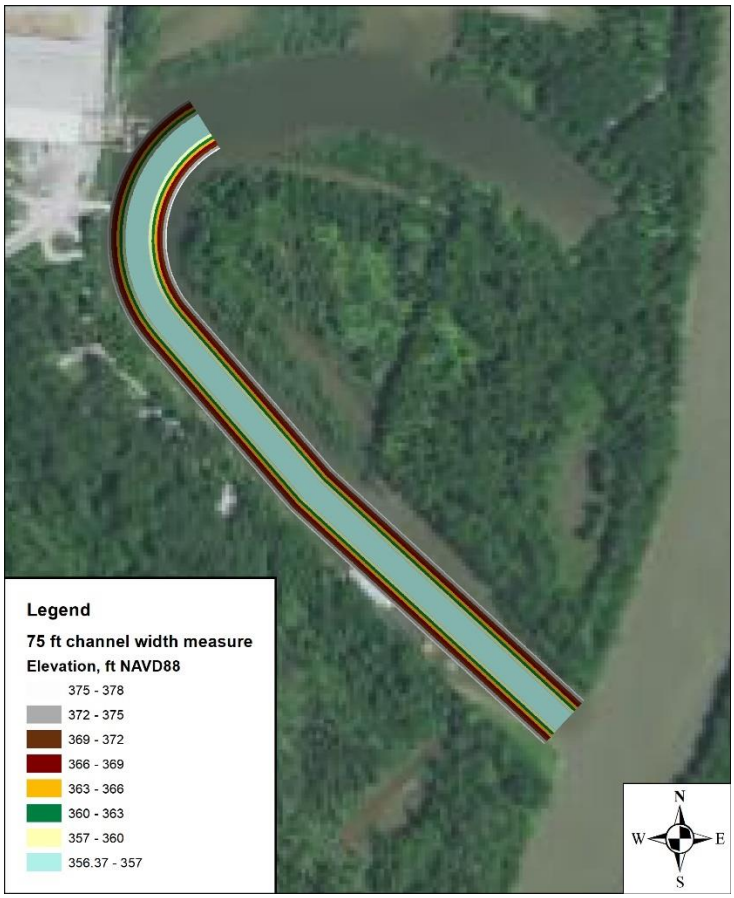

Figure B-5. Surface for 75 ft Width Dredging Measure (One-Way Traffic Width)

2.1.4 Estimated Dredging Volumes

Using the methodology described above, the estimated volumes for each measure were determined and calculated for each alternative as presented below in **Table B-3** and **Table B-4**. Section 3.6 in the main report describes the alternatives in more detail.

Table B-3. Estimated Dredge Volumes (CY) for South Oxbow Alternatives with 110 ft Channel Width (Two-Way Traffic Width)

Alternative	10ft Depth	11 ft Depth	12 ft Depth	13 ft Depth	14 ft Depth
3a - Channel	21,000	32,000	45,000	59,000	74,000
2a - Channel and Turning Area	68,000	87,000	107,000	128,000	151,000
(Turning Area alone)	48,000	55,000	62,000	70,000	77,000
1a - Channel, Turning Basin 1, FL-1	94,000	117,000	143,000	171,000	200,000

Table B-4. Estimated Dredge Volumes (CY) for South Oxbow Alternatives with 75 ft Channel Width (One-Way Traffic Width)

Alternative	10ft Depth	11ft Depth	12ft Depth	13ft Depth	14ft Depth
3b - Channel	12,000	20,000	29,000	39,000	49,000
2b - Channel and Turning Area	60,000	75,000	91,000	109,000	127,000
(Turning Area alone)	48,000	56,000	63,000	71,000	78,000
1b - Channel, Turning Basin 1, FL-1, FL-2	87,000	110,000	134,000	160,000	187,000

2.1.5 Risk and Uncertainty

At the time of the analysis, the 2021 comprehensive bathymetric survey was the most recent survey available that covered the main channel in the study area. The bed elevations between range lines were interpolated and not surveyed. There is some uncertainty in the bed elevation due to interpolation.

