Figure 1. Study site indicating location of Shooters Island in relation to Newark Bay. (Map courtesy of Google Earth)

Figure 2. Side view of cable arm environmental bucket in open position.

Figure 3. View of the cable arm environmental bucket showing the array of lateral flaps.

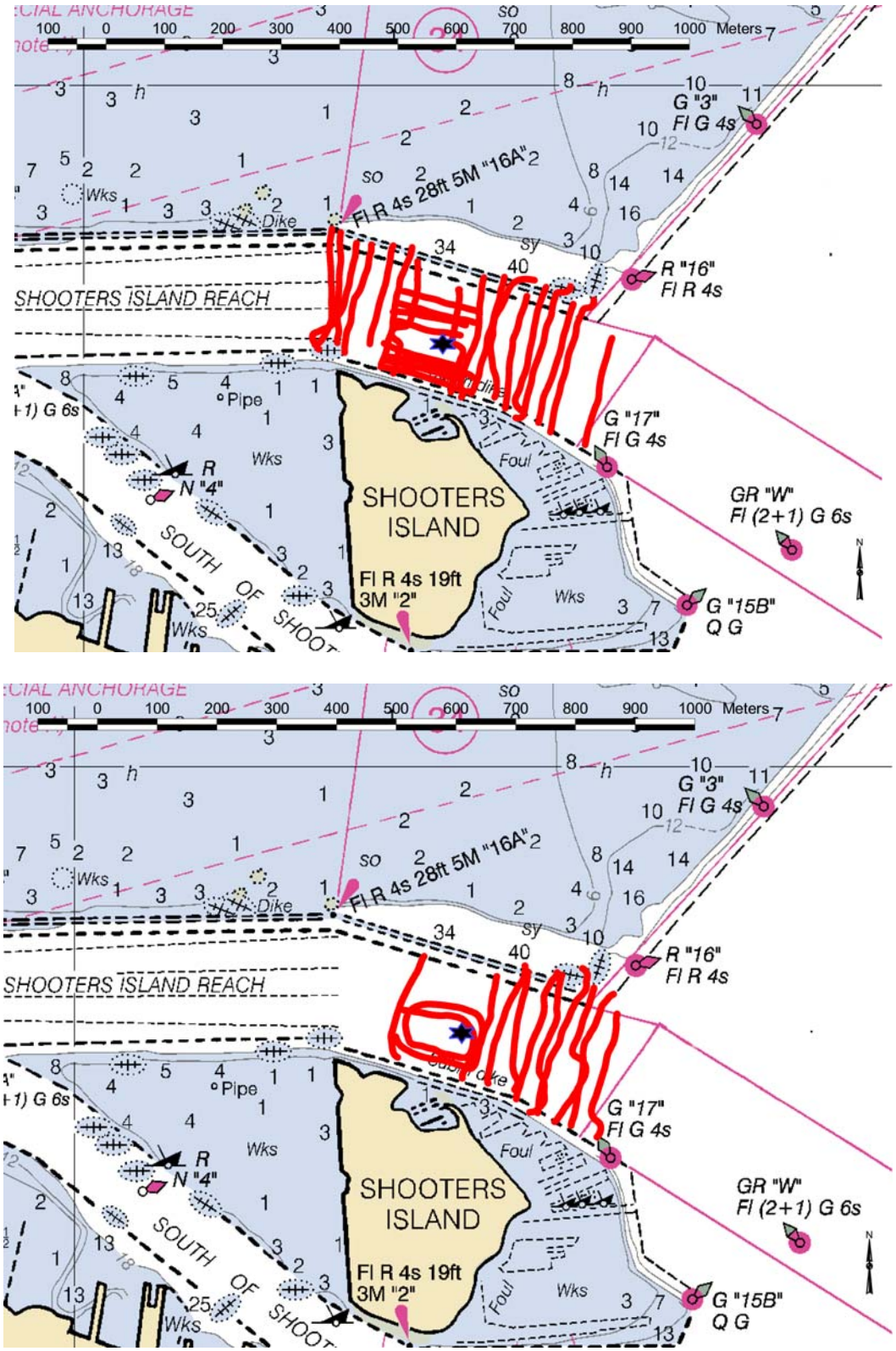

Figure 4. Layout of transects (in red) for ebb tide surveys NJEA (top) and NJEB (bottom). Approximate dredge location denoted by blue star.

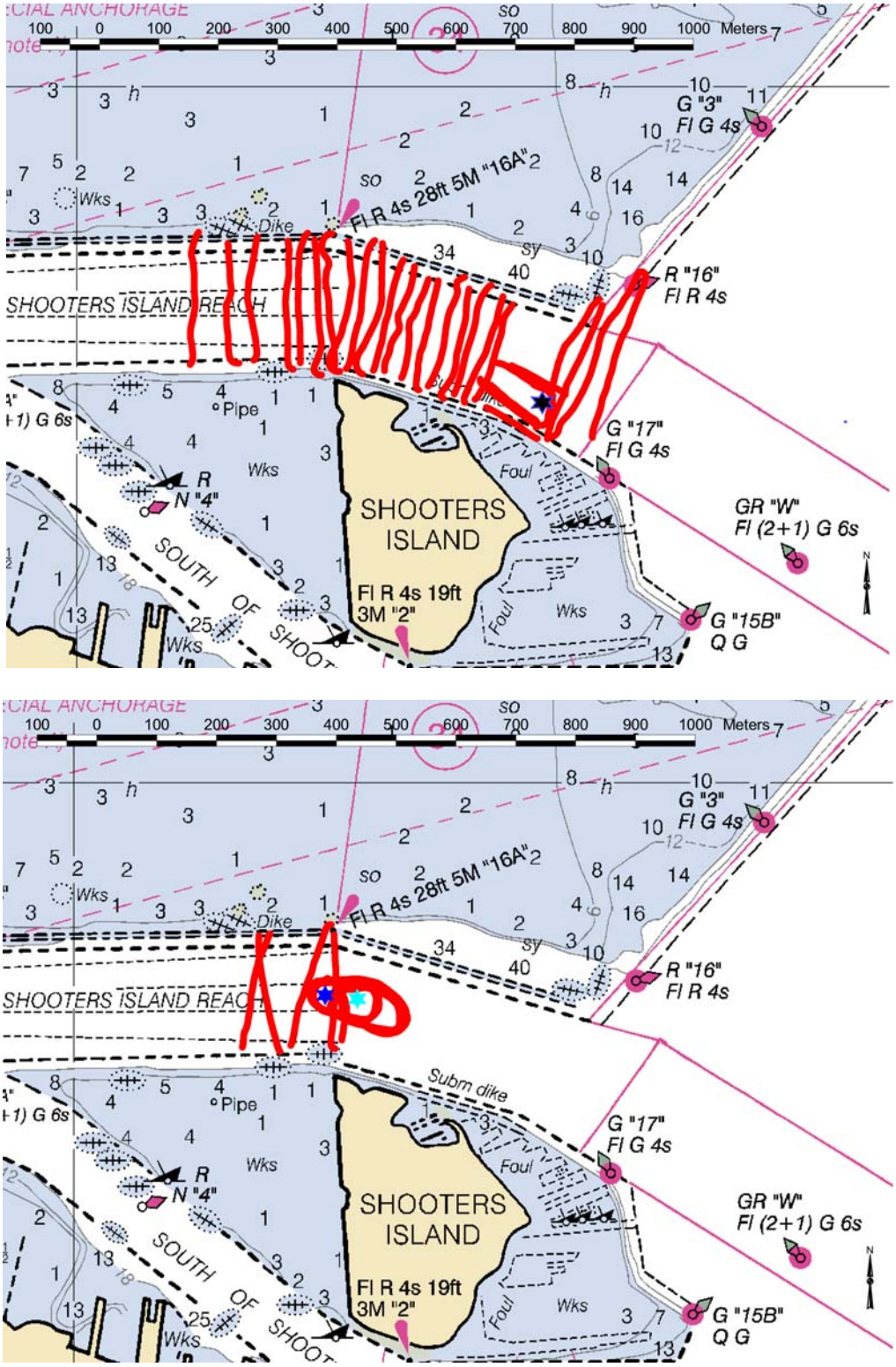

Figure 5. Layout of transects for flood tide surveys NJFD (top) and NJAB (bottom). Dredge location identified by blue star. Note that during the course of Survey NJAB, the dredge advanced easterly from the location identified by the dark blue star to the light blue star.

Figure 6. Deployment of fixed buoys with turbidity sensors. In this deployment the tide was carrying the plume toward to foreground. A third buoy with turbidity sensors deployed on the up-current side of the dredge is visible in the background.

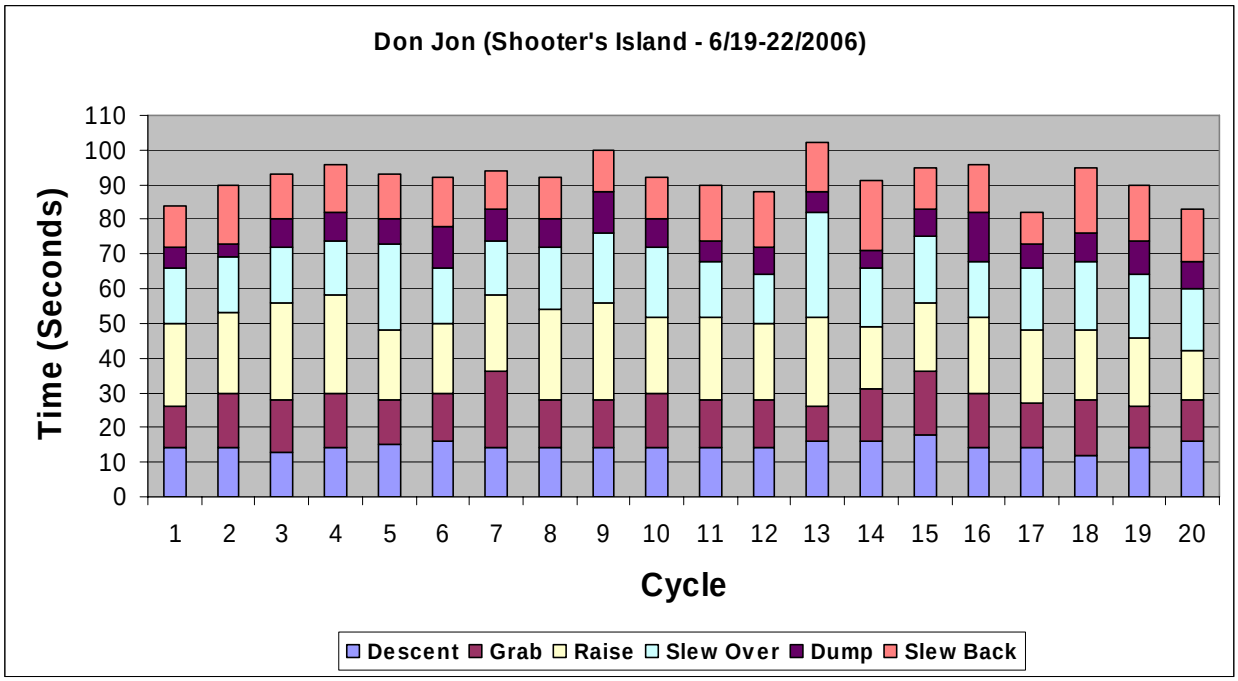

Figure 7. A series of 20 cable arm bucket cycles indicating the elapsed time for six separate components of each cycle; bucket descent, closure, ascent, slewing to barge, slewing back to water.

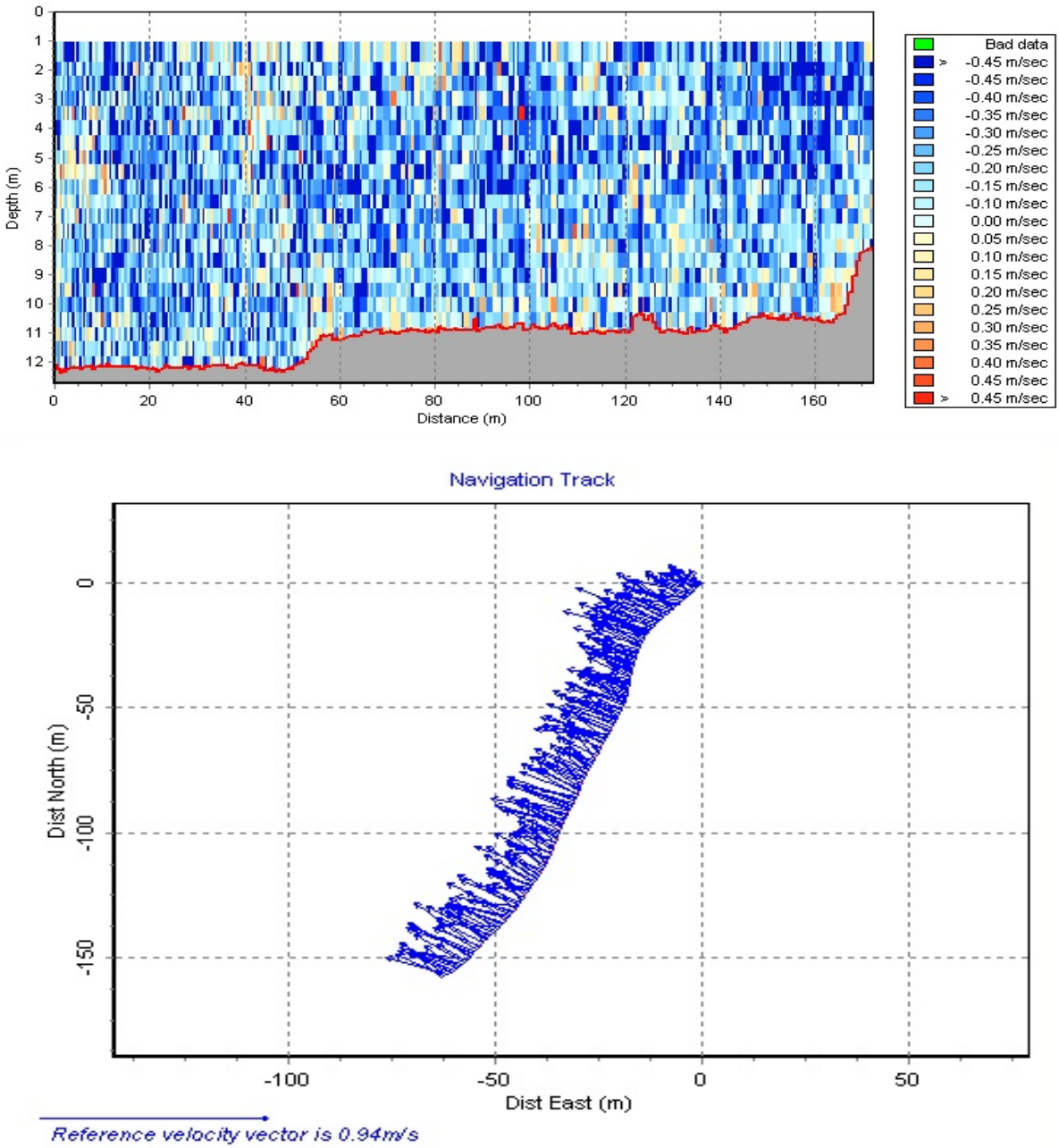

Figure 8. Vertical profile of current velocities across Shooters Island Reach (top) and current velocity and direction vectors (bottom) for Transect NJFA010, occupied 100 meters from the dredging operation during a **flooding tide**.

