

Figure 6-87. Locations of sites 16 and 17 on the Illinois Waterway



Figure 6-88. Site 16 on the Illinois Waterway

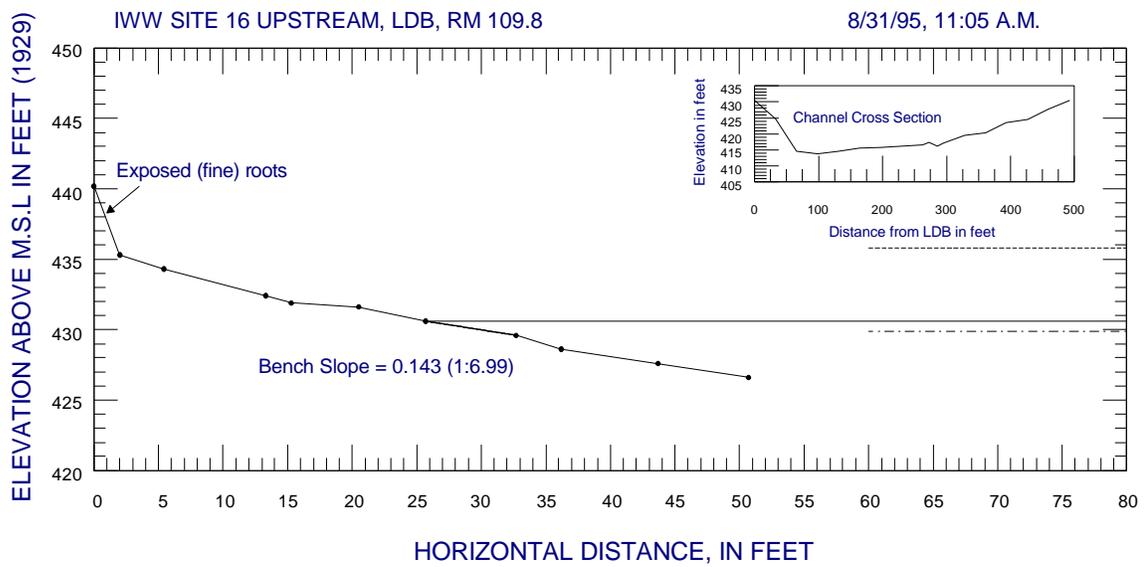


Figure 6-89. Bank sections at site 16

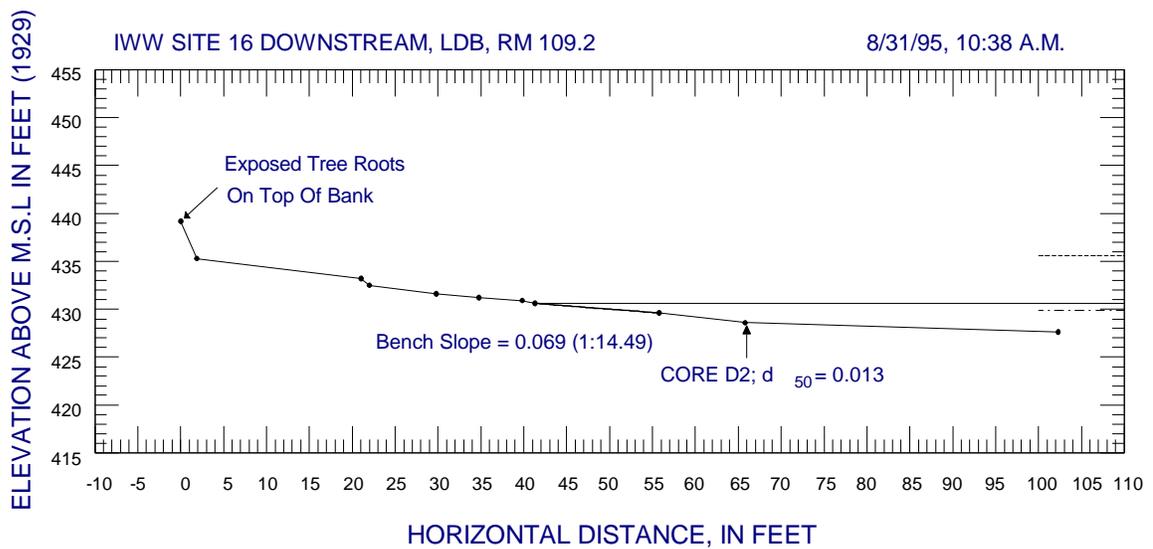
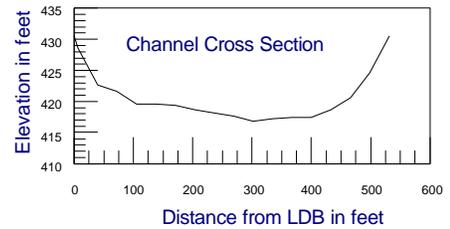
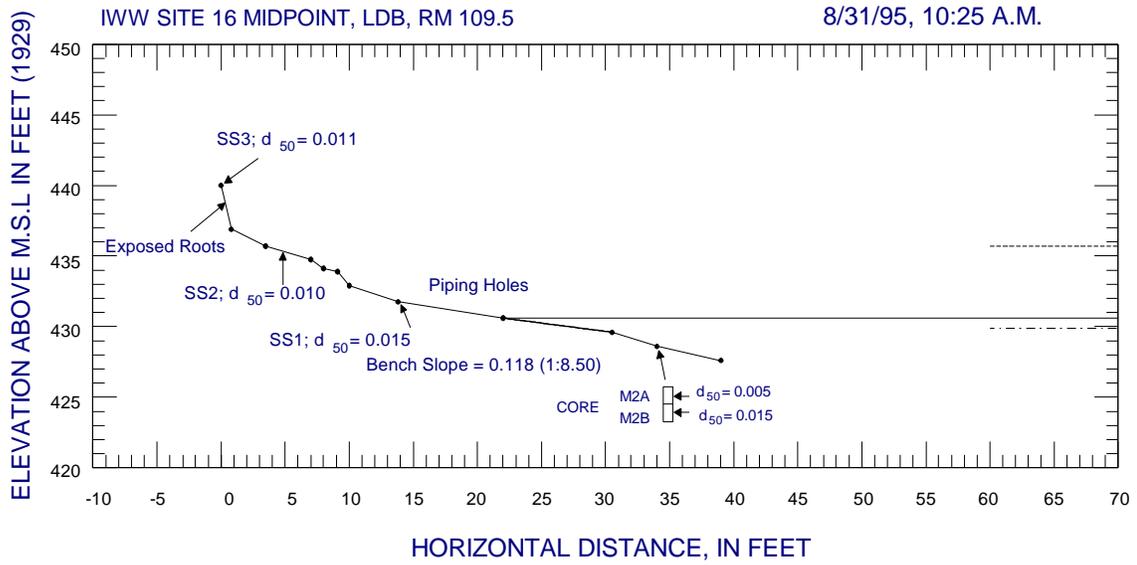


Figure 6-89. Bank sections at site 16 (concluded)

At the midsection, the d_{50} varied from 0.011 mm at the top surface of the bank to 0.005 mm at the upper portion of a core sample at a water depth of about 2 feet. The d_{50} of the lower portion of this core sample, 0.015 mm, is similar to that of other materials found on the bank. Gradation plots of bank soils and nearshore sediment are presented in appendix F. The detailed cross section and coordinates are shown in appendix G.

Bench slopes varied rapidly from 1V:7.0H at the upstream section to 1V:14.5H at the downstream section. The upstream section and midsections are classified as type 2, and the downstream section is classified as type 3 (figures 6-19, 6-20, and table 6-4). Rework and transport of bench materials occur at stages within the normal range of pool-level fluctuations. Erosion of in-place soils occurs at stage above OHW. Seepage and piping affect the extent of failure during recession periods when the river stages can drain.

Site 17, La Grange Pool, 8/31/95. This site is located at the outside of the bend across the river from site 16. The whole area is within Anderson Lake Conservation Area. Figure 6-87 shows the position of the site on a GIS-based map of the Illinois navigation chart, and figure 6-90 shows a photograph of the site.

Table 6-27. Site 17

<i>Percentage of occurrence</i>	<i>Stage above msl, in ft</i>	<i>Topographical features</i>	<i>Bank/bed material, mm</i>
90	430.1	<ul style="list-style-type: none"> Bench (underwater) (slopes varied between 1V:4.3H and 1V:3.4H) 	
75	431.1	<ul style="list-style-type: none"> Bench 	<ul style="list-style-type: none"> $d_{50} = 0.009$
50	433.7	<ul style="list-style-type: none"> Berm/bench (slopes = 1V:2.8H) 	<ul style="list-style-type: none"> $d_{50} = 0.010$
25	438.1	<ul style="list-style-type: none"> Scarp (slopes = 1V:0.47H) 	
10	441.5	<ul style="list-style-type: none"> Top of the bank 	<ul style="list-style-type: none"> $d_{50} = 0.005$
0-9	>441.5		

Note: Gage on the Illinois River near Havana, IL @ RM 119.6 was used for stage histogram. Gauge is 10.1 miles away from the site. WSE = 430.6'; OHW = 435.7'; NP = 429.9'.



Figure 6-90. Site 17 on the Illinois Waterway

The site is about 280 feet from the sailing line. This site was described as severely eroded by Hagerty (1988). According to Corps personnel, this was formerly a dredged material placement site, containing about 8 feet of dredged materials. However, floods apparently have removed all the dredged materials. Seepage flows containing oxidized iron (brownish color) were observed along the bank. Seepage may be attributed to the presence of adjacent Anderson Lake behind this site.