The 2021 comprehensive survey data was converted into a .TIN to represent the channel surface (**Figure B-6**). The surface .TIN is formed by connecting survey points to create a network of triangles, with the elevation interpolated within the triangles. The surface calculated from the 2021 comprehensive survey shows signs of triangulation issues, as shown by the rectangular blocks on the left side of the channel looking downstream. The triangulation issue may have occurred because points that were too far apart triangulated and interpolated the elevation between them, creating the rectangular blocks. The triangulation issue adds uncertainty to the interpolated bed elevation within the rectangular blocks of the surface.

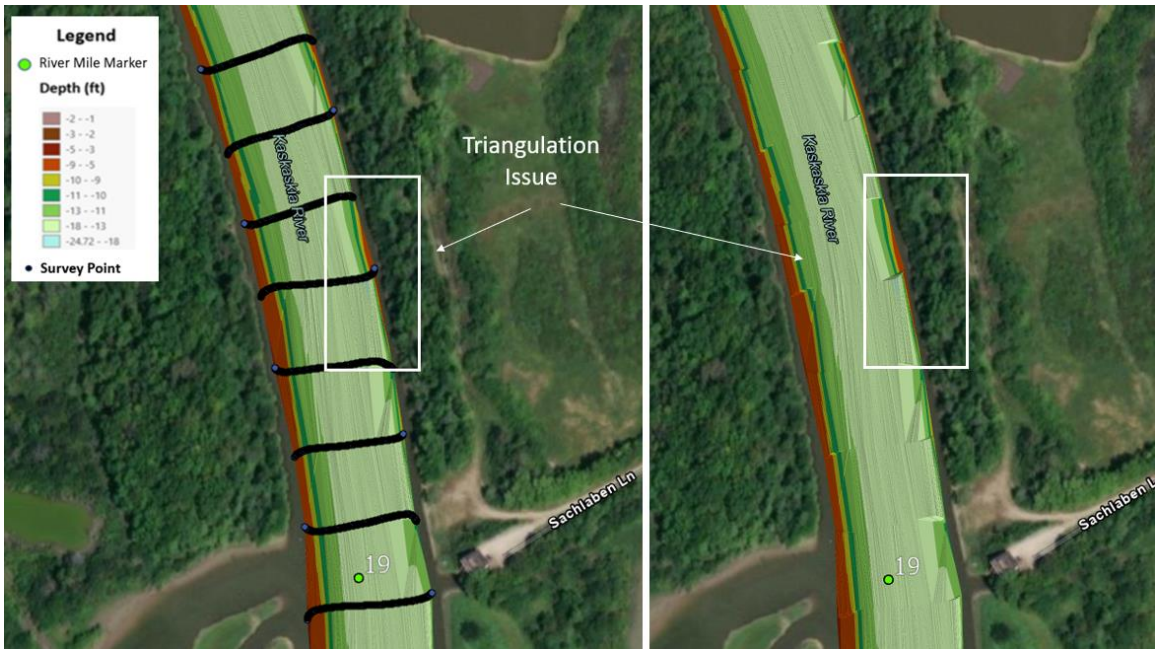

Figure B-6. Representative triangulation Issue with Depth Surface Created Using 2021 Comprehensive Survey

The 2021 comprehensive survey is a snapshot in time of the bed condition at the time the survey was collected. It is reasonable to assume that the bed of the south oxbow has changed in the ensuing time. As such, the dredging volumes calculated should be seen as estimates based on the available limited information and are subject to change during construction.

2.2 NORTH OXBOW MEASURES ANALYSIS

2.2.1 Potential Impacts on River Navigation Channel

The north oxbow alternatives may have an impact on the main navigation channel of the Kaskaskia River, which has an authorized depth of 9 ft per the Kaskaskia River Navigation Project. Measures in the north oxbow alternatives include dredging the channel and widening the mouth of the north oxbow. Specifically, sediment deposition in the river channel may change due to alteration of the north oxbow.

The north oxbow is connected to the main Kaskaskia River channel on the downstream end. The river will backwater into the oxbow from the main channel, and the water in the oxbow is slack. Water can also enter the oxbow through rain events and out-of-bank flow events. At the oxbow mouth, there is an interface between the slack water and the flowing water from the main channel. Widening the oxbow mouth will increase the cross-sectional area, which increases the interface between the flowing water of the main channel capable of moving sediment downstream and the slack water of the oxbow that cannot maintain sediment movement. An increased interface will lead to an increase in sediment deposition. Dredging the oxbow will also increase cross-sectional area. The average velocity will decrease with increased cross-sectional area. The decrease in velocity can lead to more sediment settling out

and depositing. Maintenance dredging will be needed to maintain the desired dredged channel depth in the oxbow.