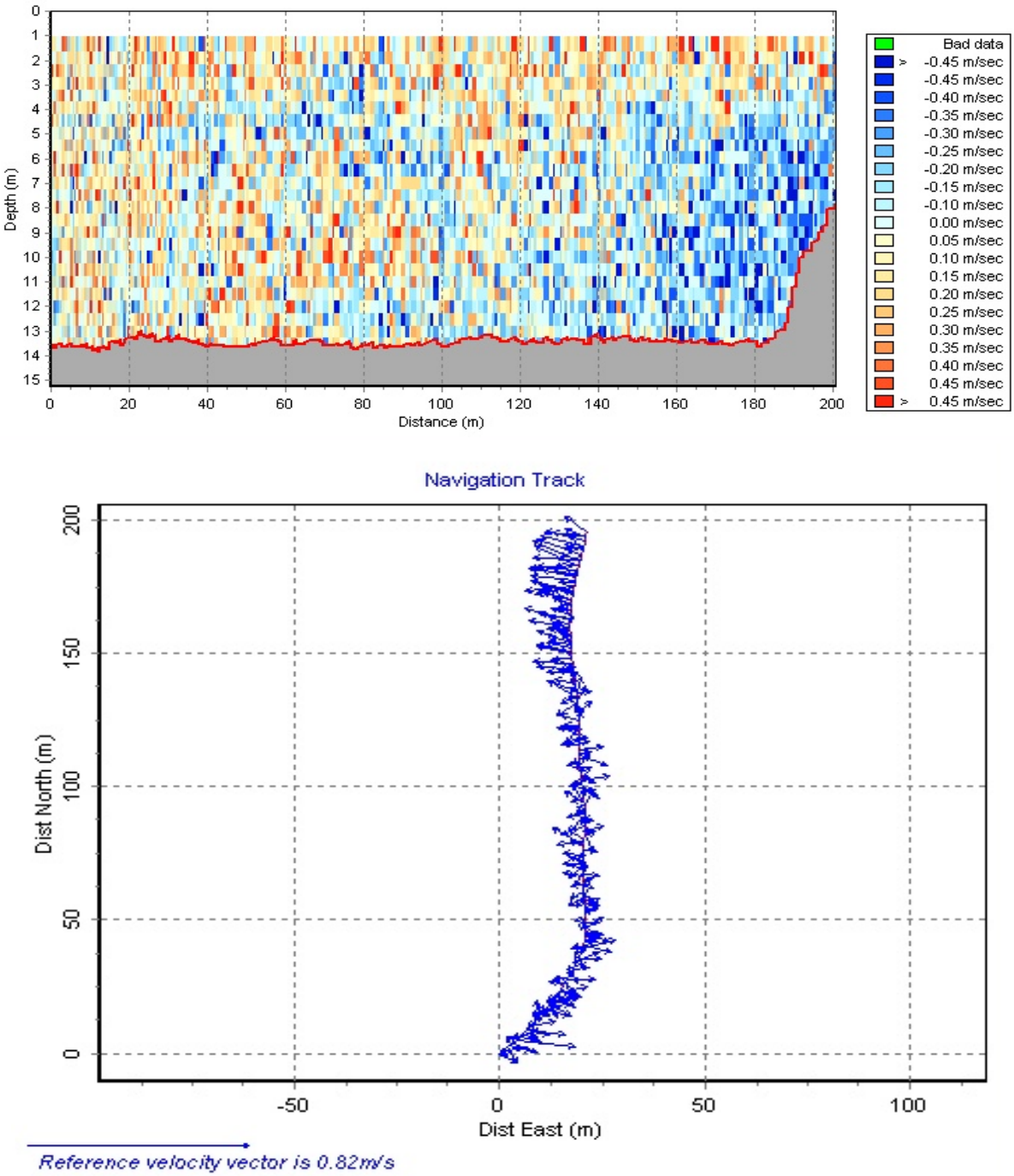

Figure 9. Vertical profile of current velocities across Shooters Island Reach (top) and current velocity and direction vectors (bottom) for Transect NJEA000, occupied 150 meters from the dredging operation during an **ebbing tide.**

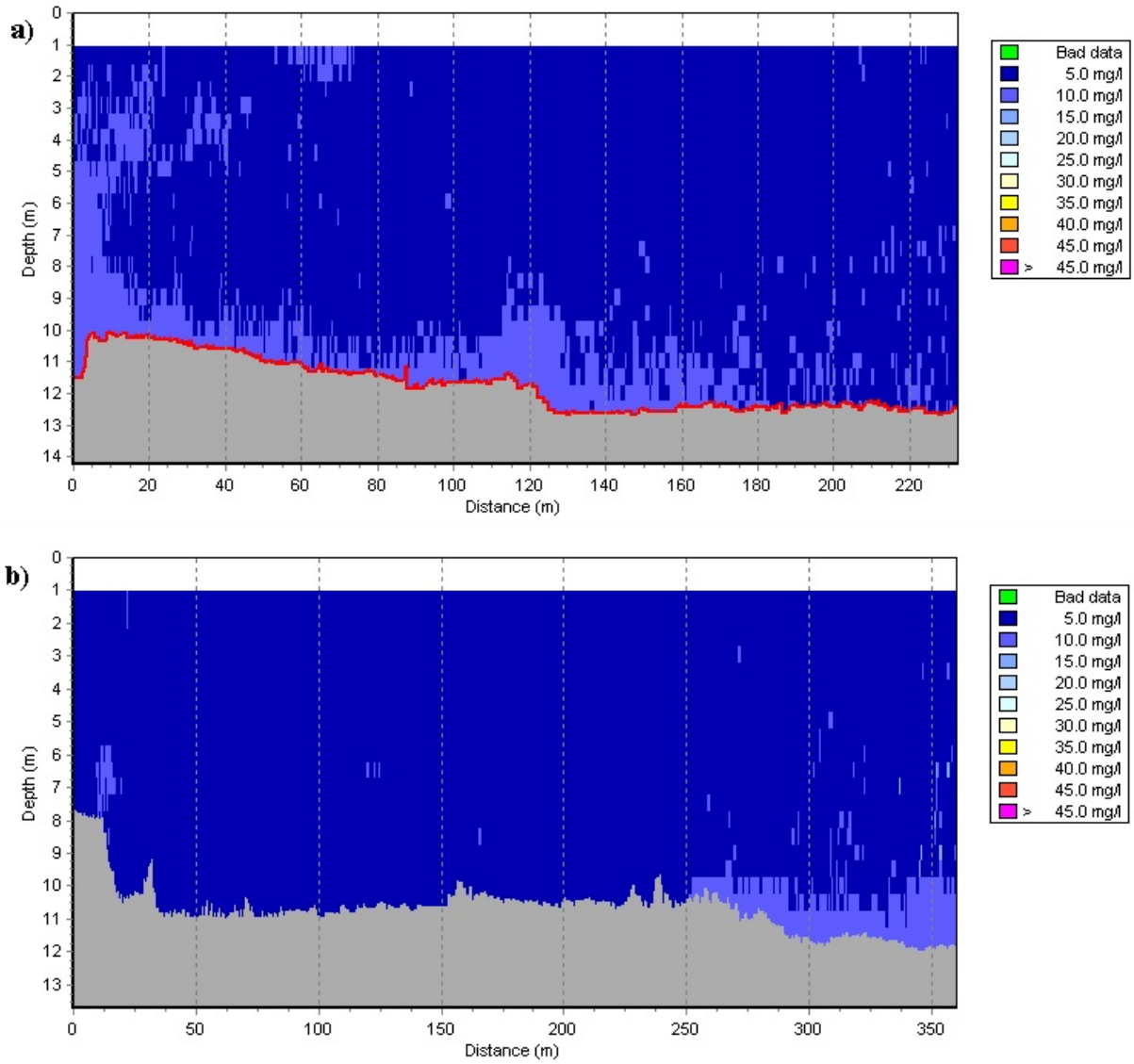

Figure 10. Representative examples of vertical profiles of ambient TSS concentrations across the Shooters Island Reach during a flooding tide on 19 June (top) and an ebbing tide (bottom) on 22 June 2006.

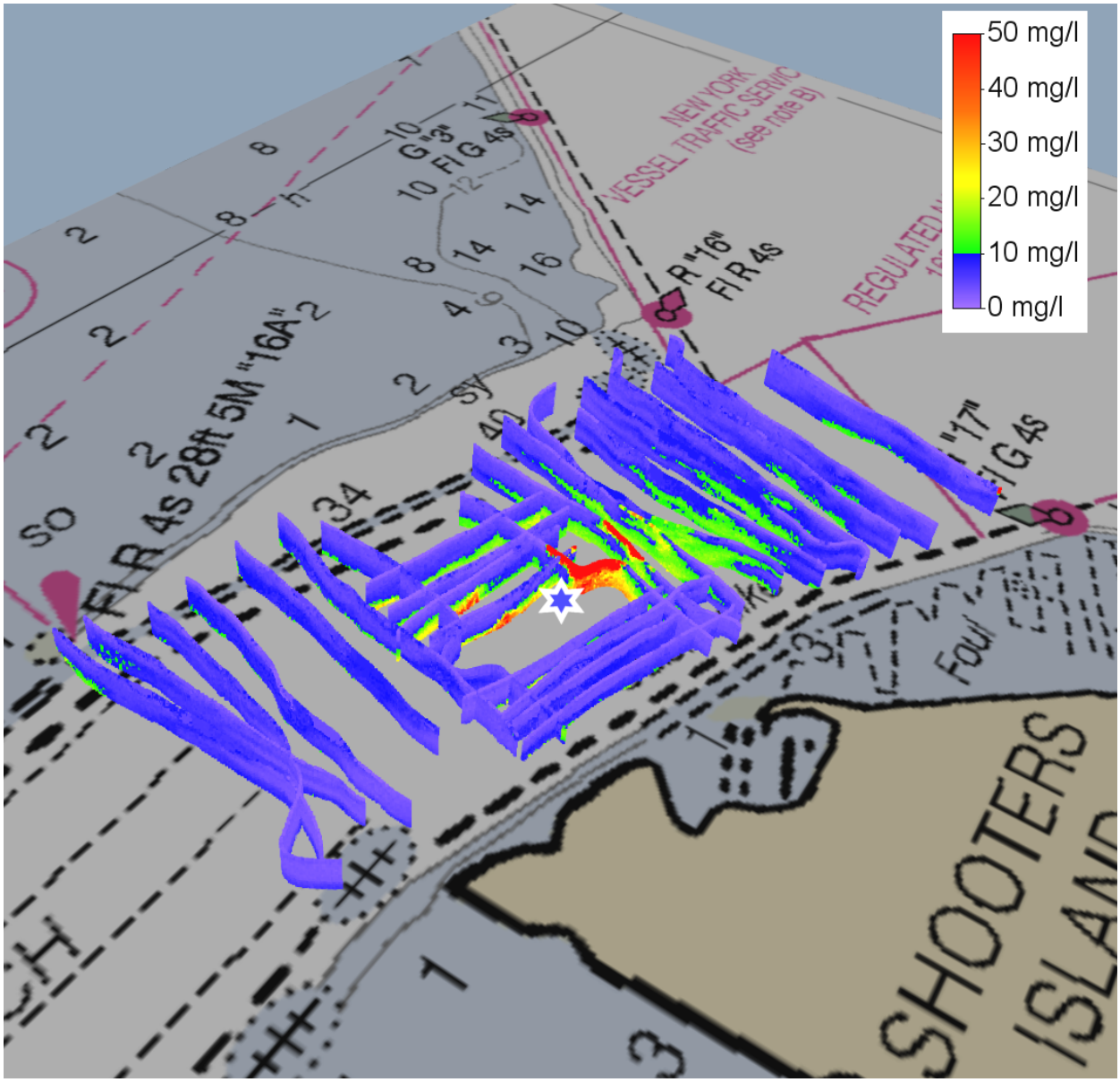

Figure 11. Three dimensional depiction of suspended sediment concentrations for ebbing tide ADCP Survey NJEA. Dredge position indicated by star.