Figure 6-91 shows the three measured bank sections and two reduced cross sections. The OHW is 435.7 feet and NP is 429.9 feet above msl. There is a scarp near the water's edge and downslope from areas of seepage flows; the OHW elevation is above a zone of seasonal grasses. The OHW elevation corresponds well to the base of a scarp on the upper portion of the bank. Other stages and corresponding features are given in table 6-27.

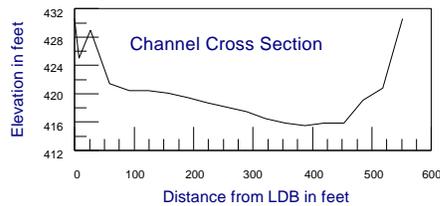
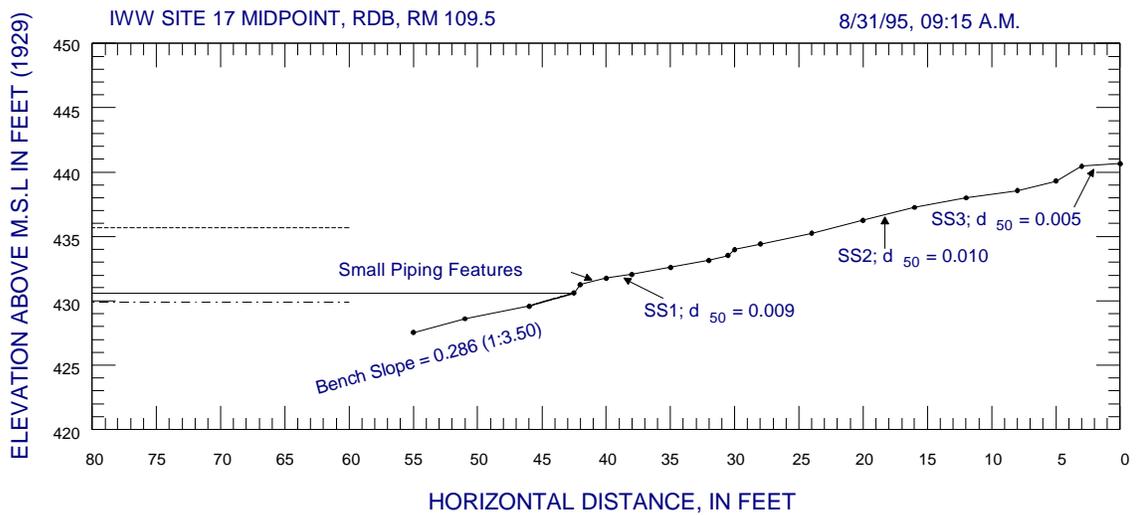
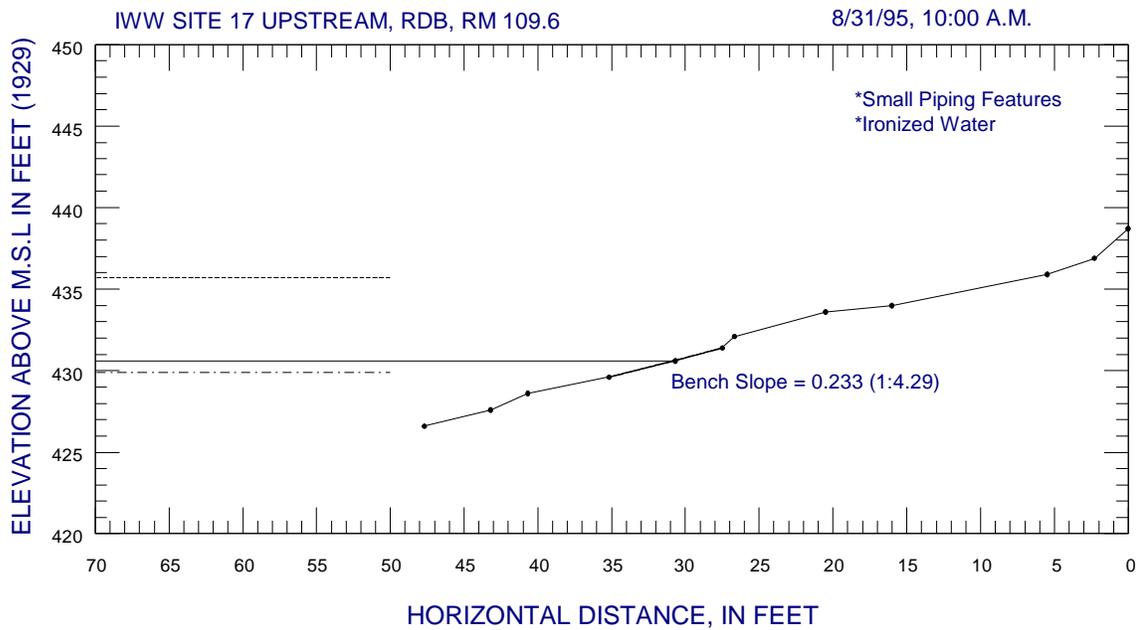


Figure 6-91. Bank sections at site 17

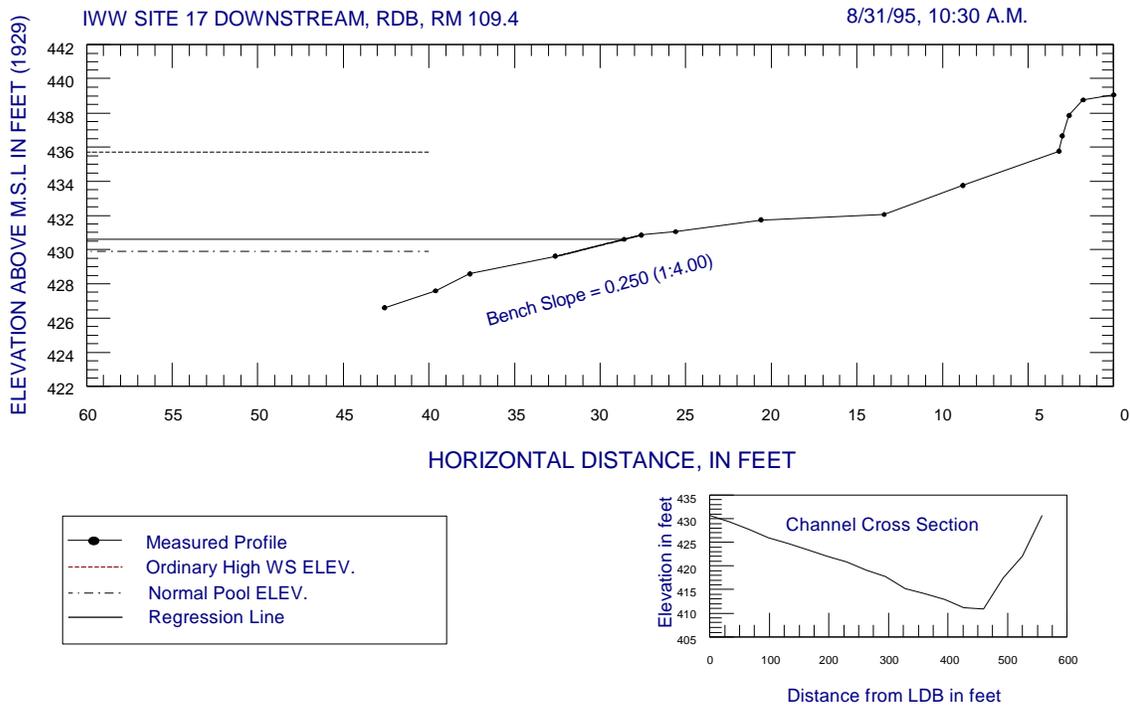


Figure 6-91. Bank sections at site 17 (concluded)

At the midsection, the d_{50} varied from 0.005 mm at the top surface of the bank to 0.009 mm near the water's edge. Bank materials are similar. Gradation plots of bank soils and nearshore sediment are presented in appendix F. The detailed cross section and coordinates are shown in appendix G.

Bench slopes varied around 1V:4.0H. Both the upstream section and midsection are classified as type 5, and the downstream section is classified as type 4 (figures 6-21, 6-22, and table 6-4). Seepage at NP stages could weaken the bench materials and wave wash could create scarps on the bench. As at site 16, the subaerial bench was moist. Waves and currents at stages within the normal range of pool fluctuations cause erosion on bench and berm. These forces move failed soil or recent sediment away from the bank sections also.

Site 18, La Grange Pool, 8/31/95. This site is located on the RDB at RM 94.3. Sugar Creek Island is located on the other side of the river. The mouth of Sugar Creek is located at RM 94.5. The site is located in a crossover between bends. Figure 6-92 shows the position of the site on a GIS-based map of the Illinois navigation chart, and figure 6-93 shows a photograph of the site.

The site is about 250 feet from the sailing line. Both Bhowmik and Schicht (1980) and Hagerty (1988) observed erosion immediately upstream and downstream from the mouth of Sugar Creek, but did not indicate erosion at the current site. However, scarps and displaced trees were found on the bank in this trip. The bank had a thick cover of sand over exposed clay in several places. Dredged material was placed here in the 1960s, according to Corps personnel. In this 1995 trip, the previously eroded section was covered with sand, with shells and gravel at the water's edge. For comparison purposes, the upstream section was taken from that previously eroded section.