With or without a numerical model of the study area, the increase of deposition cannot be quantified effectively based on the scarcity of available data and level of uncertainty of a sediment transport model for the expected scale of impacts. It is expected that the increase in deposition would not have a large effect on the main navigation channel depth or the amount of sediment transported through the reach.

2.2.2 Fleeting Area 5 (FL5)

2.2.2.1 Background

At the request of the KRPD, the possibility of adding a fleeting area in the main Kaskaskia River channel upstream of the north oxbow was examined. The Kaskaskia River Navigation Project was authorized to create a 9-ft deep, 225-ft-wide navigation channel. The authorized navigation channel must be maintained, and a new fleeting area would not be allowed if it negatively impacts the authorized channel.

KRPD provided an example layout from the KRPD Terminal #1 dock as a reference of an approved fleeting area further upstream on the Kaskaskia River. The USACE St. Louis District Regulatory Branch has permitted 2-barge wide fleets at KRPD's Terminal #1, Terminal #2, and Evansville sites. In the main channel near RM 18 close to KRPD#2, there is an existing permitted fleeting area that is 2 barges wide by 2 barges long. USACE coordinates with the river industry and the US Coast Guard (USCG) to ensure the barges do not extend too far into the navigation channel.

The following analysis focuses on determining if there is enough width to maintain the authorized navigation channel with the addition of FL-5.

2.2.2.2 Assumptions

The 2021 comprehensive bathymetric survey was used to analyze whether there was sufficient width for a fleeting area and the 9 ft deep, 225 ft wide navigation channel. The Red Bud hinge point minimum elevation (367.63 ft NAVD 88) was subtracted from the 2021 survey surface to create a surface that estimates depth at the minimum potential water surface elevation.

There is no explicit buffer width between a fleeting area and a navigation channel. On the Illinois River, which is larger than the Kaskaskia River, tows typically stay about 150 ft off from fleets (distance from communication with Bernie Heroff, ArtCo Port Captain). Based on USACE Engineer Manual 1110-2-1611: Layout and Design of Shallow-Draft Waterways, for two-way traffic, there should be at least 50 ft between passing tows and 20 ft between tows and navigation channel limits (**Figure B-7**).