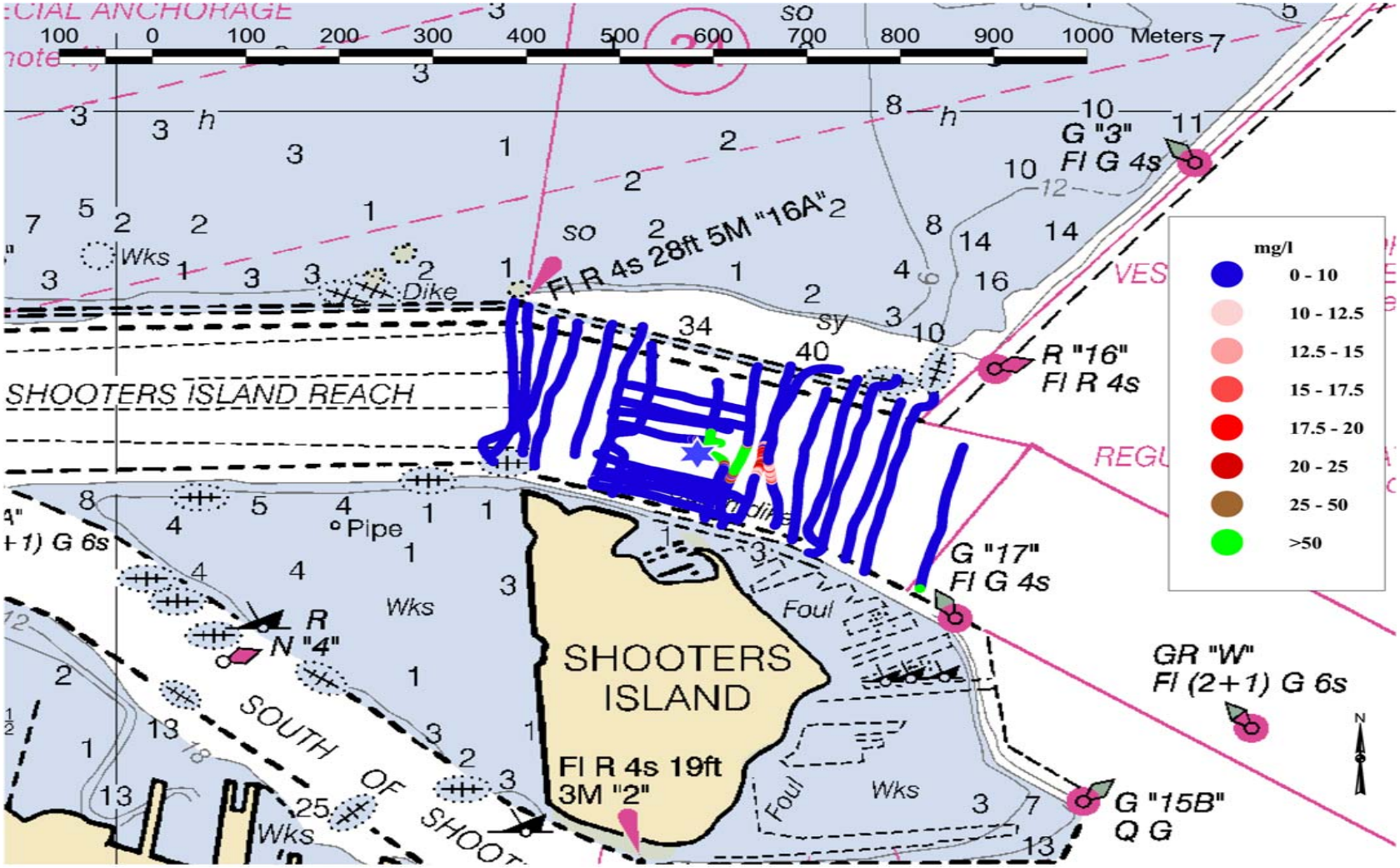

Figure 12. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 2 meters for Survey NJEA, completed during an ebbing tide on 19 June 2006. Dredge location indicated by star.

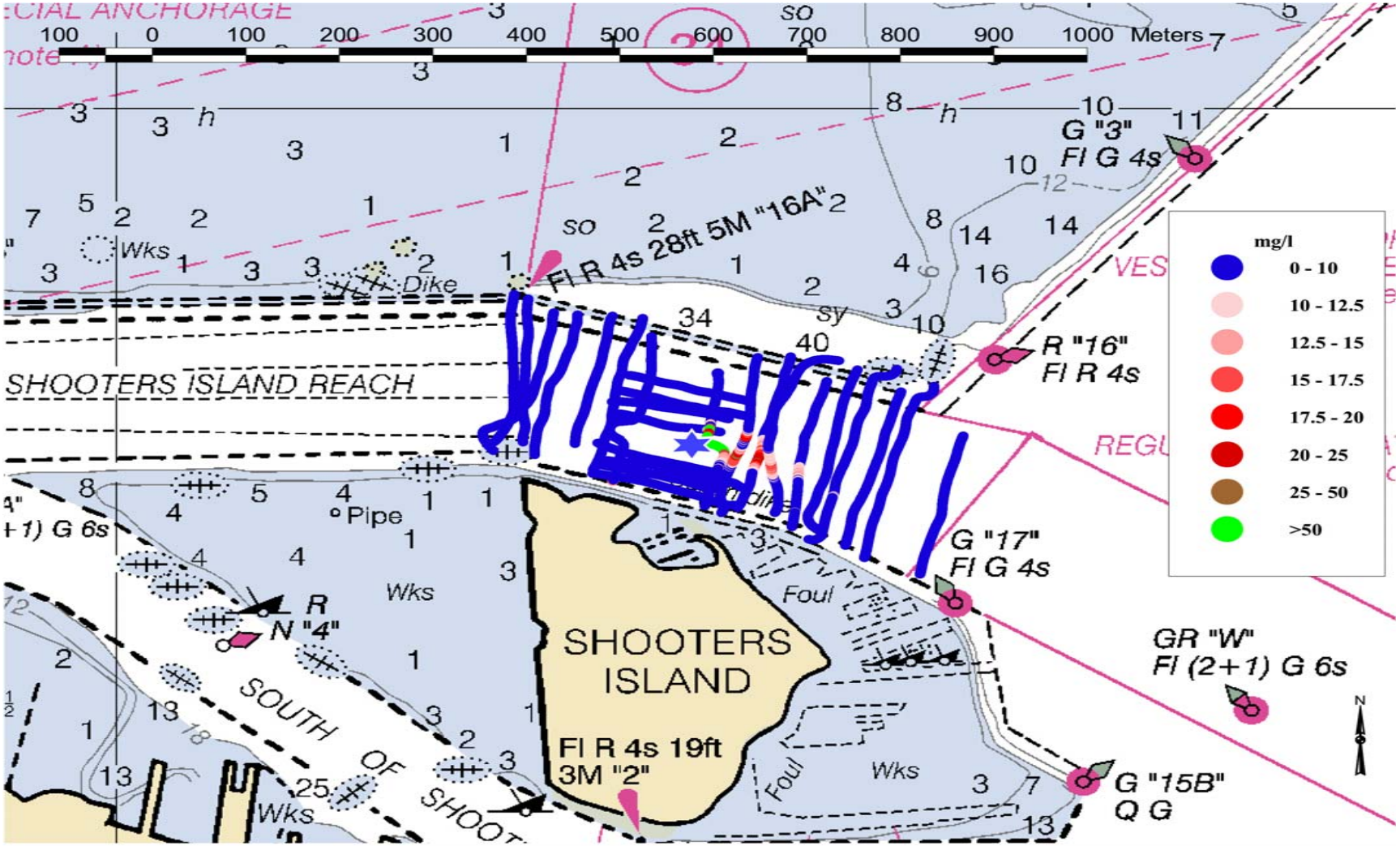

Figure 13. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 4 meters for Survey NJEA, completed during an ebbing tide on 19 June 2006.

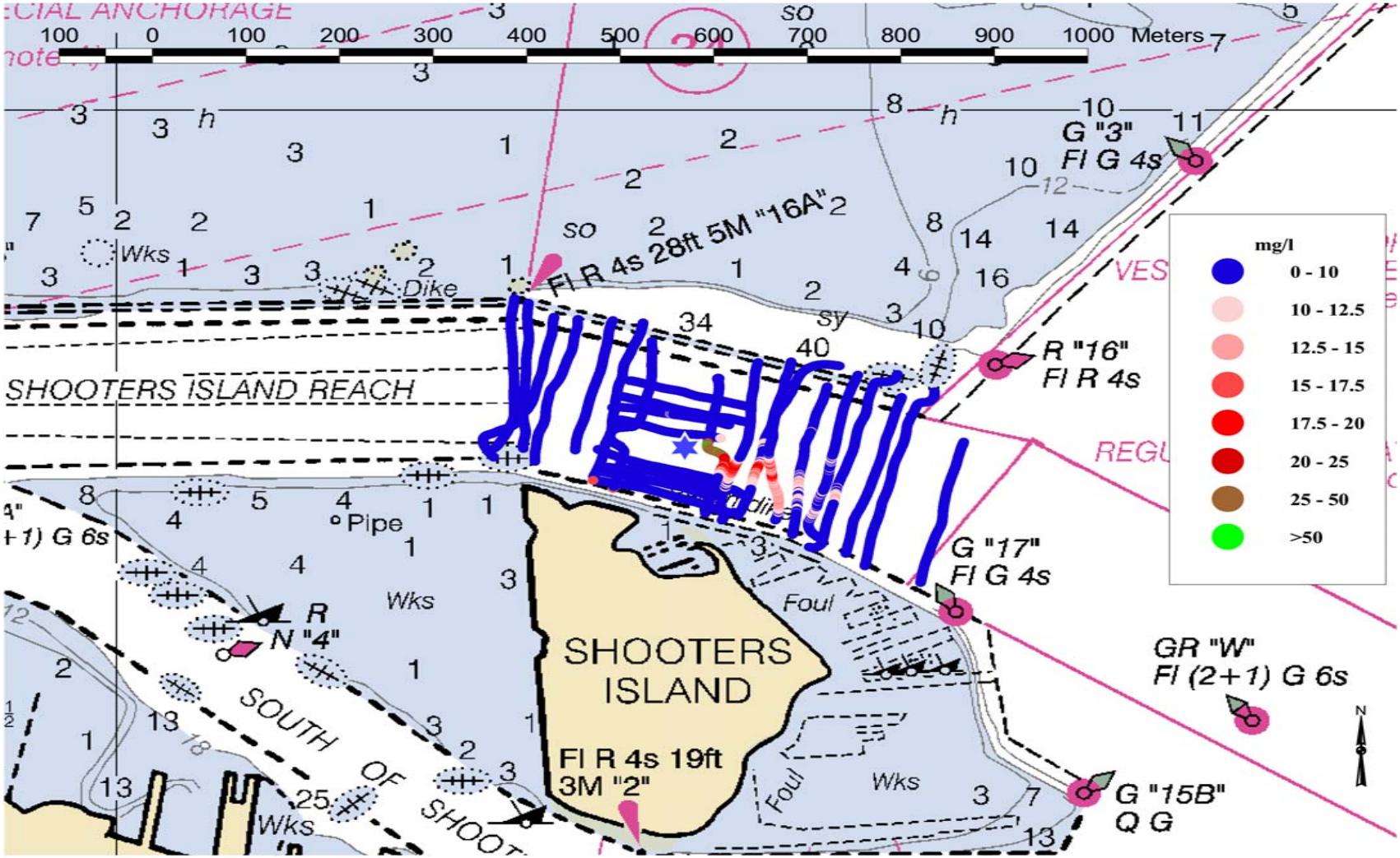

Figure 14. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 6 meters for Survey NJEA, completed during an ebbing tide on 19 June 2006.

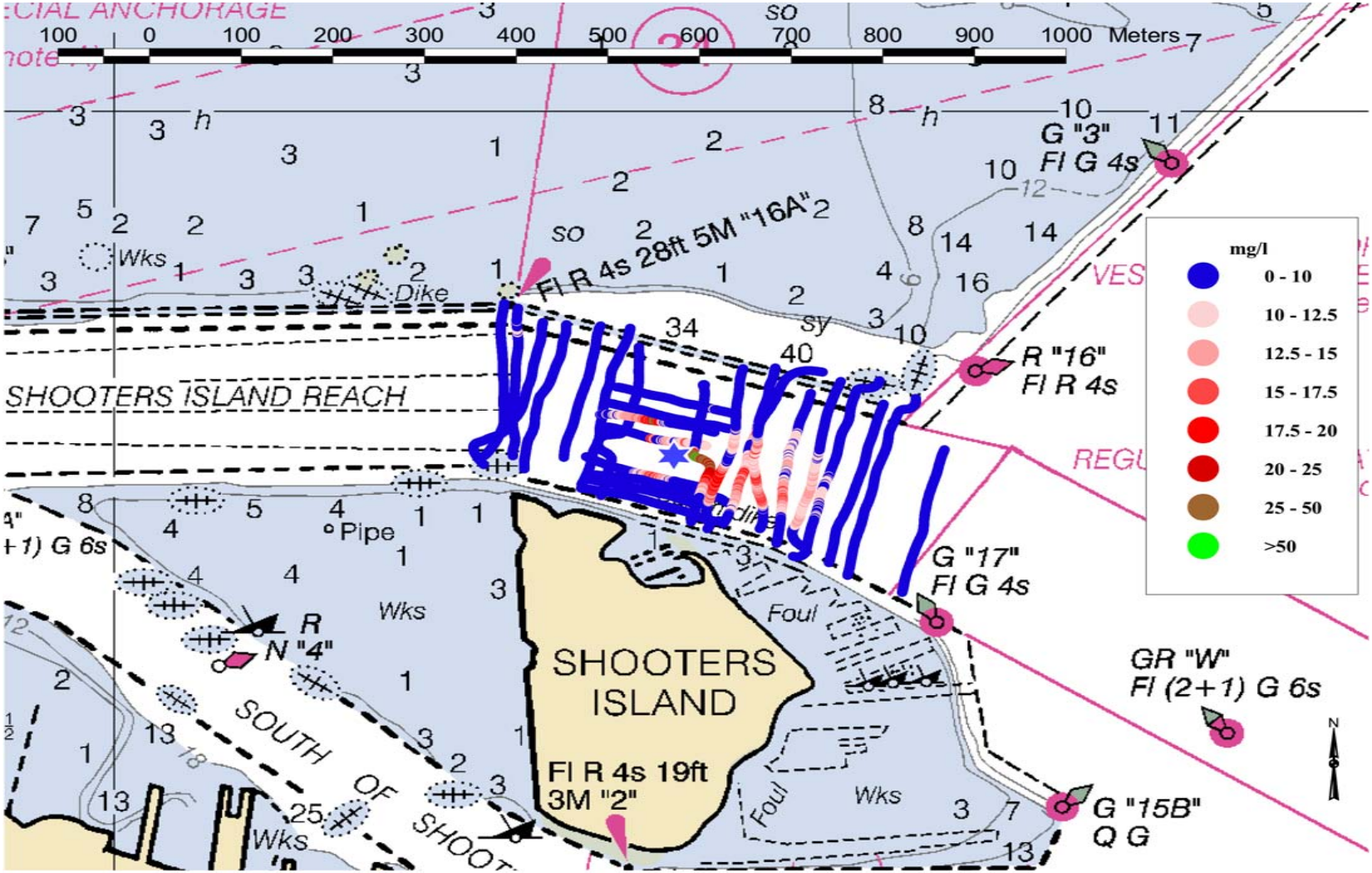

Figure 15. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 8 meters for Survey NJEA, completed during an ebbing tide on 19 June 2006.