Figure 6-94 shows the three measured bank sections and a reduced cross section. All three sections were cut by a scarp, but scarp elevations were different. At this site, the OHW is 433.7 feet and the NP is 429.9 feet above msl. The scarp was above the OHW elevation at the upstream section, but the scarp elevations were lower for the midsection and downstream sections. The midsection and downstream section had small scarps in the stage range between the OHW and NP, but the upstream section did not have such scarps. Table 6-28 contains the stages with corresponding recurrence frequencies at this site.

At the midsection, the d_{50} varied from 0.016 mm at the top surface of the bank to 0.015 mm at the upper part of a core sample at a water depth of about 2 feet. Gradation plots of bank soils and nearshore sediment are presented in appendix F. The detailed river cross section and coordinates are shown in appendix G.

The bench slopes varied from 1V:7.4H at the upstream section to 1V:13.0 at the downstream sections. The subaqueous bench dropped off quickly at the midsection at this site. Both the upstream and downstream sections are classified as type 4, but the midsection is classified as a combination of types 2 and 4 (figures 6-19, 6-21, and table 6-4). The bank crest was covered by dense vegetation, and roots from that vegetation provided additional bonds to bank materials. The bank showed vertical cracks, which apparently were caused by basal scour. Sandy materials underneath the scarp seeped out after rapid stage recession. Waves and currents can rework and transport failed soils or recent sediments at stages within the normal range of pool-level fluctuations.