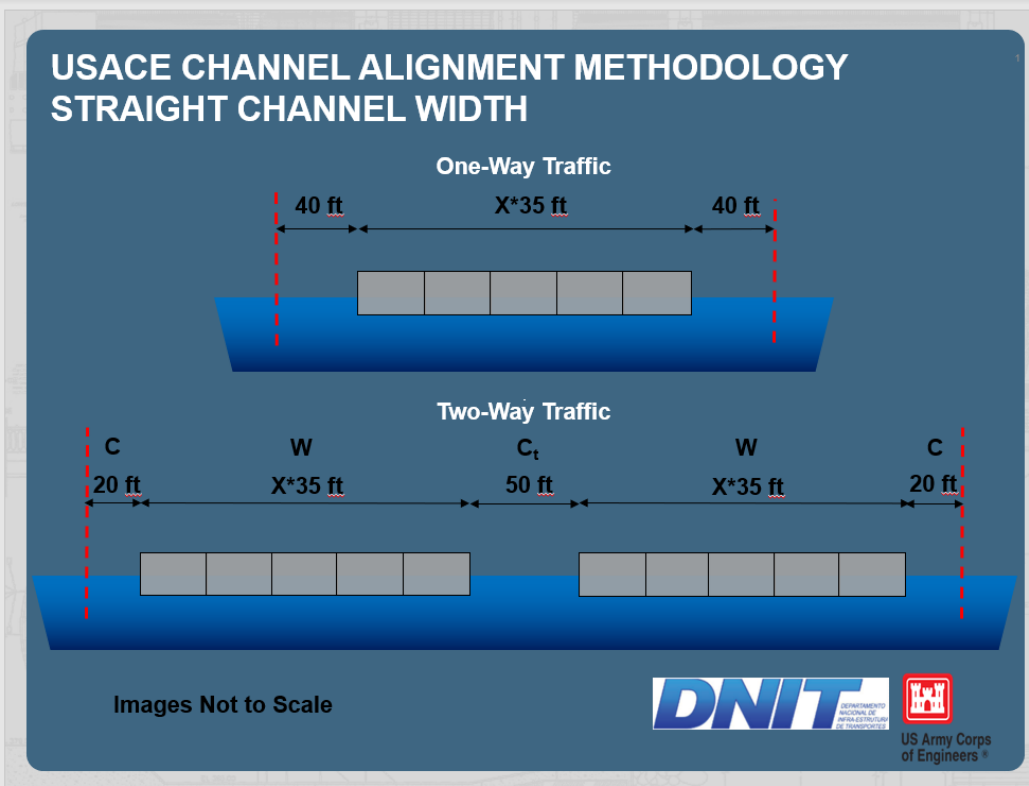

Figure B-7. Channel Alignment Based on EM 1110-2-1611

It is uncertain whether the traffic on the Kaskaskia River can be explicitly marked for one-way traffic versus two-way traffic. The authorization does not specify whether two-way traffic is required or if one-way traffic can be permanently specified through a navigation notice. **Table B-5** shows the minimum width required for different barge configurations based off EM 1110-2-1611, assuming a standard barge width of 35 ft. Based on the calculations, possible configurations to maintain a 225-ft navigation channel include two-way traffic with 1-barge wide tows; two-way traffic with 1-barge wide tow going one direction and 2-barge wide tows going the opposite direction; and one-way traffic with 1 – 4-barge wide tows (though, such a configuration is unlikely given the lock's 2-barge wide width restriction).

There must be at least 225 ft of width between the fleeting area and the 9-ft depth contour at low water conditions. There should be a buffer width between the fleeting area and the barge traffic; however, a minimum width has not been specified by regulation or guidance. If authorization allows, adjusting the traffic configuration may provide more buffer space between traffic and the fleeting area.

Table B-5. Traffic Width Based on EM 110-2-1611 Layout and Design of Shallow-Draft Waterways

Number of Barges Spanning Width of Tow for Traffic Direction A	Number of Barges Spanning Width of Tow for Traffic Direction B	Width between Traffic (ft)	Total width between bank and barge traffic (ft)	Total Width (ft)	Difference in Width From 225 ft (225 ft - Total Width)
1	1	50	40	160	65
1	2	50	40	195	30
2	1	50	40	195	30
2	2	50	40	230	-5
0	1	0	80	115	110
0	2	0	80	150	75
0	3	0	80	185	40
0	4	0	80	220	5

2.2.2.3 Estimated Available Width

A Triangulated Irregular Network (.TIN) surface of the 2021 survey minus the Red Bud hinge point elevation (367.63 ft NAVD 88) was used to estimate available depth in the channel at the lowest water surface elevation. Using ArcGIS Pro 3.1.1 and a file of the proposed fleeting area, the available width between the channel-ward edge of the fleeting area and the edge of the 9 ft depth contour was measured.

Due to limited survey extents for the 2021 comprehensive survey, the clear identification of the 9 ft depth contour was not possible in some areas. In this case, the measurements were taken to the edge of the survey extent. It was assumed that the 9 ft depth contour would not extend much farther from the survey extent edge. A standard barge size of 195 ft by 35 ft was assumed for the tows in the fleeting area.

2.2.2.3.1 EXISTING FLEETING AREA

There is an existing authorized fleeting area near RM 18 in the main channel, as shown in **Figure B-8Error! Reference source not found.**. It should be noted that the location of the existing fleeting area is approximated in the figure. The channel is wider near RM 18 than the reach upstream of RM 19. The approximate location of the fleeting area was used for this analysis. From the channel-side edge of the existing fleeting area to the edge of 9-ft depth contour, there appears to be 234-258 ft of navigable width (≥ 9 ft deep), as shown in **Figure B-8**.