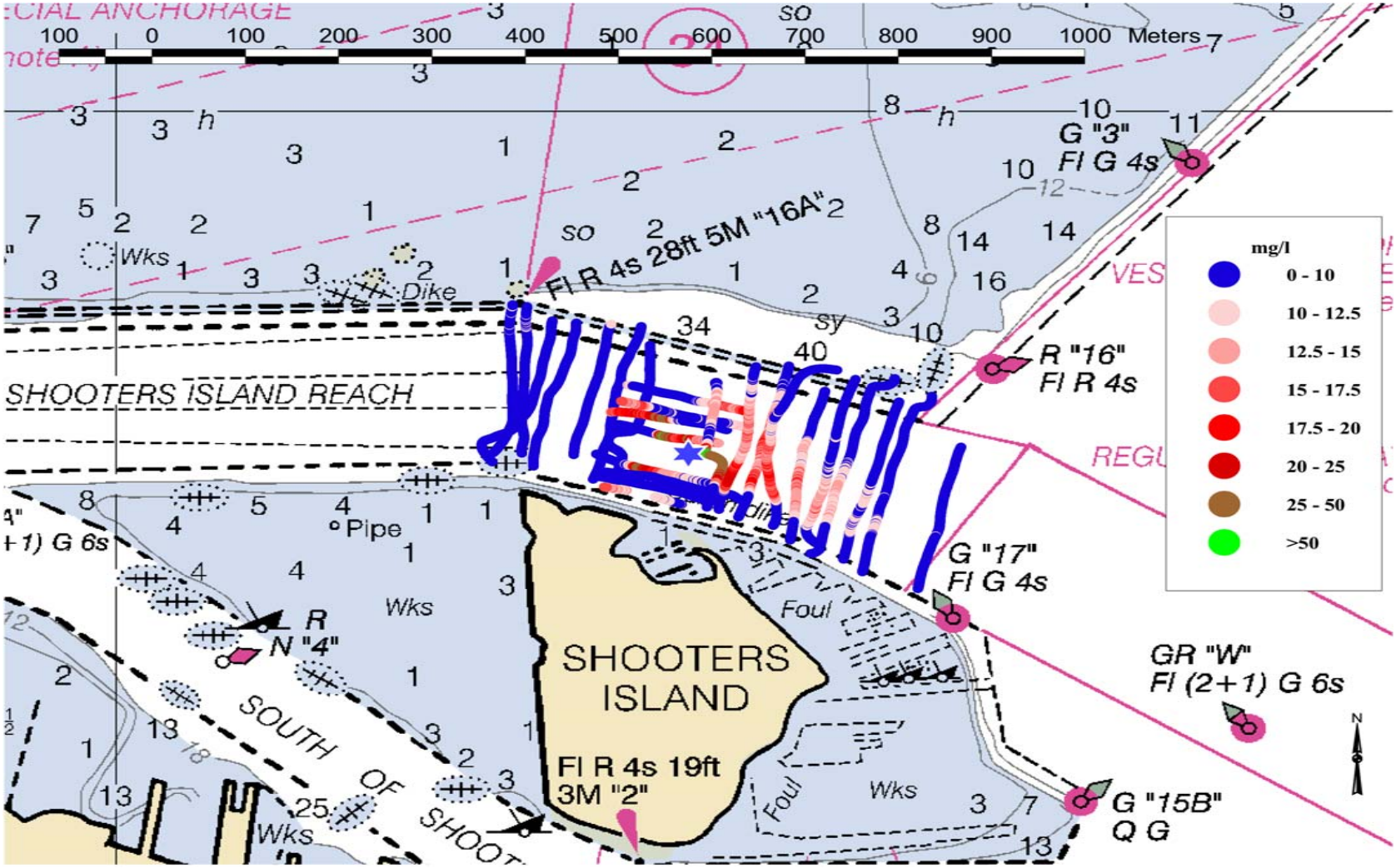

Figure 16. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 10 meters for Survey NJEA, completed during an ebbing tide on 19 June 2006.

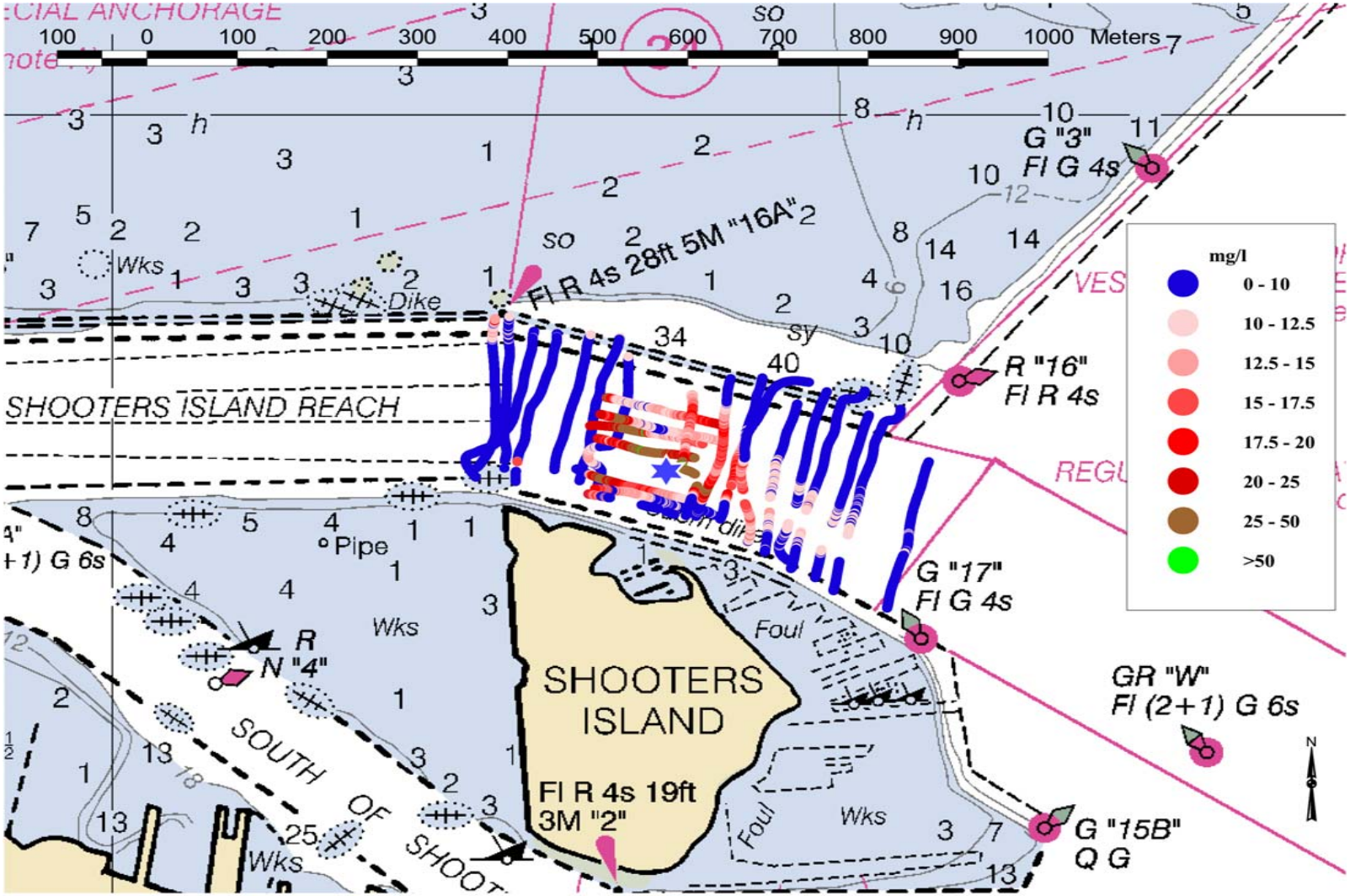

Figure 17. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 12 meters for Survey NJEA, completed during an ebbing tide on 19 June 2006.