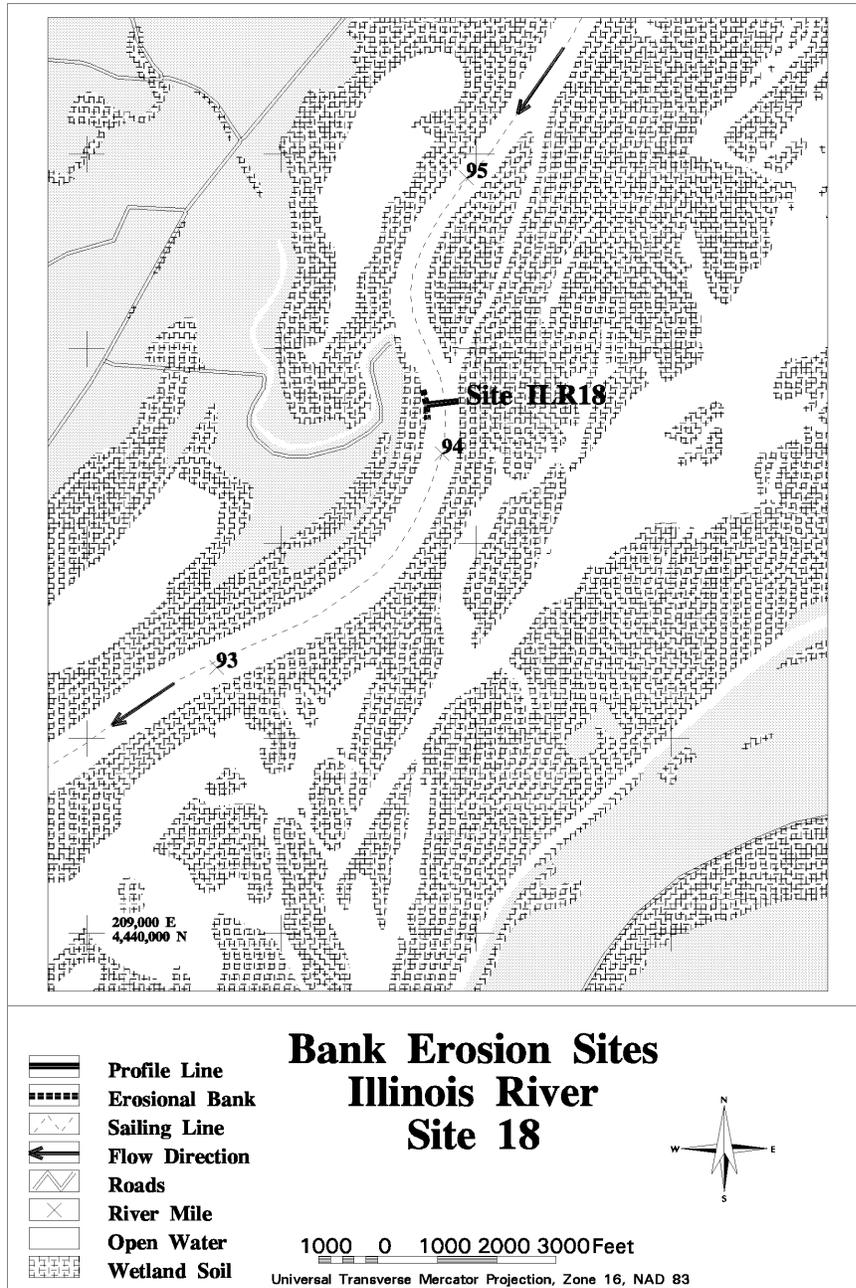


Figure 6-92. Location of site 18 on the Illinois Waterway



Figure 6-93. Site 18 on the Illinois Waterway

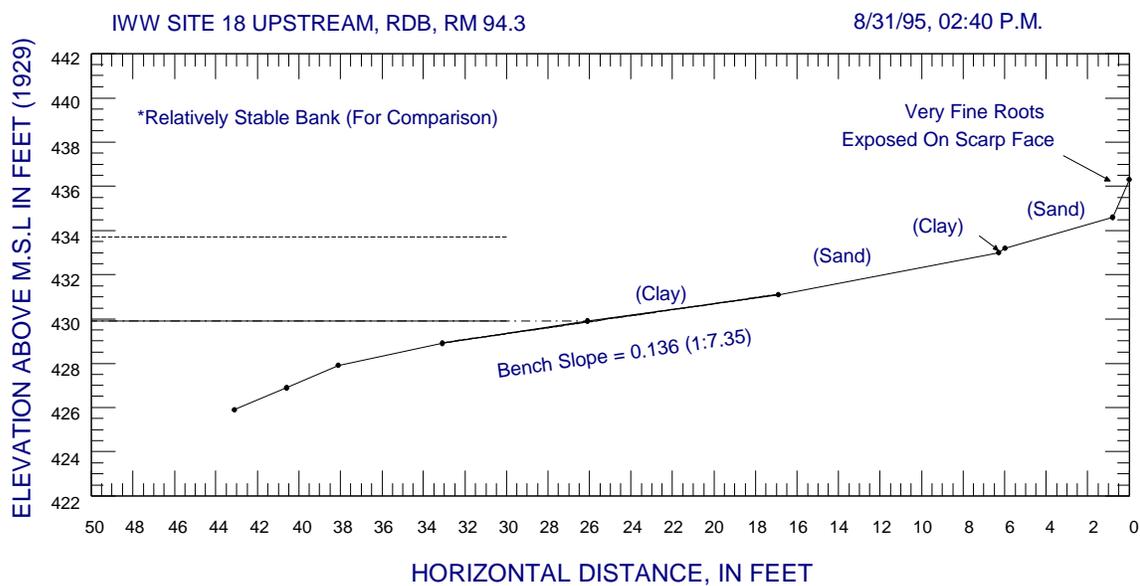


Figure 6-94. Bank sections at site 18

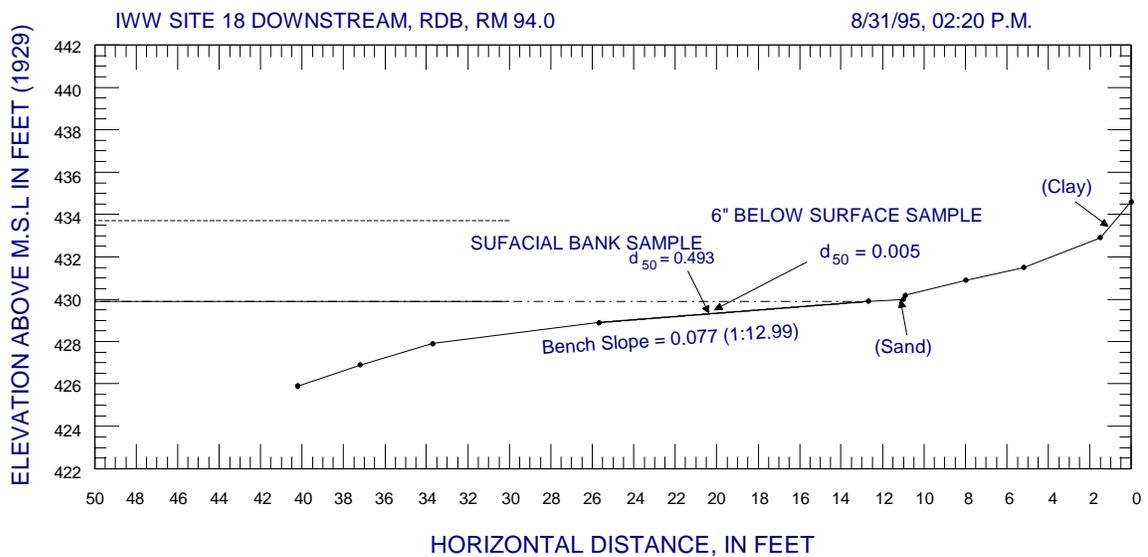
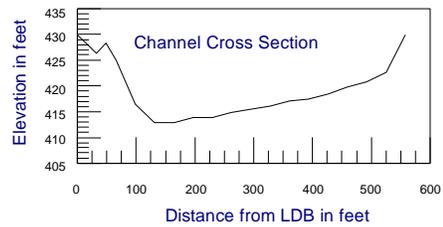
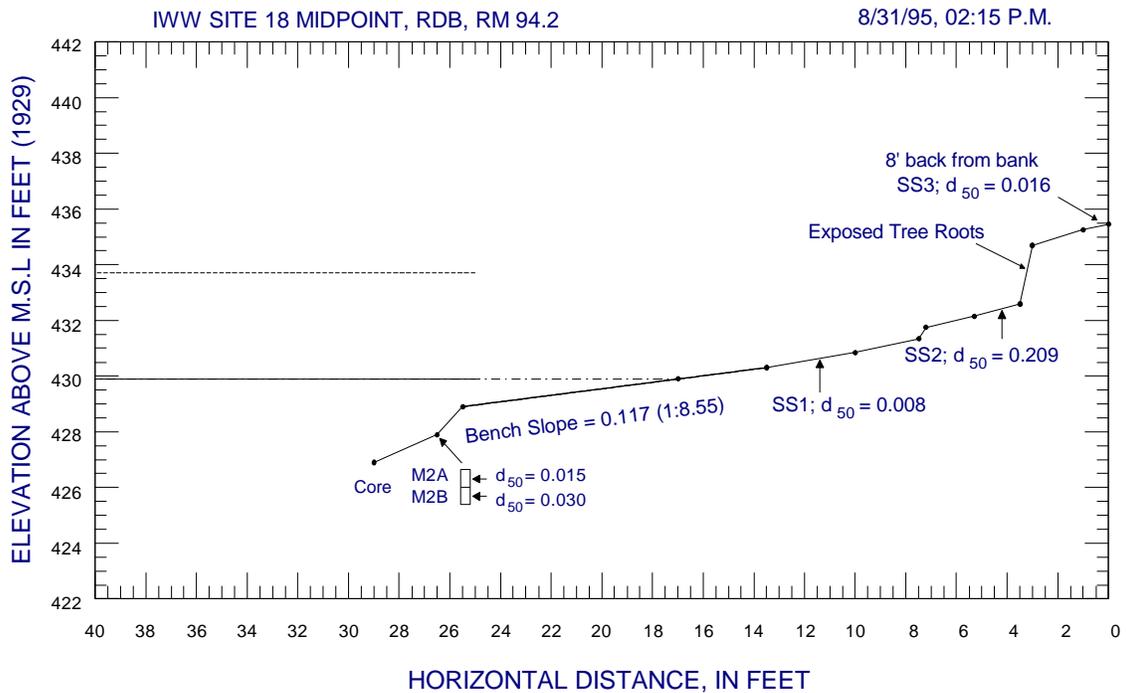


Figure 6-94. Bank sections at site 18 (concluded)

Table 6-28. Site 18

<i>Percentage of occurrence</i>	<i>Stage above msl, in ft</i>	<i>Topographical features</i>	<i>Bank/bed material, mm</i>
90	429.4	<ul style="list-style-type: none"> Bench (underwater) (slopes varied between 1V:13.0H and 1V:7.4H) 	<ul style="list-style-type: none"> d₅₀ (core) varied (0.015-0.030) d₅₀ varied (0.005-0.493)
75	429.6	<ul style="list-style-type: none"> Bench (underwater) 	
50	430.2	<ul style="list-style-type: none"> Bench 	
25	433.6	<ul style="list-style-type: none"> Bench/berm (slope varied between 1V:3.4H and 1V:3.3H) 	<ul style="list-style-type: none"> d₅₀ = 0.209
10	438.15	<ul style="list-style-type: none"> Top of the bank Scarp (slopes varied between 1V:0.88H and 1V:0.24H) 	<ul style="list-style-type: none"> d₅₀ = 0.016
0-9	>438.15		

Note: Gage on the Illinois River near Beardstown, IL @ RM 88.3 was used for stage histogram. WSE = 429.9'; OHW = 433.7'; NP = 429.9'.

Site 19, La Grange Pool, 8/31/95. This site is located on the RDB at RM 91.2 outside a gentle bend. The Peabody Coal Company barge terminal is located at RM 91.7, and the Farmers Grain Company barge terminal is located at RM 91.1. Both terminals are located on the RDB. Figure 6-95 shows the position of the site on a GIS-based map of the Illinois navigation chart, and figure 6-96 shows a photograph of the site.