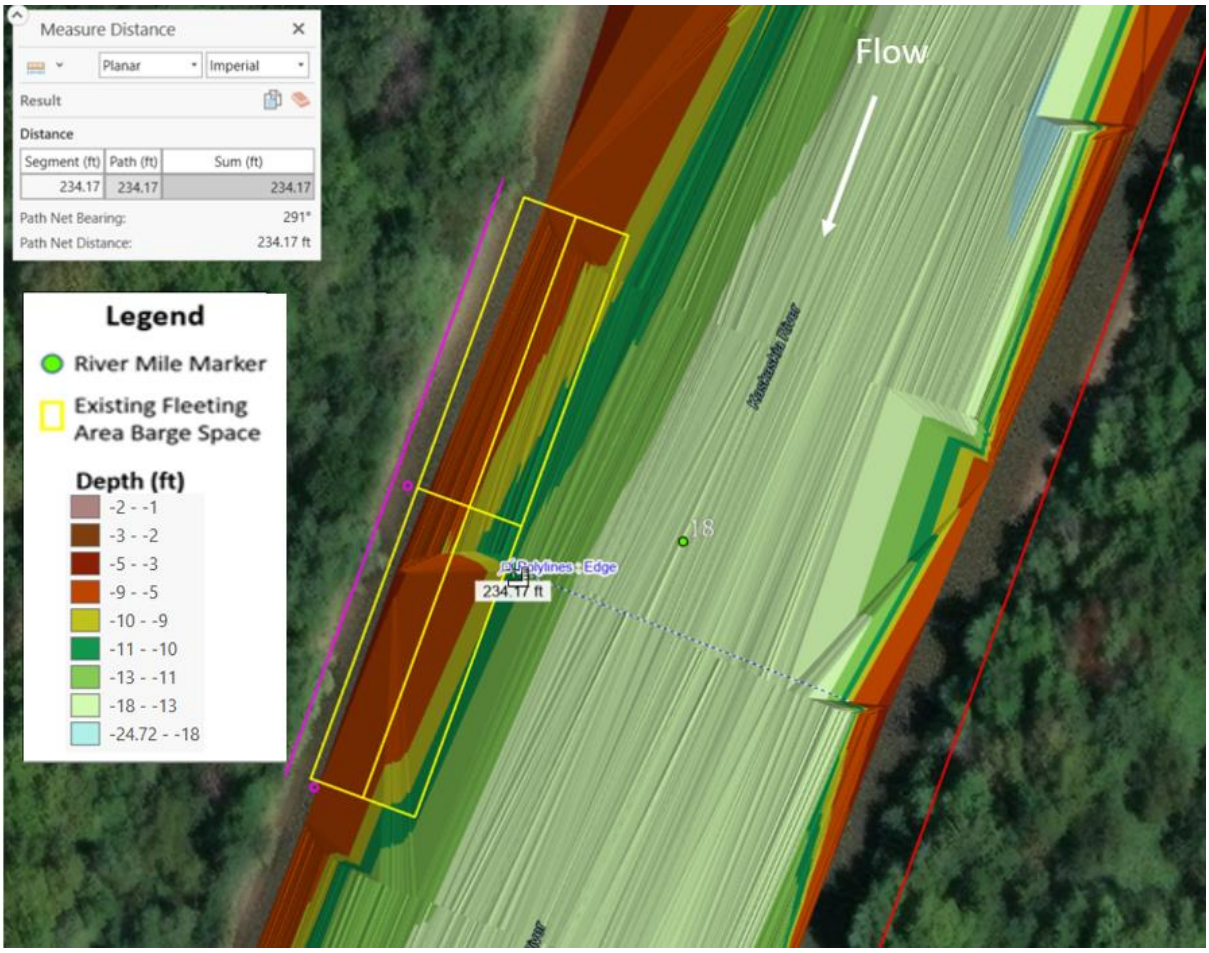

Figure B-8. Existing Fleeting Area at RM 18 on the Kaskaskia River Overlaying Depth Surface from 2021 Single Beam Comprehensive Survey Minus the Red Bud Gage Minimum Elevation

2.2.2.3.2 2X4 TOW FLEETING AREA

It was determined that there would not be enough space for a 2-barge wide fleeting area adjacent to the 225 ft wide channel. As shown in **Figure B-9**, the distance between the 2-barge wide fleet and the 9 ft deep channel edge would allow for less than 225 ft width by approximately 10-20 ft.