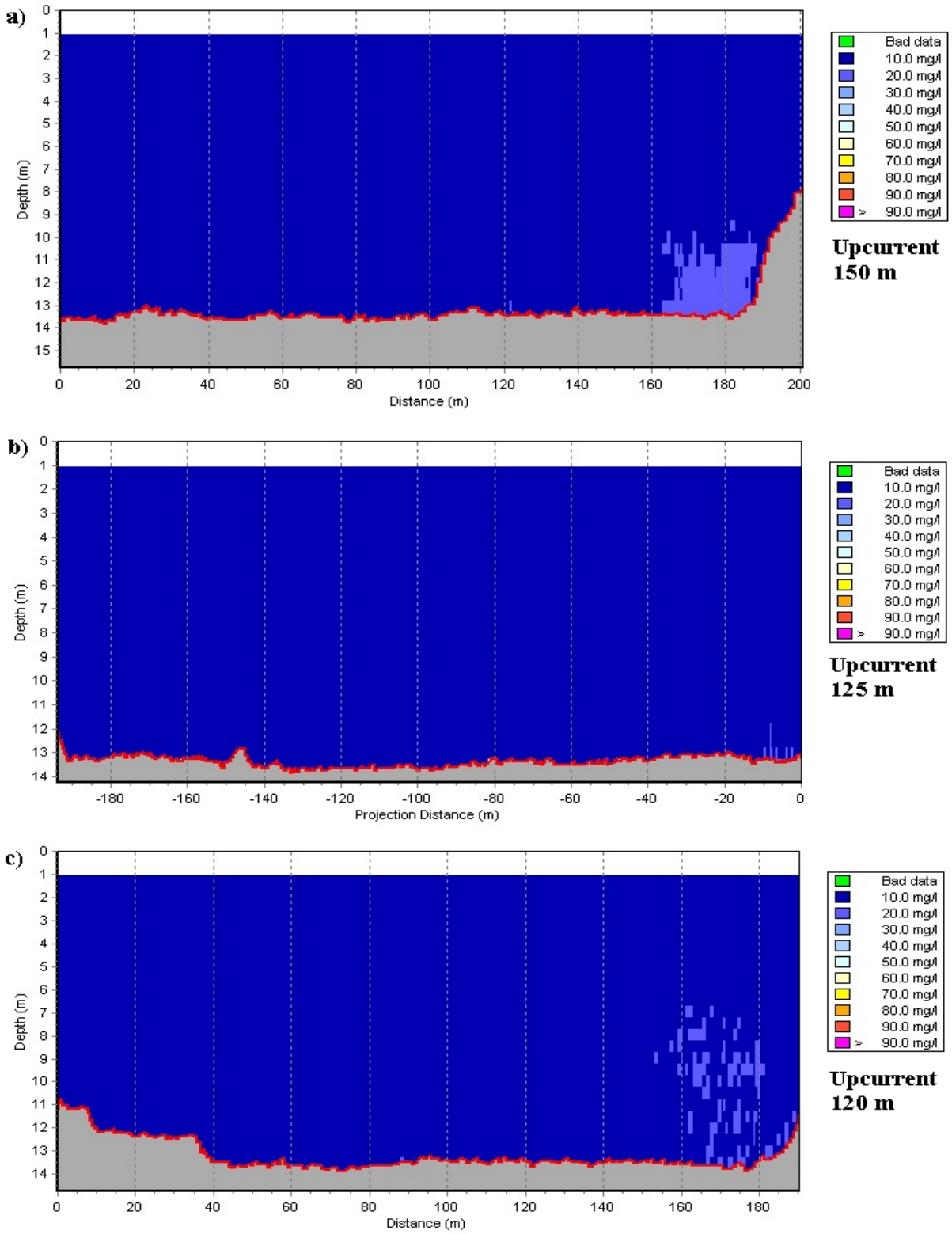

Figure 18. Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

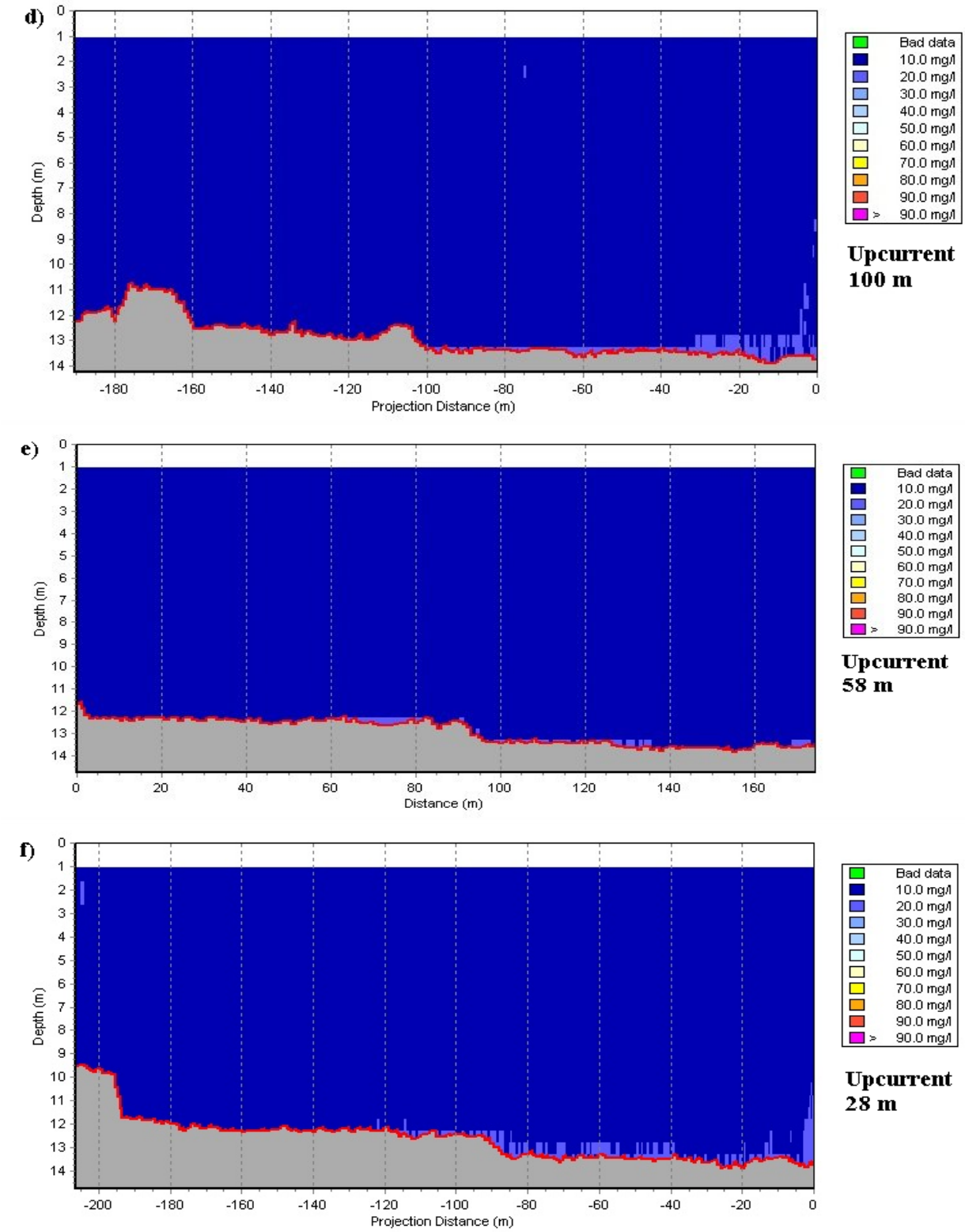

Figure 18 (cont.). Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

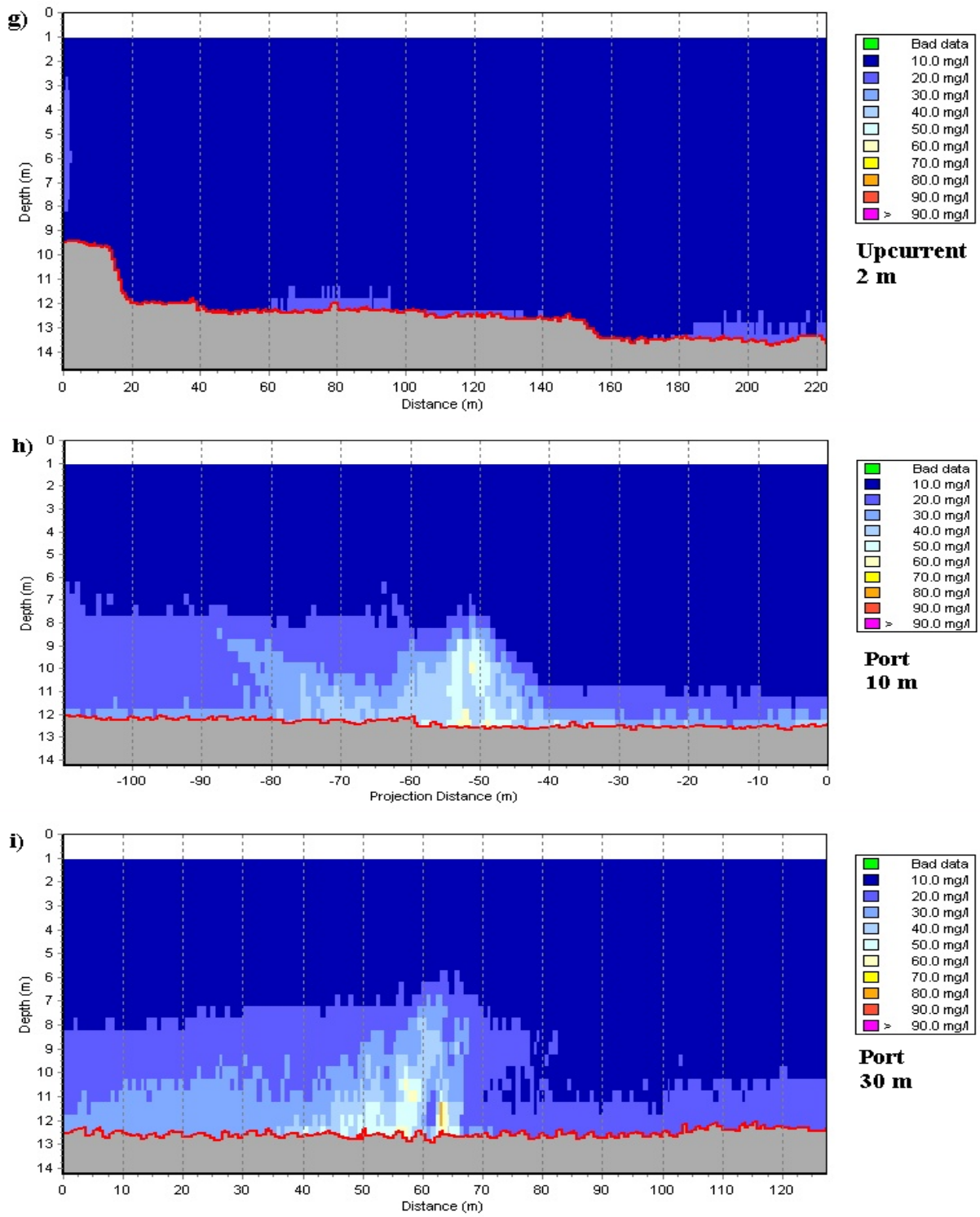

Figure 18 (cont.). Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

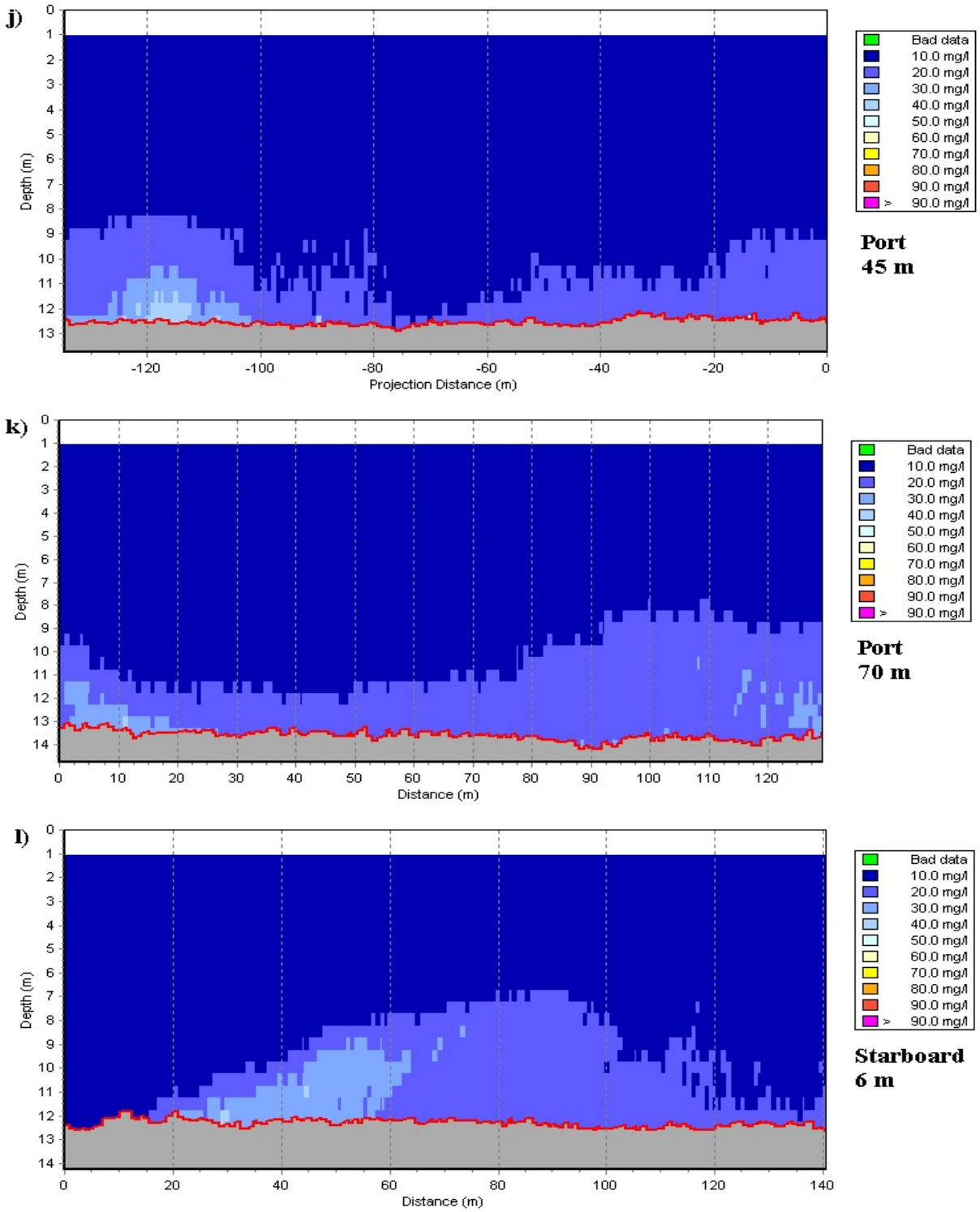

Figure 18 (cont.). Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

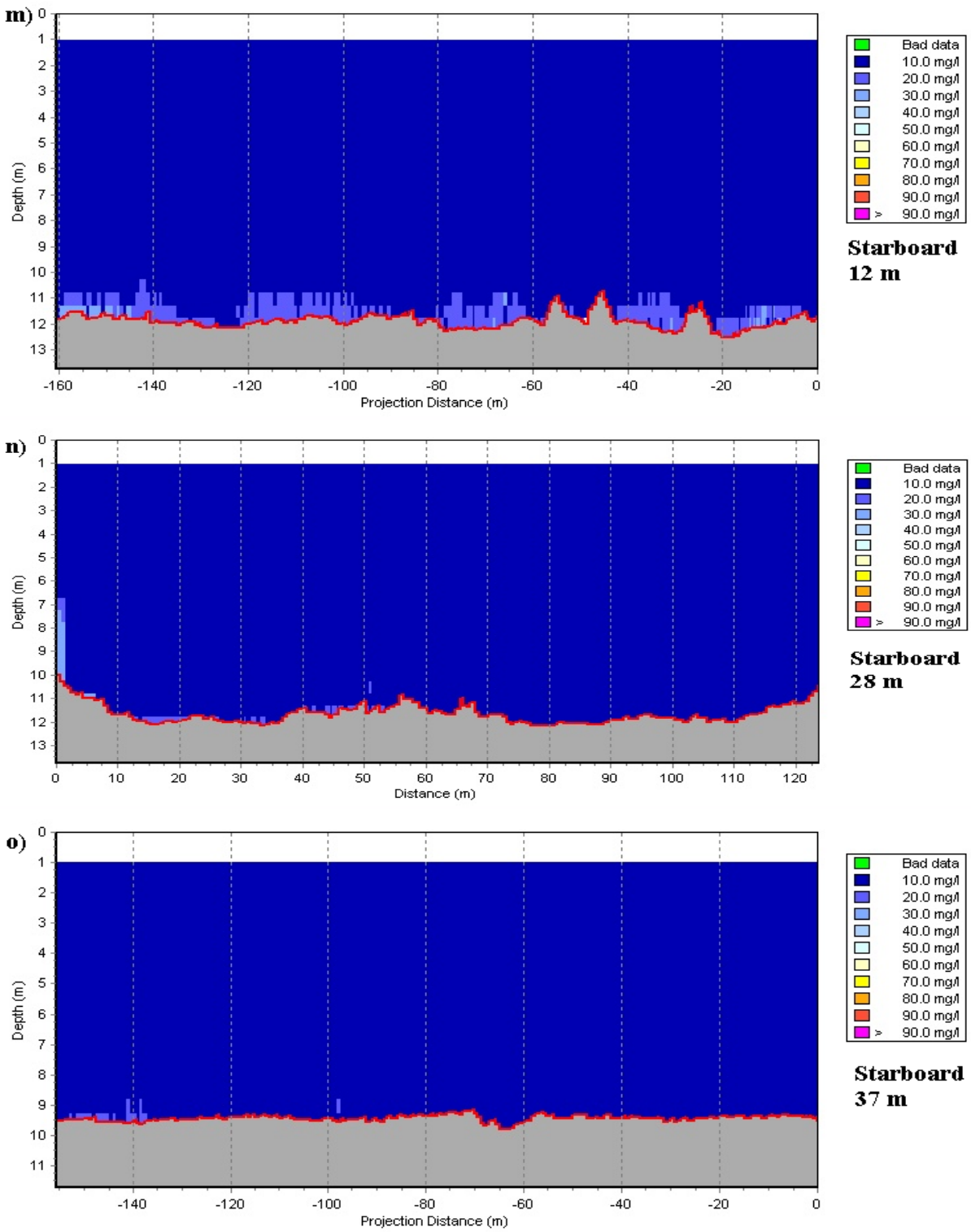

Figure 18 (cont.). Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

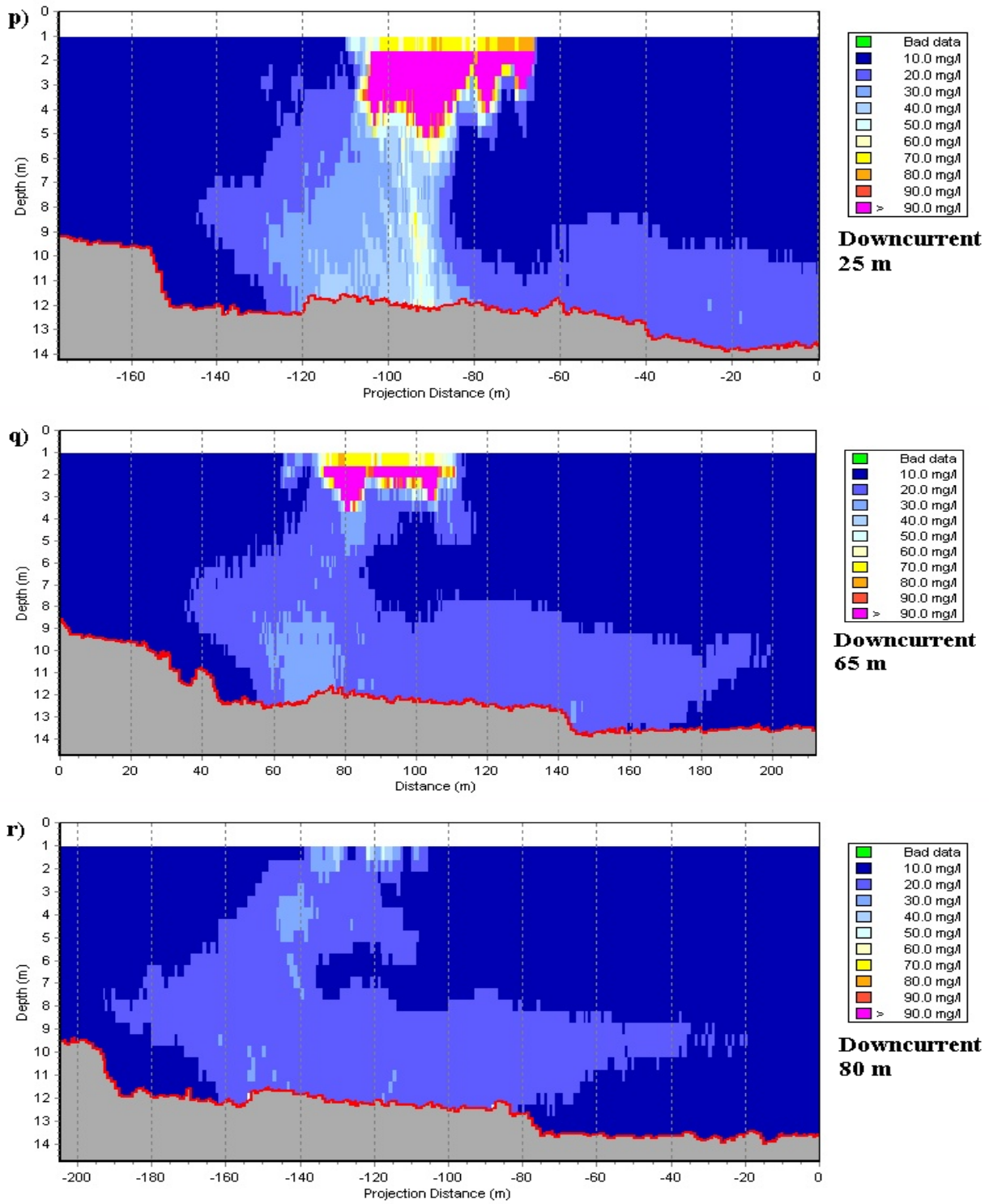

Figure 18 (cont.). Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