The site is about 310 feet from the sailing line. A Chicago Burlington & Quincy railroad line is located just behind the site. Hagerty (1988) marked this site as an erosion site, but it appeared to be stable when Bhowmik and Schicht (1980) surveyed. A depression between the bank and the railroad embankment will retain floodwater or rainwater, and cause seepage to the bank. The depression was a borrow pit for the construction of the railroad embankment. Some large dead trees and exposed roots were observed. Velocities were relatively high at a close distance from the shore.

A scarp approximately 4 to 6 feet high was present. The lower bank and berm area contained several scarps and a moist soil layer at the toe. Some sand deposition was found on the narrow bench area. Figure 6-97 shows the three measured bank sections and a reduced cross section. The upstream bank section was extended approximately 160 feet to include the top of the embankment for the Chicago Burlington & Quincy Railroad. The OHW is 433.3 feet and NP is 429.9 feet above msl. The OHW elevation is at the base of the large scarp. The stage at the time of the field visit was at NP level.

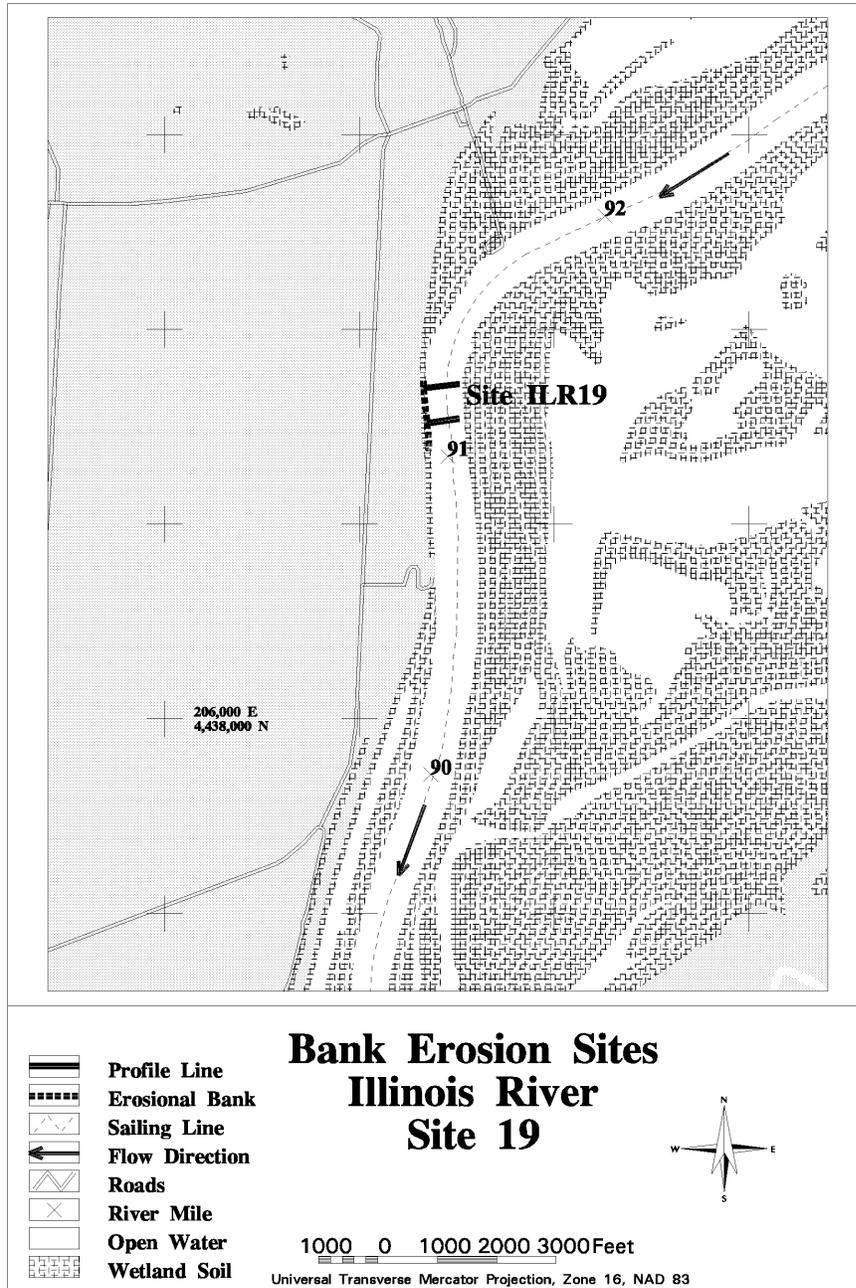


Figure 6-95. Location of site 19 on the Illinois Waterway



Figure 6-96. Site 19 on the Illinois Waterway

At the midsection, the d_{50} varied from 0.027 mm at the top surface of the bank to 0.014 mm at the upper part of a core sample at a water depth of about 2 feet. Gradation plots of bank soils and nearshore sediment are presented in appendix F. The detailed river cross section and coordinates are shown in appendix G.

Bench slopes varied from 1V:4.8H at the upstream section to 1V:10H at the downstream section. This site is classified as a combination of types 2 and 4 (figures 6-19, 6-21, and table 6-4). Seepage initiated bank failure, rework and transport of failed soils occurred at stages within the normal pool-level fluctuations. Traffic-induced disturbances should be considered because the closeness to the barge terminal. Rapid drop of depth at mid- and downstream sections may reflect such a factor.