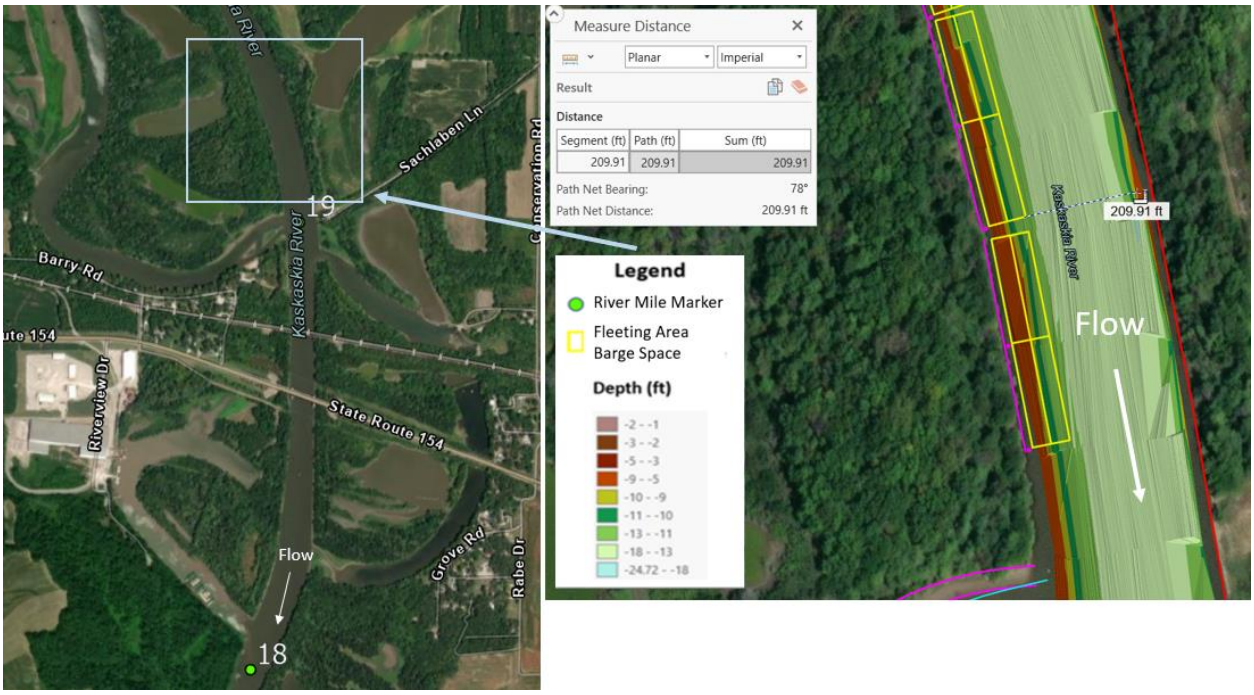

Figure B-9. Proposed 2-Barge Wide Fleeting Area Shows Less Than 225 ft of Navigable Width at Minimum Pool

2.2.2.3.3 1X2 TOW FLEETING AREA

A fleeting area configuration of eight 1x2 barge tows was assessed as shown in **Figure B-10**. The distance between the fleeting area edge and the channel at a 9-ft depth is listed

Table B-6. In the configuration of 1x2 barges, tows 5-8 would allow for at least 230 ft of navigable width. A navigable width of 230 ft was rounded from 225 ft to be more conservative. The channel may be able to accommodate these four spaces in the fleeting area.

Table B-6. Available Navigable Channel Width ((≥ 9 ft depth) Next to Tows in Proposed Fleeting Area (ft)

Tow From Upstream to Downstream	Upstream Barge	Downstream Barge	Narrowest Area
1	214	222	212
2	220	218	217
3	220	226	220
4	229	236	229
5	234	240	234
6	240	238	238
7	240	231	231
8	234	238	234