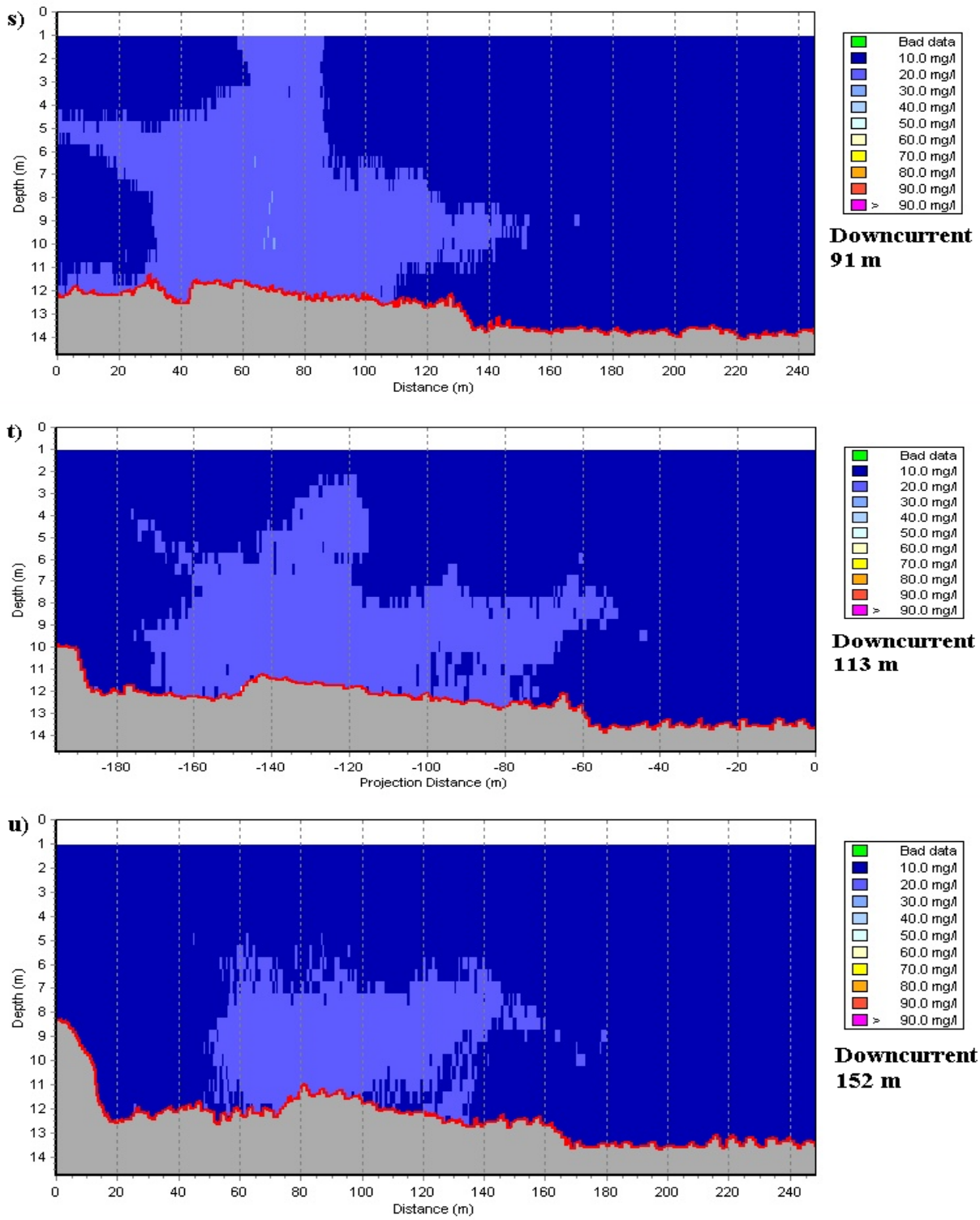

Figure 18 (cont.). Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

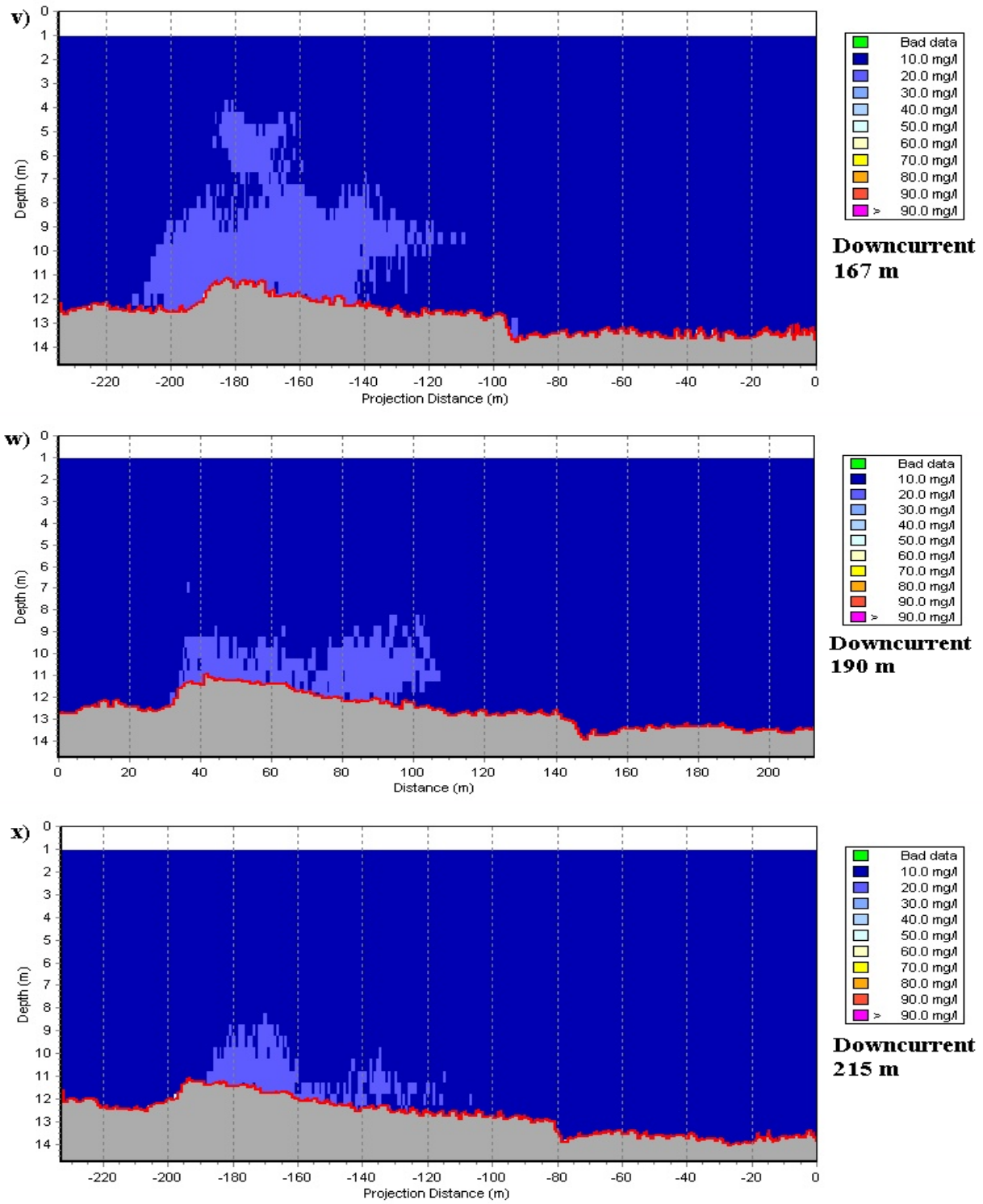

Figure 18 (cont.). Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

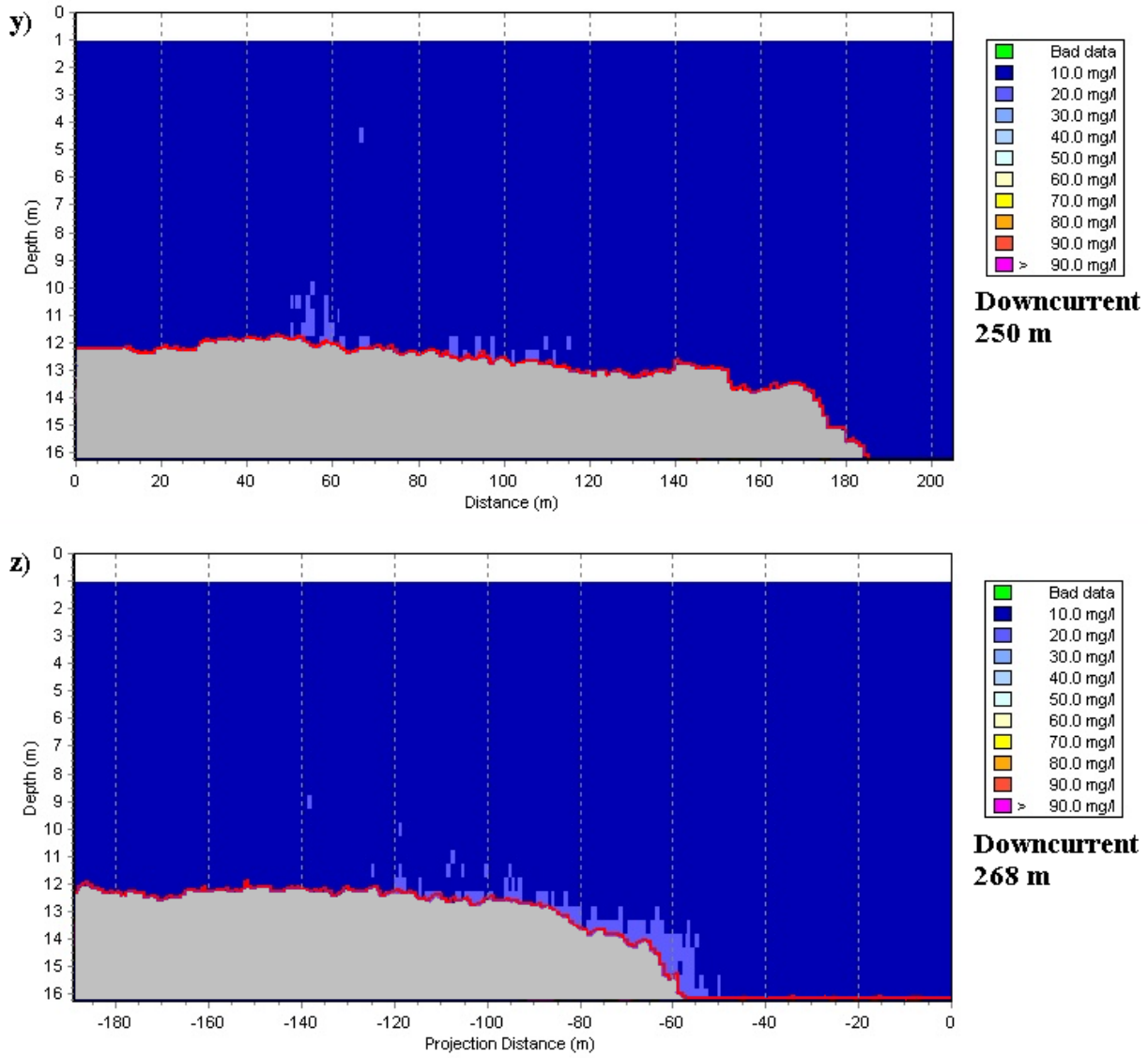

Figure 18 (cont.). Vertical profiles (Survey NJEA) of TSS concentrations across Shooters Island Reach during an ebbing tide on 19 June 2006. Distances from the source are given for each transect below the legend at the right of the graph.

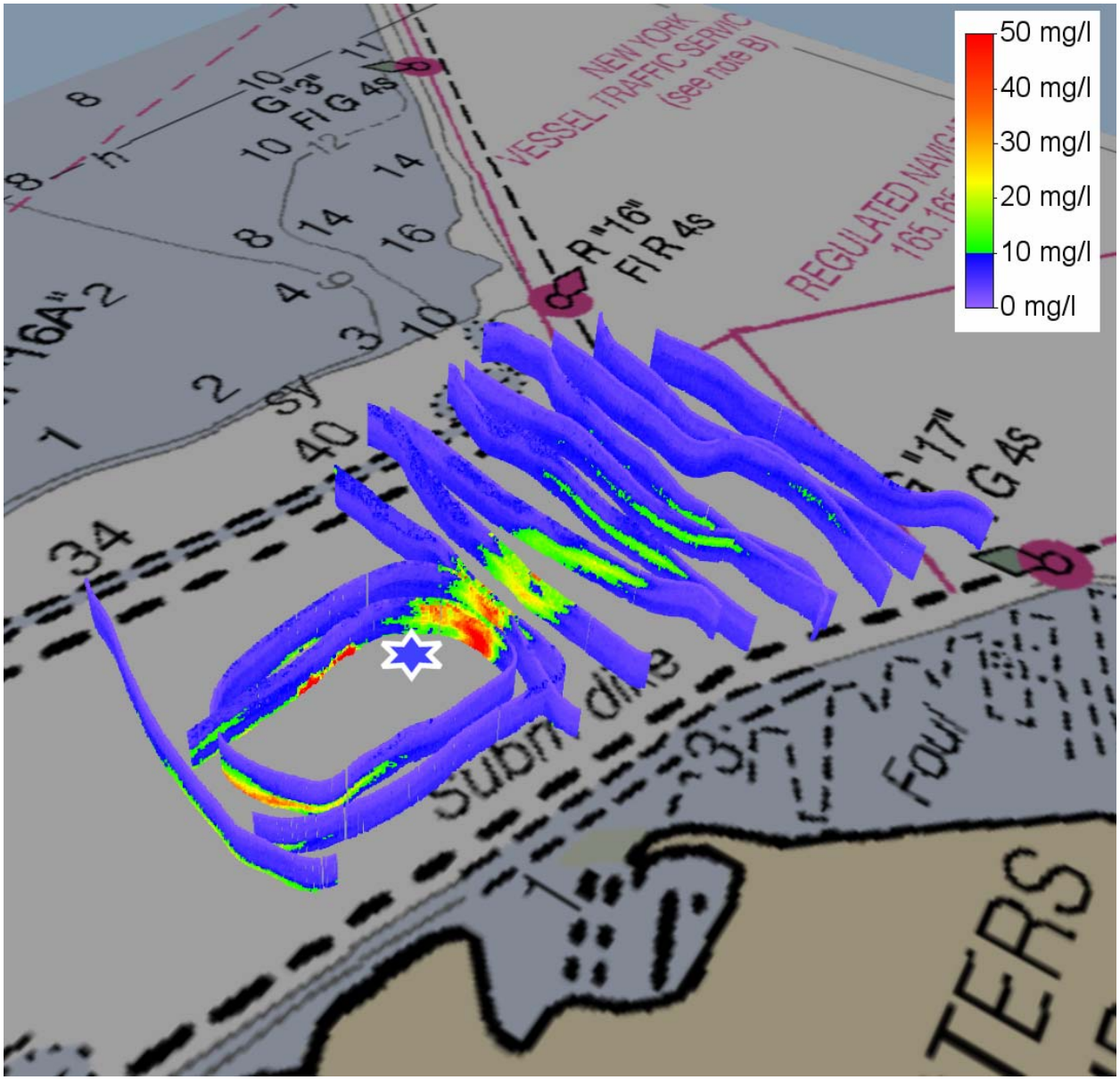

Figure 19. Suspended sediment concentrations for Survey NJEB plotted with respect to their x, y and z coordinates. (Dredge position indicated by star).