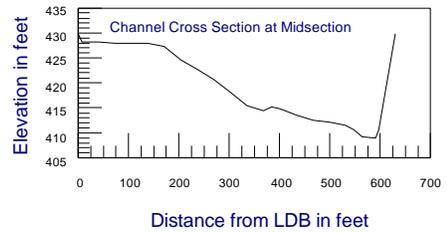
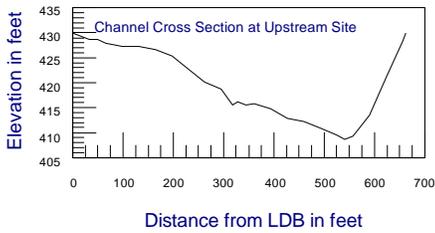
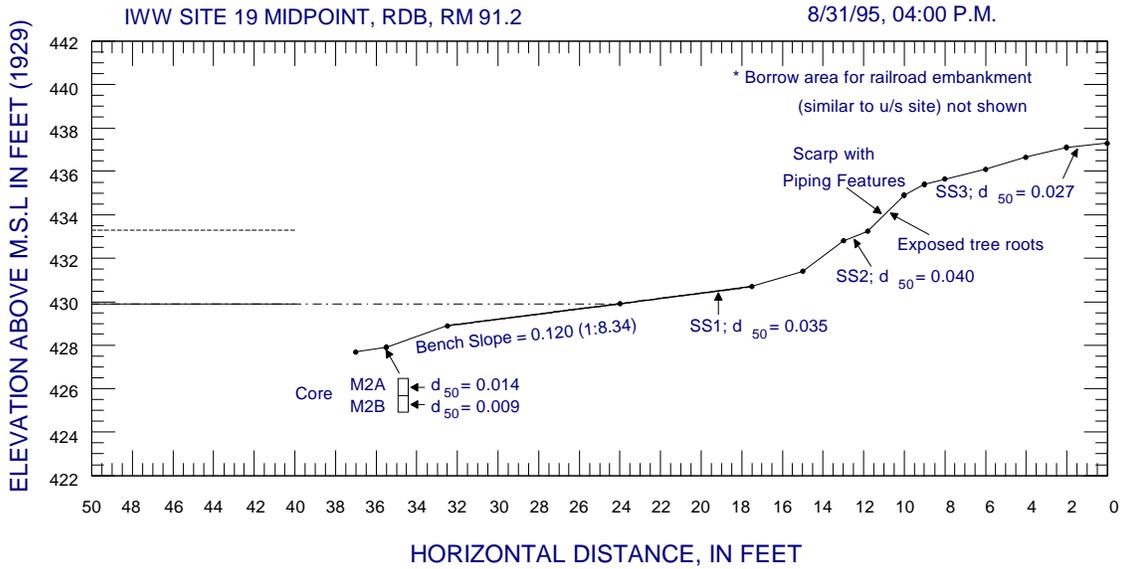
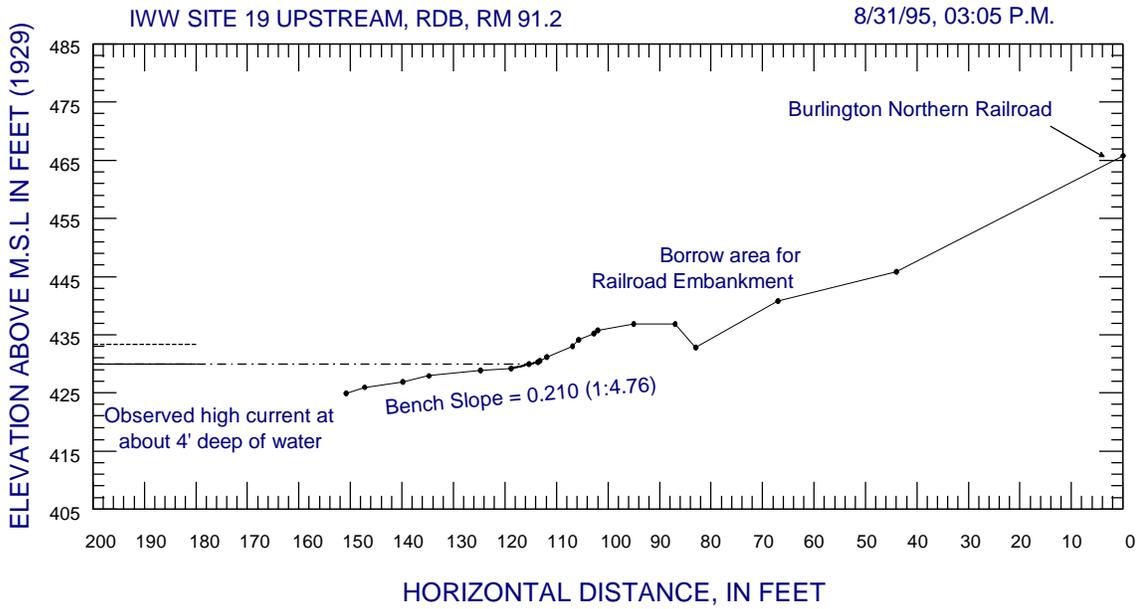


Figure 6-97. Bank sections at site 19

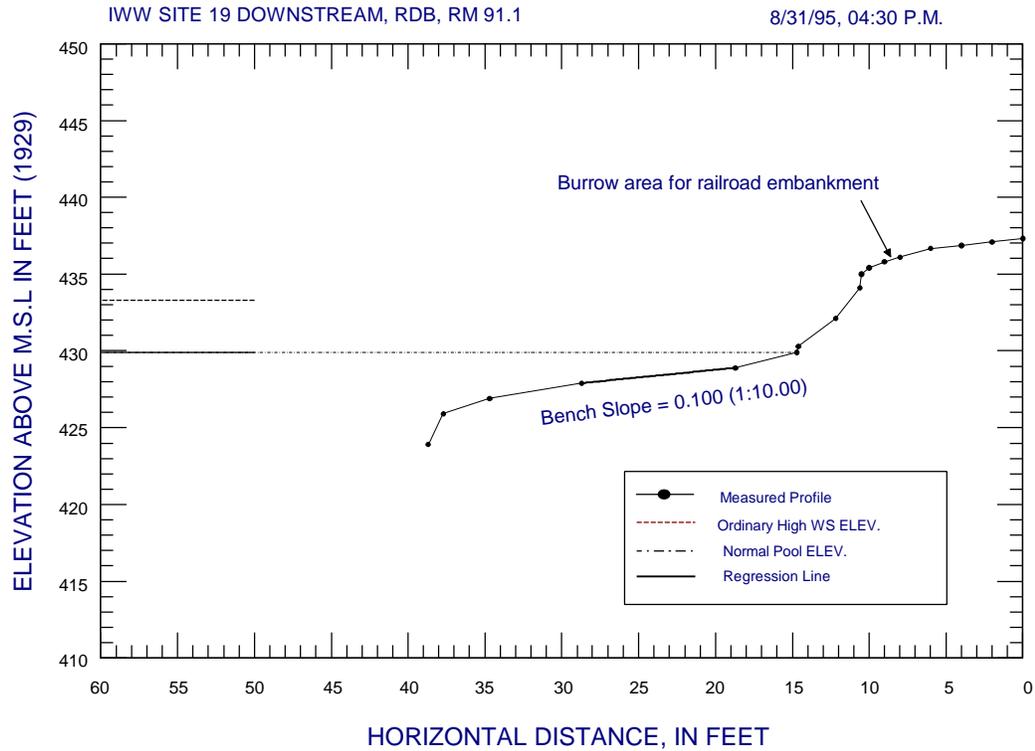


Figure 6-97. Bank sections at site 19 (concluded)

Table 6-29. Site 19

<i>Percentage of occurrence</i>	<i>Stage above msl, in ft</i>	<i>Topographical features</i>	<i>Bank/bed material, mm</i>
90	429.4	<ul style="list-style-type: none"> • Bench (underwater) (slopes varied between 1V:10H and 1V:4.8H) 	<ul style="list-style-type: none"> • d_{50} (core) varied (0.009-0.014)
75	429.6	<ul style="list-style-type: none"> • Bench (underwater) 	
50	430.2	<ul style="list-style-type: none"> • Bench 	<ul style="list-style-type: none"> • $d_{50} = 0.035$
25	433.6	<ul style="list-style-type: none"> • Bench/berm/scarp • Berm slope = 1V:2.2H • Scarp slope = 1V:1.1H 	<ul style="list-style-type: none"> • $d_{50} = 0.040$
10	438.15	<ul style="list-style-type: none"> • Top of the bank 	<ul style="list-style-type: none"> • $d_{50} = 0.027$
0-9	>438.15		

Note: Gage on the Illinois River near Beardstown, IL @ RM 88.3 was used for stage histogram.
WSE = 429.9'; OHW = 433.3'; NP = 429.9'.

Site 20, Alton Pool, 8/31/95. This site is located on the RDB at RM 79.4 just downstream of La Grange L&D at RM 80.2. The lock is located on the RDB. The site is in a straight reach. Figure 6-98 shows the position of the site on a GIS-based map of the Illinois navigation chart, and figure 6-99 shows a photograph of the site.

The navigation channel is fairly close to site 20; the bank is about 230 feet from the sailing line. No major tributary enters the IWW at this location. The opposite side of the river is used as a mooring area as barges wait for lockage. Bhowmik and Schicht (1980) noted erosion on both sides of the river downstream from the L&D. Hagerty (1988) selected this site for further survey and also indicated scarps about 12-14 feet high. In 1995, the face of the bank was bare, and the upper bank covered with short grasses. A fairly clear wet/dry line was present at the lower portion of the bank. The subaqueous bench dropped very quickly toward the channel. The land use on the top of the bank is agriculture (corn).