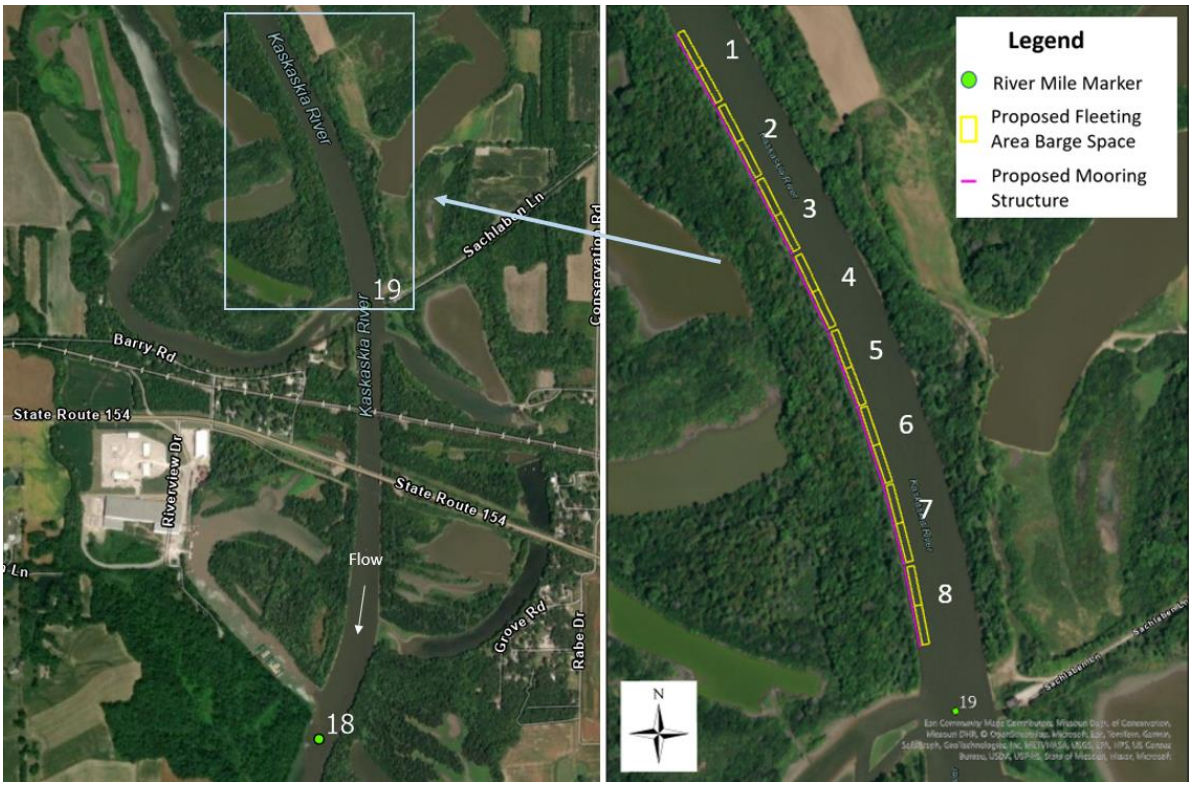

Figure B-10. Proposed 1-Barge Wide Fleeting Area Upstream of the North Oxbow Mouth and RM 19

2.2.2.4 Risk and Uncertainty

The same risks listed above in relation to surface creation apply. As with the volume calculations, the channel bed is mobile, and the bed has changed since the 2021 survey. It is possible that there has been more deposition in this area since the 2021 survey and there is less navigable width available than was estimated in this analysis.

The analysis estimated the available width of at least 9 ft next to the proposed fleeting area. To move through a 9-ft deep channel, barges must be loaded to have less than a 9-ft draft since space is needed between the barge draft and the channel bottom. To help mitigate this risk, the depth and available width was evaluated at the lowest navigable water scenario (the minimum value of the hinge point), which is a conservative scenario.

Although it may be possible to maintain a 225-ft wide navigable channel, there is little buffer space between the fleeting area and the navigation channel. This analysis assumed 230 ft of navigable (at least 9 ft deep) channel could be sufficient space allowed for navigation next to a fleeting area. However, there is no explicit buffer width defined by the USACE St. Louis District Regulatory Branch. It is possible that more than 230 ft of navigable width is needed next to a fleeting area. There may be a higher risk of barge collision due to inadequate buffer spacing between the navigation channel and the fleeting area. The 225-ft wide navigation channel must

be maintained whether the traffic is one-way or two-way. Although restricting this reach to one-way traffic may increase the available width for traffic and reduce the risk of collision, further investigation would be needed to determine whether that can be done within the project authorization.