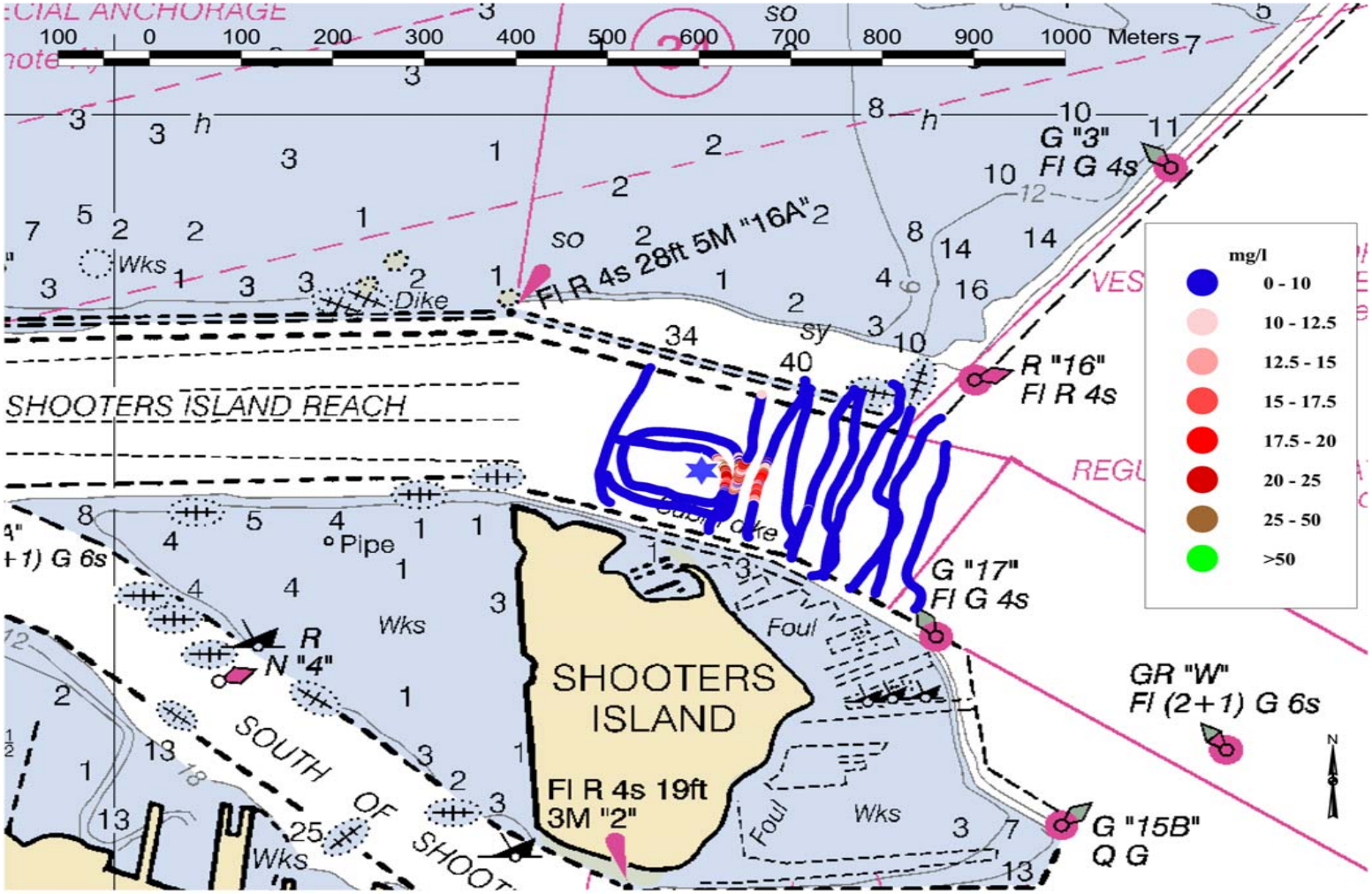

Figure 20. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 2 meters for Survey NJEB, completed during an ebbing tide on 19 June 2006.

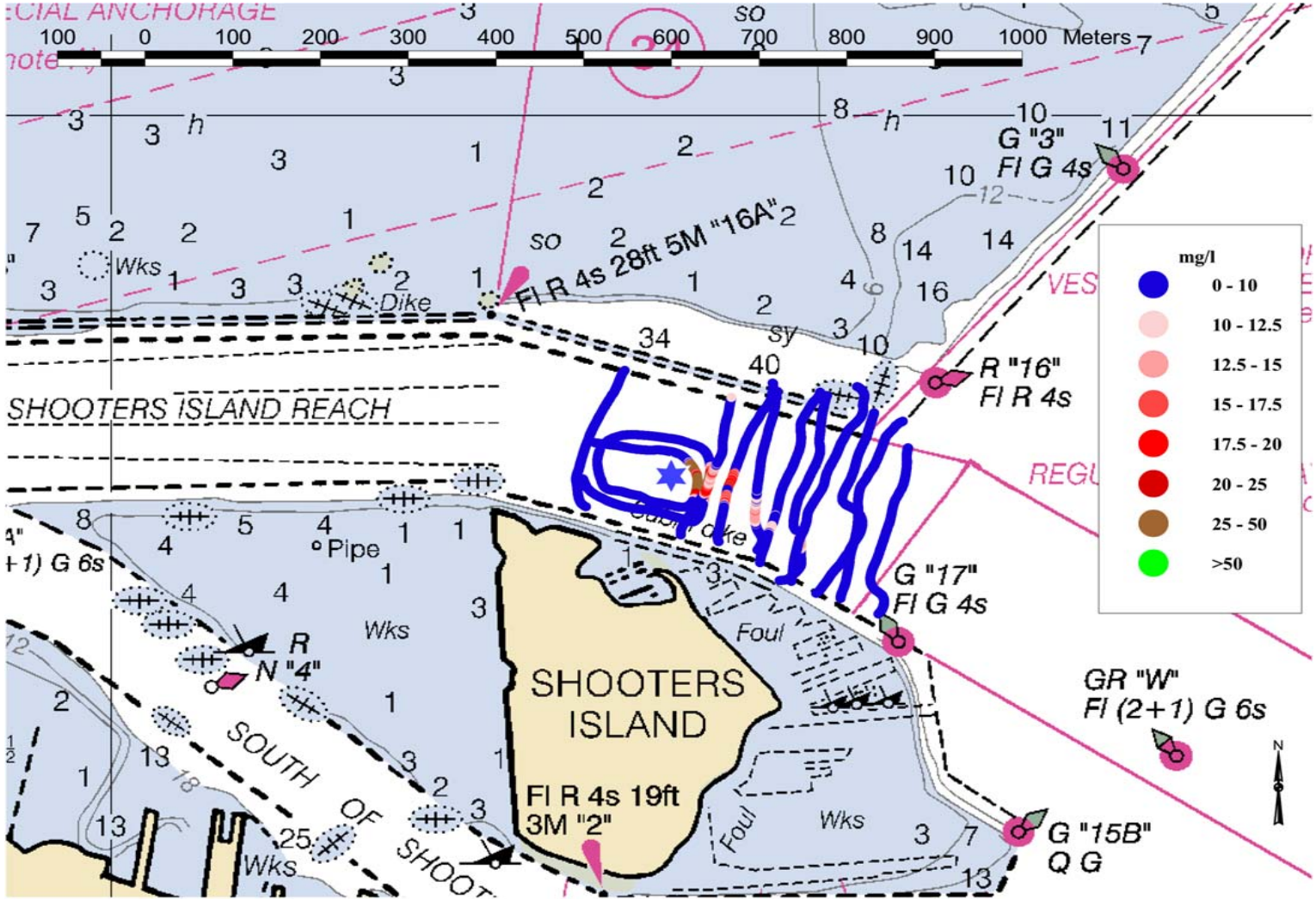

Figure 21. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 4 meters for Survey NJEB, completed during an ebbing tide on 19 June 2006.

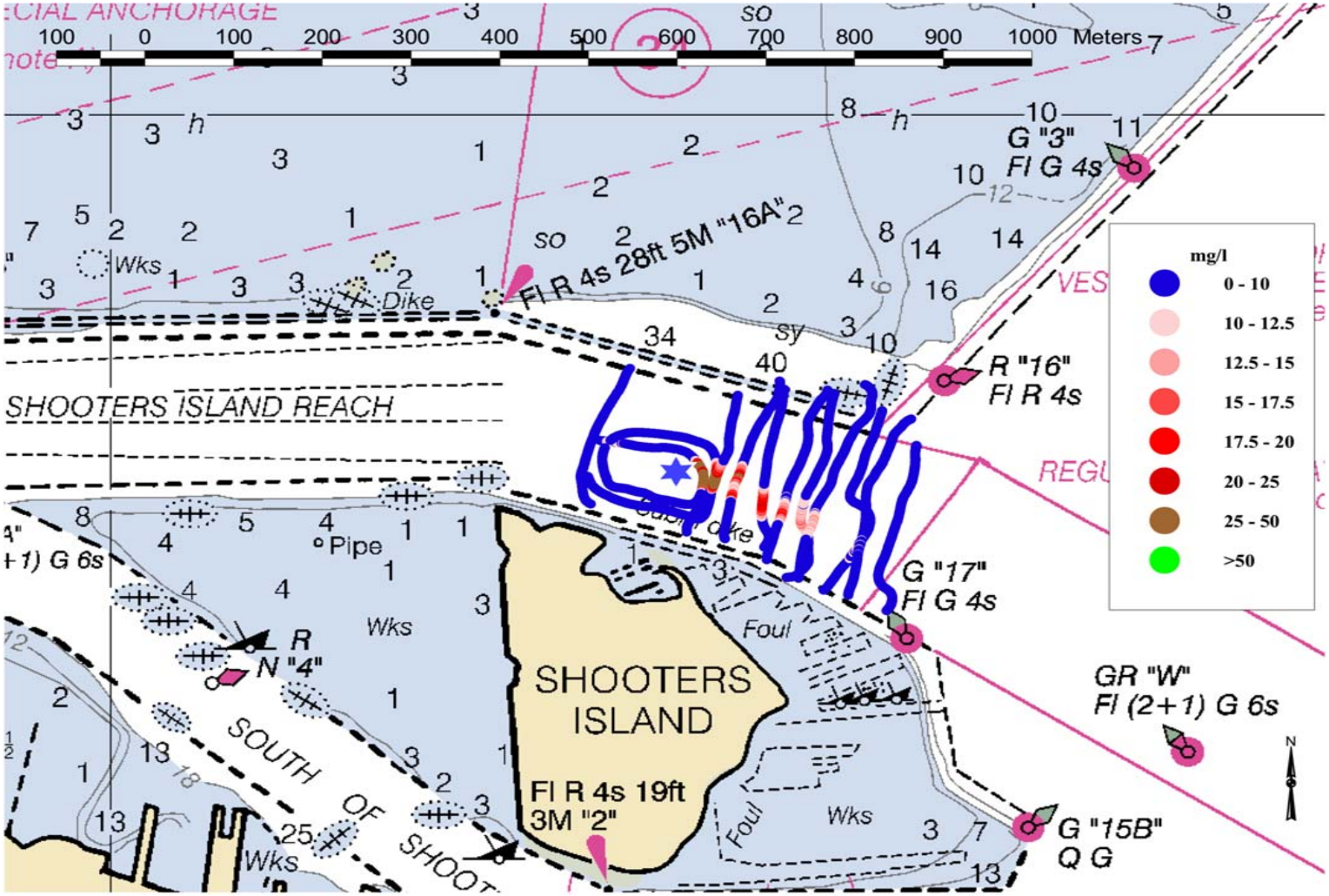

Figure 22. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 6 meters for Survey NJEB, completed during an ebbing tide on 19 June 2006.