Figure 6-100 shows the three measured bank sections and two reduced cross sections. The bench narrowed at the downstream section. The OHW and NP elevations were not available for the Alton Pool, but analysis of the historical data indicated that the river stage at the time of survey had a recurrence frequency of about 90%. As shown in table 6-30, the bare bank area lies between the NP level and the 50% recurrence frequency stage (425.7 feet above msl).

At the midsection, the d_{50} varied from 0.023 mm at the top surface of the bank to 0.004 mm near the water's edge. Seepage water quickly filled a trench dug on the bank (figure 6-99) even though the bank material was hard and cohesive. Gradation plots of bank soils and nearshore sediment are presented in appendix F. The detailed river cross section and coordinates are shown in appendix G.

Bench slopes varied from 1V:5.4H to 1V:15.9H to 1V:0.99H from upstream to downstream sections. This site can be classified as type 2 (figure 6-19 and table 6-4). Traffic approaching the L&D gets close to this site. High velocity flows released from the lock of the La Grange L&D, and turbulence induced by navigation traffic appeared to be the major cause of erosion at this site, but seepage effects also appeared to be significant.

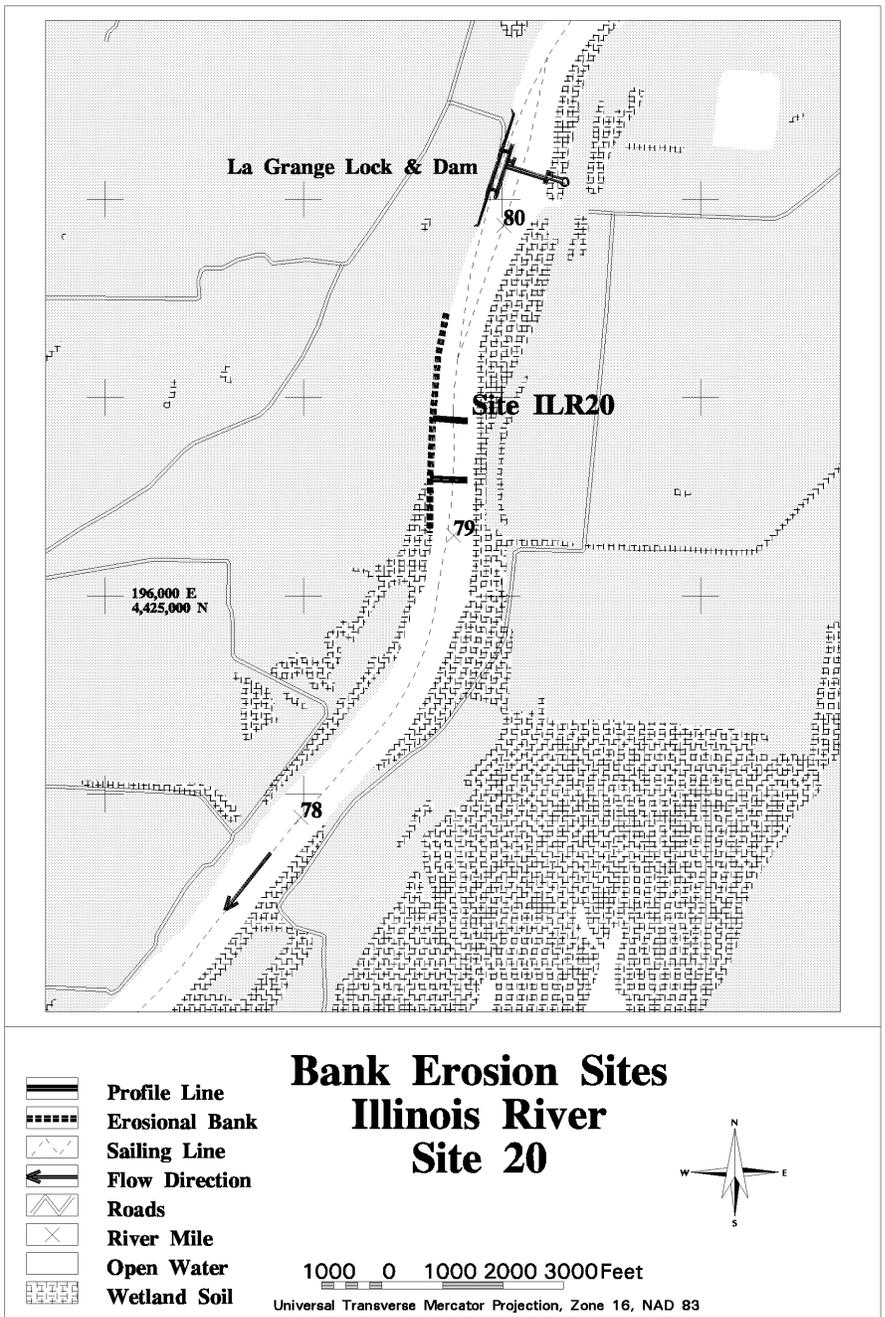


Figure 6-98. Location of site 20 on the Illinois Waterway



Figure 6-99. Site 20 on the Illinois Waterway

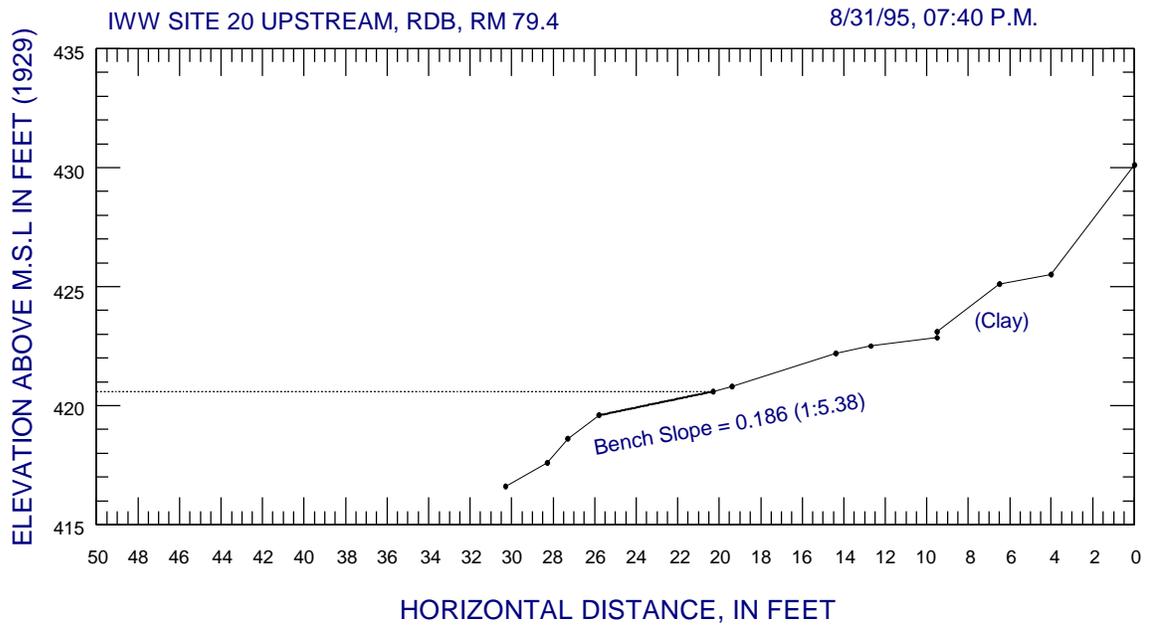


Figure 6-100. Bank sections at site 20

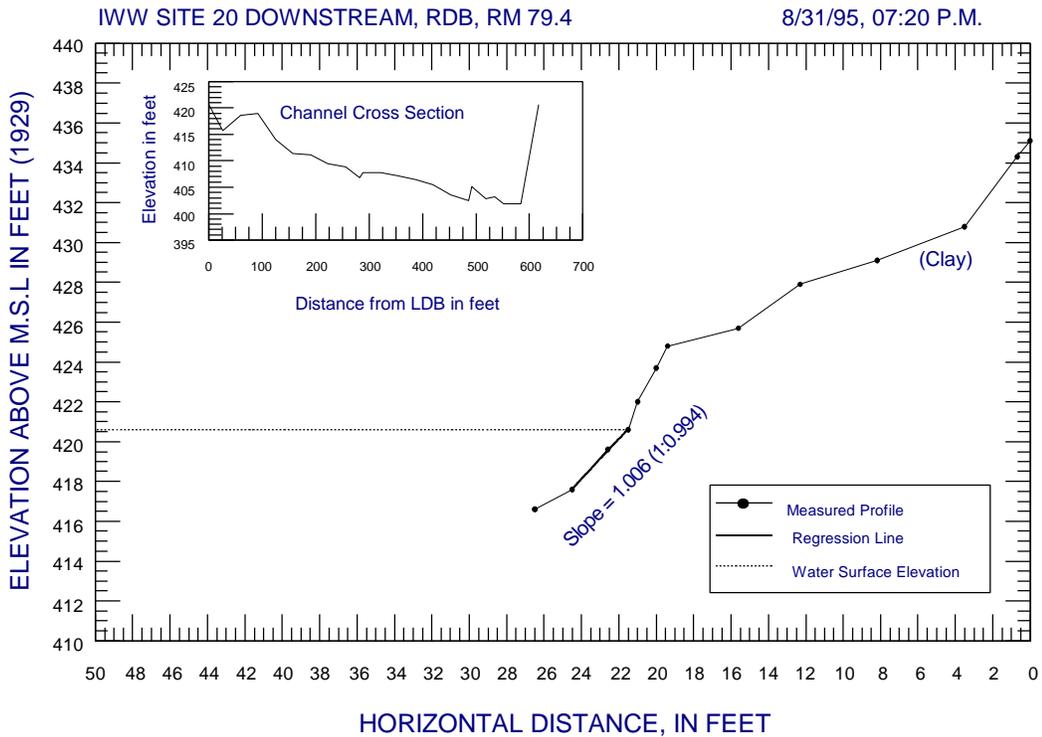
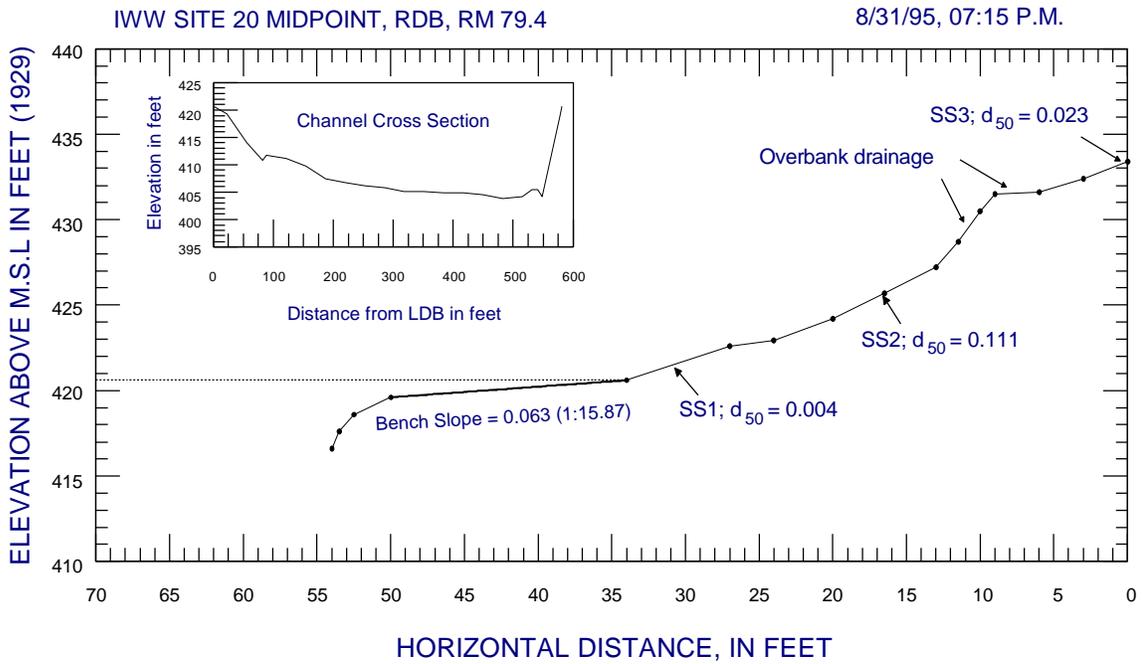


Figure 6-100. Bank sections at site 20 (concluded)

Table 6-30. Site 20

<i>Percentage of occurrence</i>	<i>Stage above msl, in ft</i>	<i>Topographical features</i>	<i>Bank/bed material, mm</i>
90	420.8	<ul style="list-style-type: none"> • Bench (slopes varied between 1V:15.9H and 1V:5.4H) 	<ul style="list-style-type: none"> • $d_{50} = 0.004$
75	422.2	<ul style="list-style-type: none"> • Bench/berm 	
50	425.7	<ul style="list-style-type: none"> • Scarp/bench 	<ul style="list-style-type: none"> • $d_{50} = 0.11$
25	430.7	<ul style="list-style-type: none"> • Berm 	
10	435.2	<ul style="list-style-type: none"> • Scarp 	
0-9	>435.2	<ul style="list-style-type: none"> • Top of the bank/scarp 	<ul style="list-style-type: none"> • $d_{50} = 0.023$

Note: Tail water gage of La Grange Pool @ RM 80.2 was used for stage histogram. WSE = 420.6'; OHW: (NA); NP: (NA).

Site 21, Alton Pool, 9/1/95. This site is located on the RDB at RM 61.7, in a straight reach with the navigation channel close to this bank. According to the navigation chart, there is a wing dam field on the LDB at RM 61.9. Surrounding structures include a bridge at RM 61.4 and a slough about 200 feet behind the bank at this site. Figure 6-101 shows the position of the site on a GIS-based map of the Illinois navigation chart, and figure 6-102 shows a photograph of the site.

The navigation channel is close to this site; the bank is about 230 feet from the sailing line. A pumping station is located on the opposite bank, and there are several wing dams upstream in this reach. Bhowmik and Schicht (1980) did not note erosion in 1978, but Hagerty (1988) observed erosion around RM 61.9 on this bank. Silver maples are growing on the edge of the bank. Slaked blocks were mantled with grass and trees; tree roots extended out on the scarp.

Seasonal grasses were growing on the upper portion of the bank face. A bare bench with springs coming out of a clay layers extended from the failed soil blocks to the water's edge. Dead trees were present on the upper part of the bench.

Figure 6-103 shows the three measured bank sections and a reduced cross section. The bank sections at the midsection differs from the up- or downstream sections. The stage at the time of survey corresponded to approximately 90% recurrence frequency. The scarps observed in the upstream and downstream sections were present in the range of stage fluctuation between 50% to 25% (424.5 and 429.1 feet, respectively, see table 6-31); this was also the range of scarp in the midsection.