The proposed fleeting area was shown to members of the USACE St. Louis District Regulatory Branch and other District employees involved in navigation. There were concerns on the vicinity of the fleeting area to the navigation channel. It is possible that the District Regulatory Branch would recommend investigating alternative locations for fleeting and overall operations.

If FL-5 was implemented, further evaluation and coordination would also be needed on navigation notices for the river navigation channel. A notice could be added to a navigation chart of the river, stating the navigation channel width is reduced adjacent to FL-5, and a caution area could be created. The USCG would need to be involved; Aids to Navigation (AtoNs) may need to be constructed, such as signage. When a vessel crosses into the caution area, an alarm would sound. Changes to the navigation chart would be submitted for review by the River Industry Action Committee (RIAC) and the USCG.

2.2.2.5 Conclusion

The analysis found that 2-barge-wide fleeting tows led to unacceptable navigation channel widths. There were locations where 1-barge-wide fleeting tows may be acceptable; however, initial concerns have been expressed by District employees involved in permitting fleeting areas due to the proximity of the fleeting area to the navigation channel. Further analysis and input would be required to permit a fleeting area. Permit decisions for fleeting areas are made individually and based on site specific criteria with input from the public, state agencies, federal agencies, USACE Navigation, RIAC, and the USCG. With a fleet proposed close to or located in the navigation channel, the USCG would likely conduct a Comprehensive Risk Assessment in conjunction with the USACE Regulatory program. This process is typically initiated at the time of the Public Notice for the project with no exact timeline for completion. FL-5 as a measure has been screened out for this project, and thus, the sponsor would be responsible for pursuing additional fleeting areas independently.

3 PERMITTING CONSIDERATIONS

3.1 DAM BREACH ANALYSIS

Initial discussions were held with the Illinois Department of Natural Resources (IDNR) in March 2024 about the need for permitting for dam breach analysis for the dredge placement areas. The initial responses from IDNR suggest that a dam breach analysis will likely be needed. IDNR stated that the dredge disposal areas are considered to be dams by IDNR/OWR even if they only impound water temporarily. Further coordination with IDNR regarding the dam breach

analysis is planned for the Preconstruction Engineering and Design phase after this study is complete.

3.2 NO-RISE ANALYSIS

Due to a 1979 Consent Decree in the Hoffman Case, the federal government must obtain a permit from the State of Illinois for certain work in or adjacent to the rivers covered by the Decree. Corps actions subject to this Consent Decree involve "dredging, channel work, levee construction, deposition of earth, fill, sand, rock, gravel, vegetation, or other materials into or adjacent to the rivers covered by the Order." For the St. Louis District, this includes work on the Mississippi River, Illinois River, Kaskaskia River, Big Muddy River, Beaucoup Creek and Macoupin Creek. Therefore, an ILRSA permit would be required for this TSP.

Illinois state guidelines dictate that in rural areas such as the study area, proposed features may not cause more than 0.5 feet of rise in water surface elevation (WSE) under a 100-year flow event (1% annual exceedance probability) (IDNR, 2014). National Floodplain Insurance Program (NFIP) regulations dictate that within a regulatory floodway, no-rise permitting requires no rise in WSE greater than 0.00 feet for the same 1% annual-exceedance probability (FEMA, 2023).

Initial discussions were held with IDNR about the need for permitting the project under the Illinois Rivers Lakes and Streams Act (ILRSA), which involves no-rise analysis. The study team submitted information to IDNR in March 2024 on the initial array of alternatives. INDR stated that they do not see an obvious need for a hydraulic analysis in relation to the rules for Construction in Floodways of Rivers, Lakes and Streams (17 IAC Ch. I, Sec. 3700), but that this is subject to change upon review of the construction plans. During the design phase of this project, a no-rise analysis will be conducted on the final design to ensure there are no impacts to flood stages. Based on best professional judgment, there is no indication that the project features will induce flooding by the construction or operation and maintenance of the project. Further coordination with IDNR to determine the need for a no-rise analysis and permitting is planned for the Preconstruction Engineering and Design phase after this study is complete.

4 REFERENCES

IDNR. (2014, December 31). *3700 Rule*. Retrieved from https://dnr.illinois.gov/waterresources/3700rule.html

U.S. Department of Homeland Security, U.S. Coast Guard. (2022). *Light List Volume V Mississippi River System.* COMDTPUB P16502.5 .