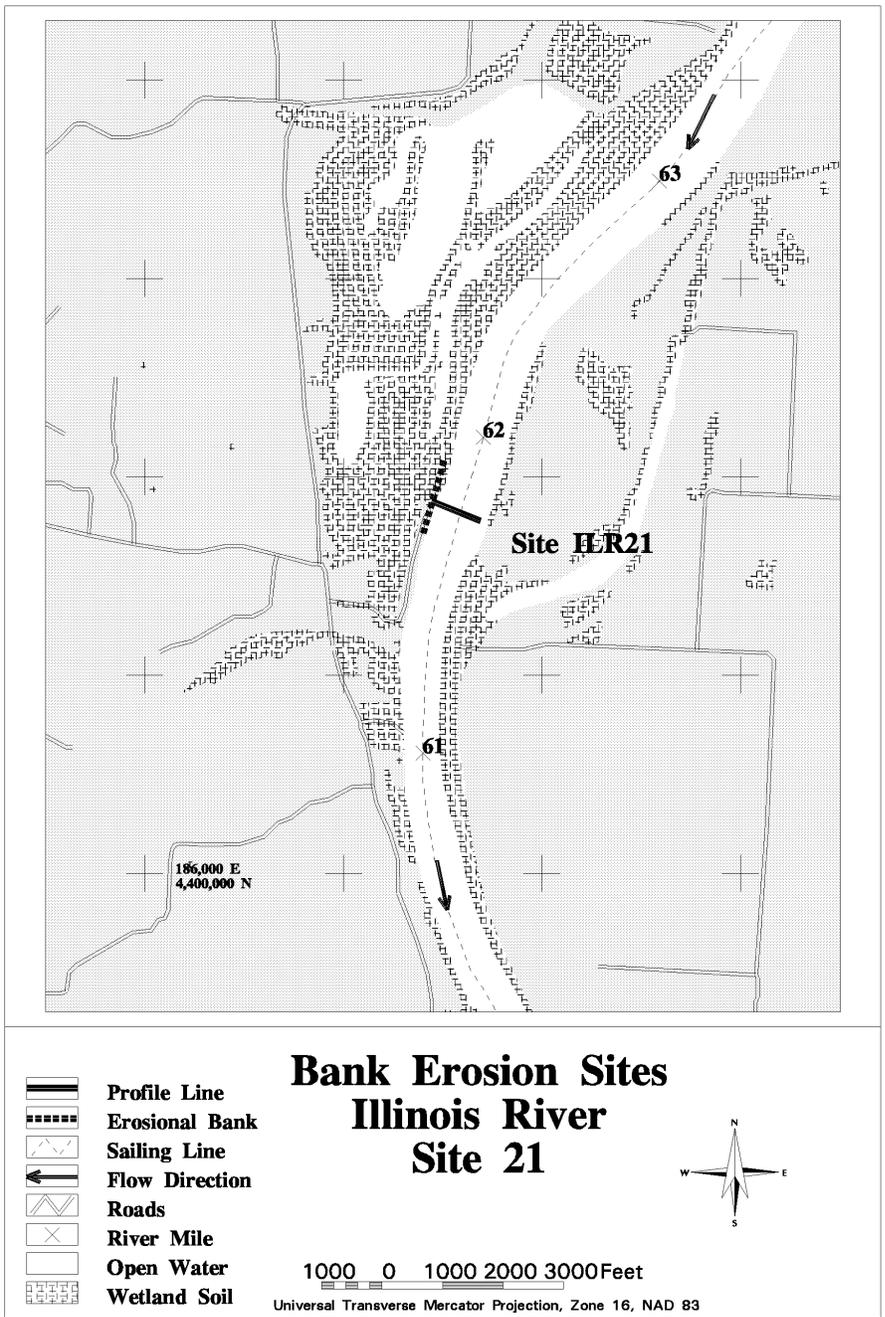


Figure 6-101. Location of site 21 on the Illinois Waterway



Figure 6-102. Site 21 on the Illinois Waterway

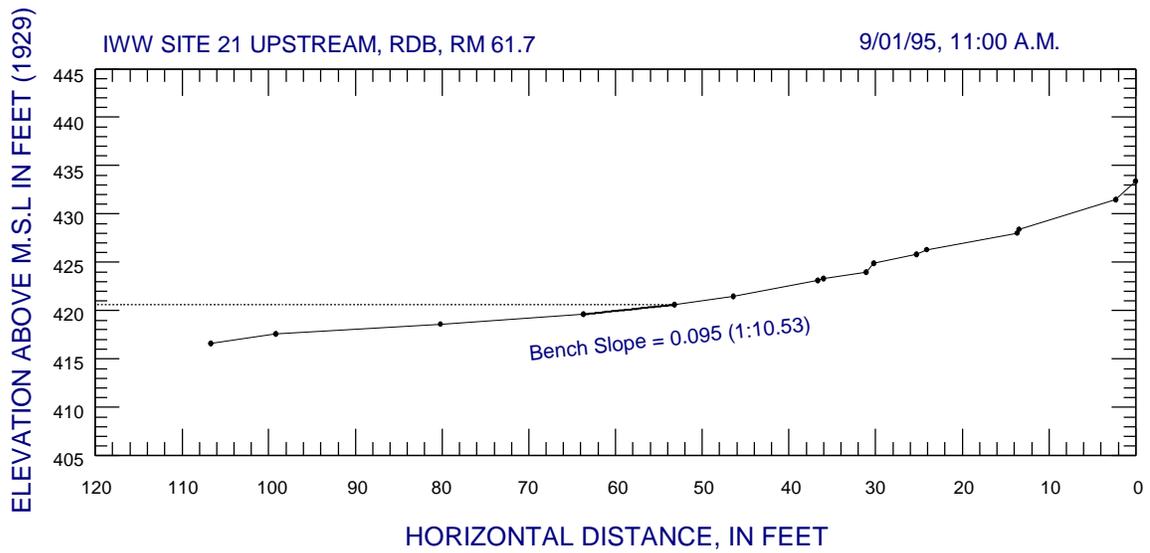


Figure 6-103. Bank sections at site 21

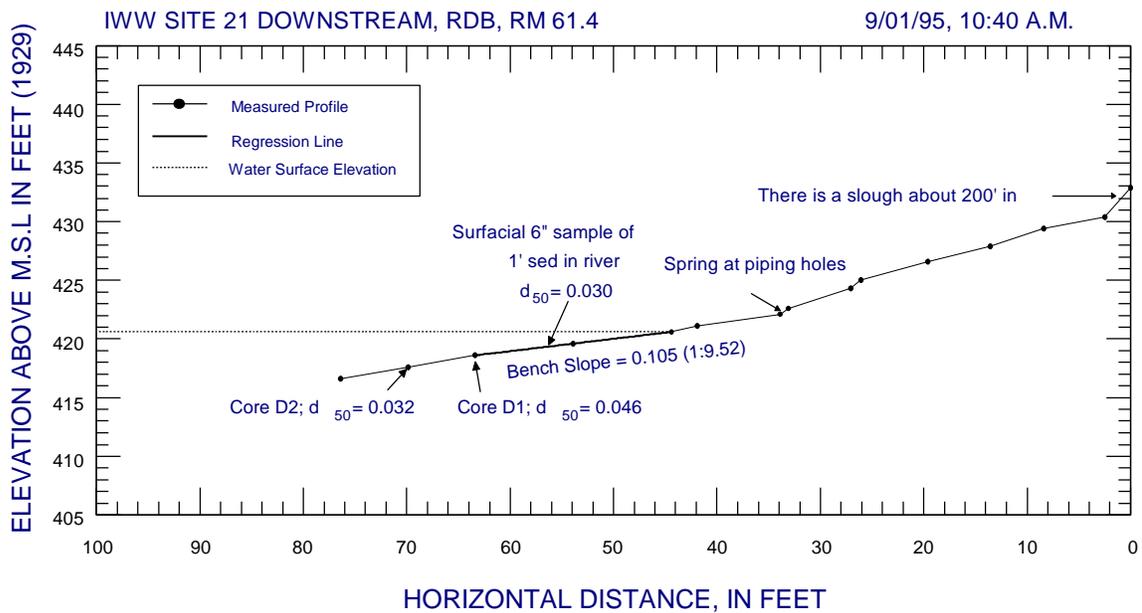
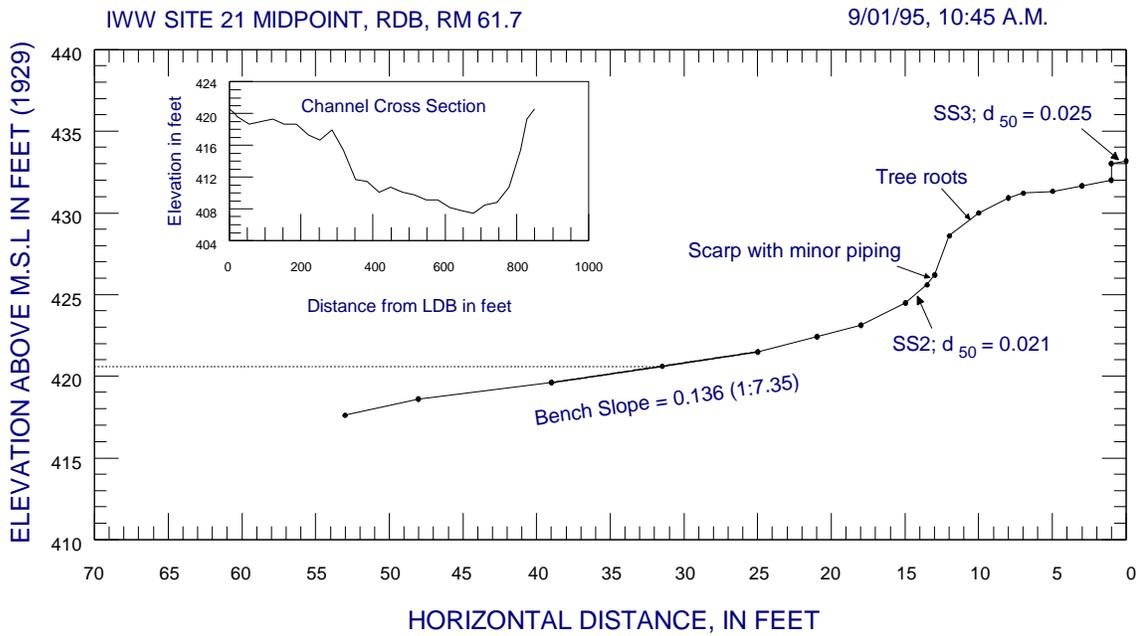


Figure 6-103. Bank sections at site 21 (concluded)

Table 6-31. Site 21

<i>Percentage of occurrence</i>	<i>Stage above msl, in ft</i>	<i>Topographical features</i>	<i>Bank/bed material, mm</i>
90	420.2	<ul style="list-style-type: none"> • Bench (underwater) (slopes varied between 1V:10.5H and 1V:7.4H) 	<ul style="list-style-type: none"> • d_{50} (core) varied (0.032-0.046)
75	421.2	<ul style="list-style-type: none"> • Bench 	<ul style="list-style-type: none"> • $d_{50} = 0.030$
50	424.5	<ul style="list-style-type: none"> • Bench/berm • Berm (slope = 1V:1.6H) 	<ul style="list-style-type: none"> • $d_{50} = 0.021$
25	429.1	<ul style="list-style-type: none"> • Scarp (slope vary between 1V:1H and 1V:0.42H) 	
10	433.7	<ul style="list-style-type: none"> • Top of the bank 	<ul style="list-style-type: none"> • $d_{50} = 0.025$
0-9	>433.7		

Note: Gage on the Illinois River near Valley City, IL @ RM 61.3 was used for stage histogram.
WSE = 420.6'; OHW: (NA); NP: (NA).

At the midsection, the d_{50} was 0.025 mm at the top surface of the bank. The d_{50} from the core samples at the downstream section was 0.046 at 1 foot and 0.032 at 2 feet of water depth. Gradation plots of bank soils and nearshore sediment are presented in appendix F. The detailed river cross section and coordinates are shown in appendix G.

Bench slopes varied from 1V:10.5H to 1V:7.4H. The upstream and downstream sections are classified as type 5, and the midsection is classified as type 4 (figure 6-21 and 6-22 and table 6-4). Wave wash apparently produced some small scarps on the bench area. Springs and seepage weakened the bench soils and made them susceptible to wave erosion. Currents at high stages or during floods can erode in-place bank soils.

Site 22, Alton Pool, 9/1/95. This site is located on the RDB at RM 45.1. The reach from RM 44 to 47 can be considered a straight reach typical of the Illinois River. Buckhorn Island is located upstream at RM 46.1. Figure 6-104 shows the position of the site on a GIS-based map of the Illinois navigation chart, and figure 6-105 shows a photograph of the site.

The navigation channel is close to site 22; the bank is about 300 feet from the sailing line. No major tributary enters the IWW at this location. Neither Bhowmik and Schicht (1980) nor Hagerty (1988) observed erosion at this location. A wing dam field exists on the RDB at RM 45.5, where Hagerty (1988) marked erosion.

Behind the top of the bank is a soybean field. The upper bank was covered by a zone of dense grasses with some tall matured trees. The grass zone ends at a scarp about 12-18 inches