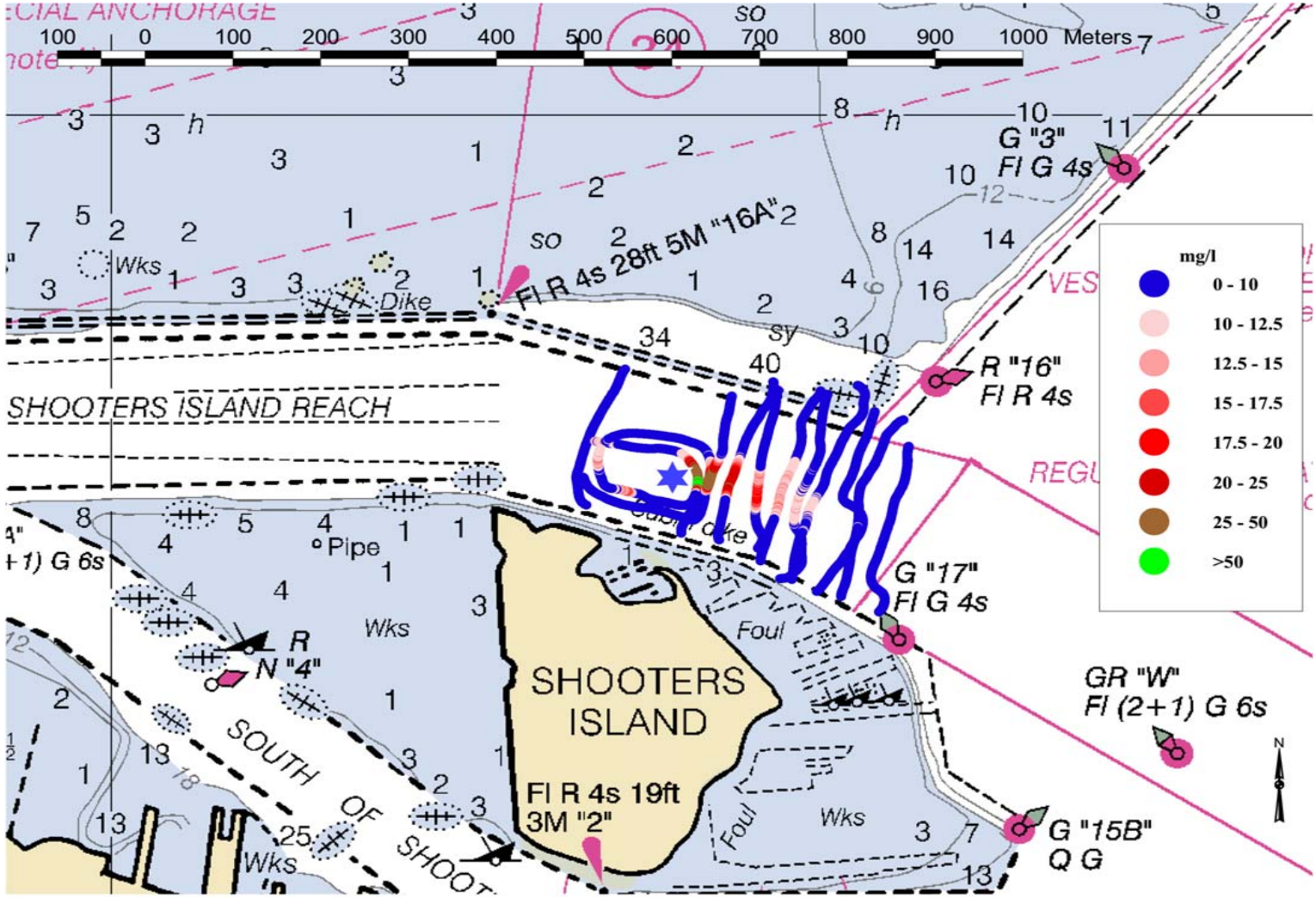

Figure 23. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 8 meters for Survey NJEB, completed during an ebbing tide on 19 June 2006.

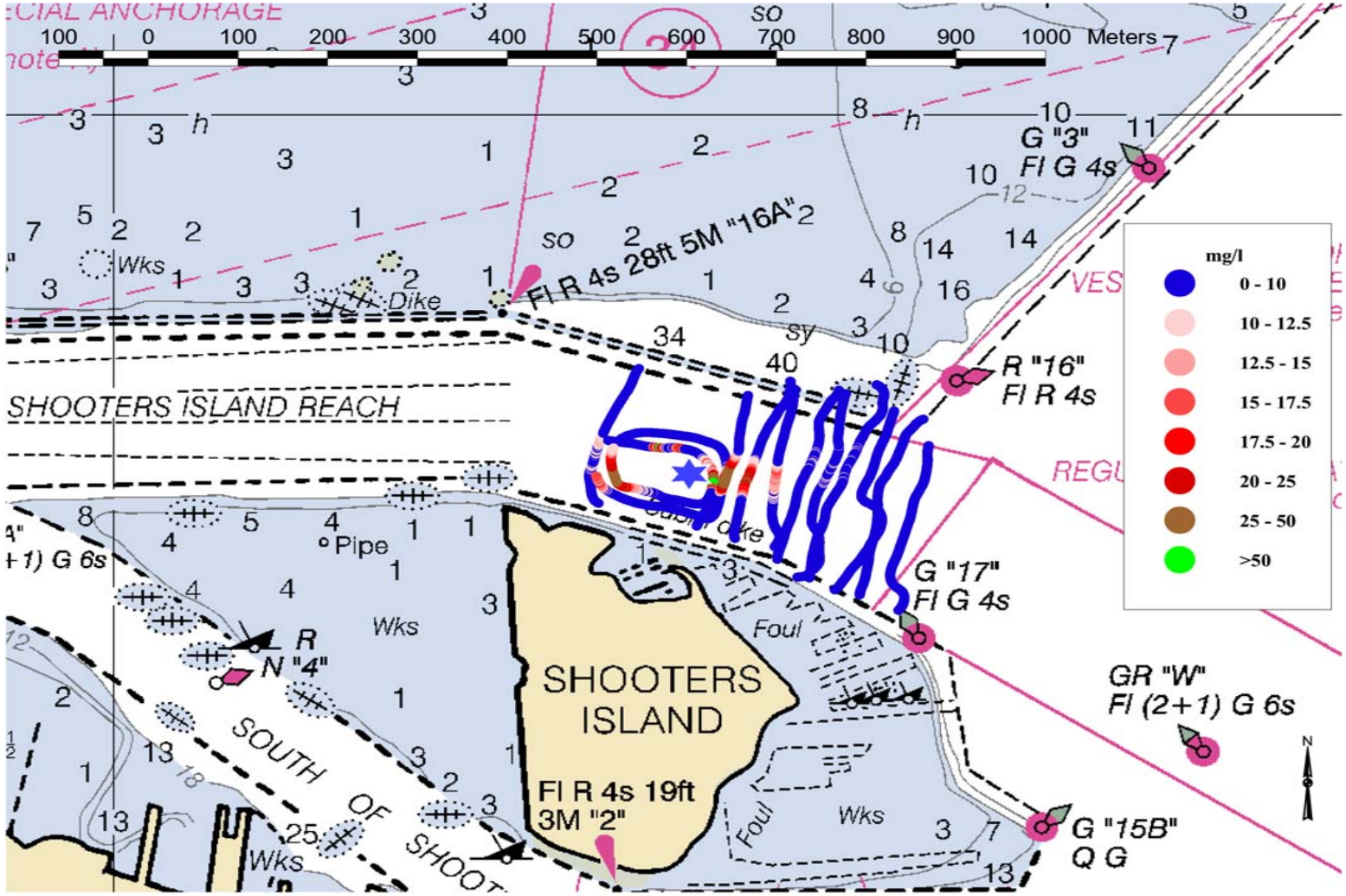

Figure 24. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 10 meters for Survey NJEB, completed during an ebbing tide on 19 June 2006.

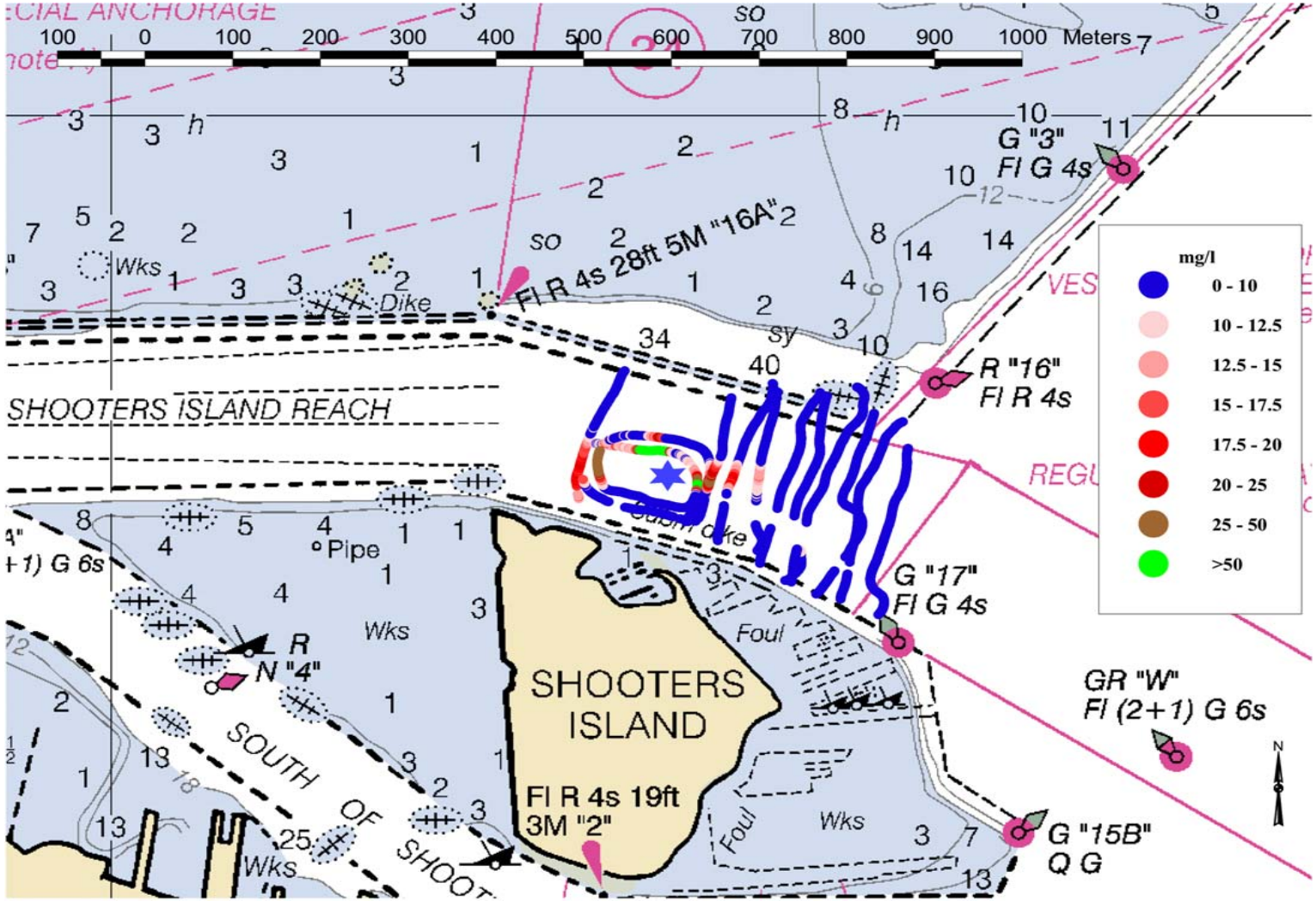

Figure 25. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 12 meters for Survey NJEB, completed during an ebbing tide on 19 June 2006.

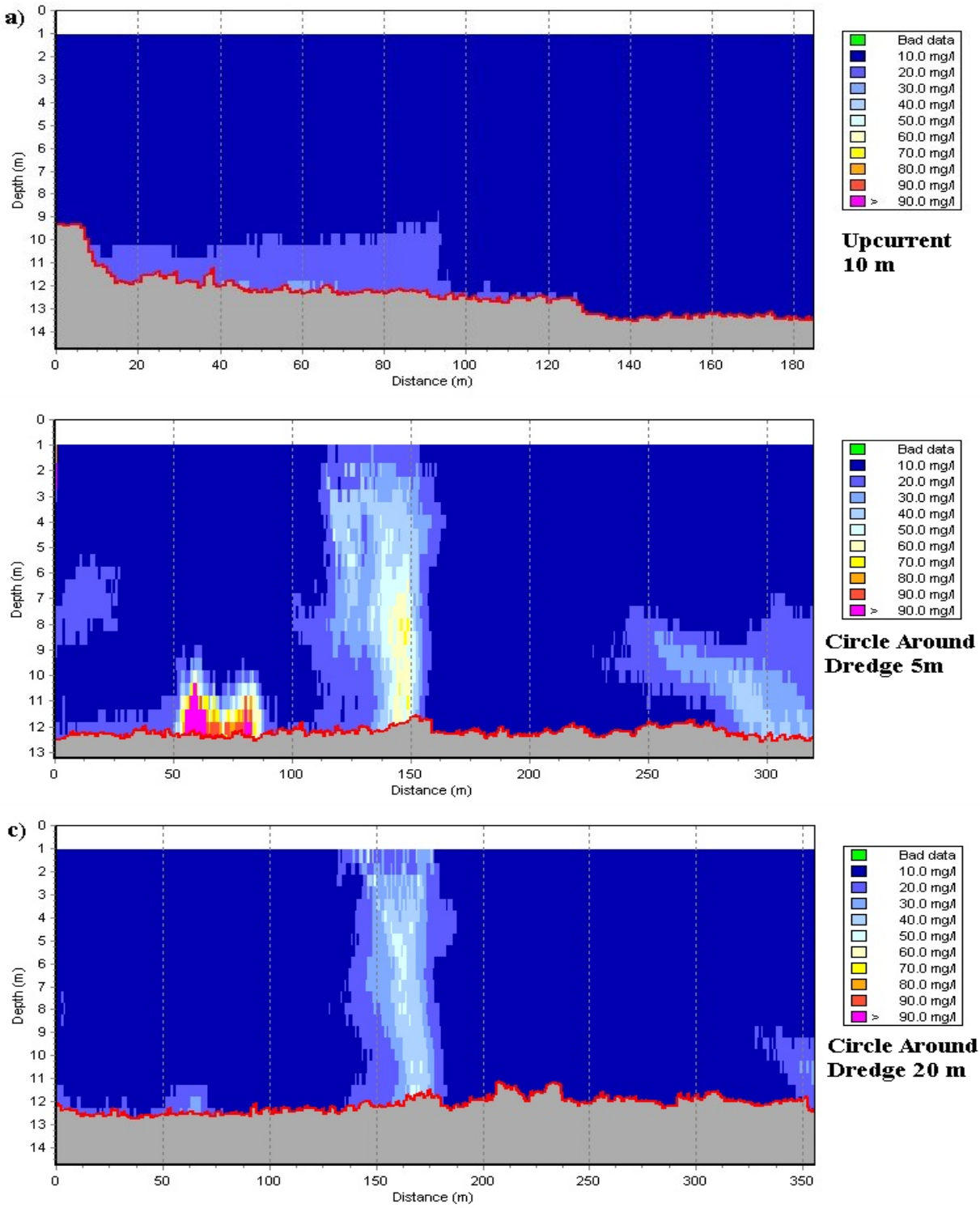

Figure 26. Vertical profiles (Survey NJEB) of TSS concentration across Shooters Island Reach during an ebbing tide, 19 June 2006.

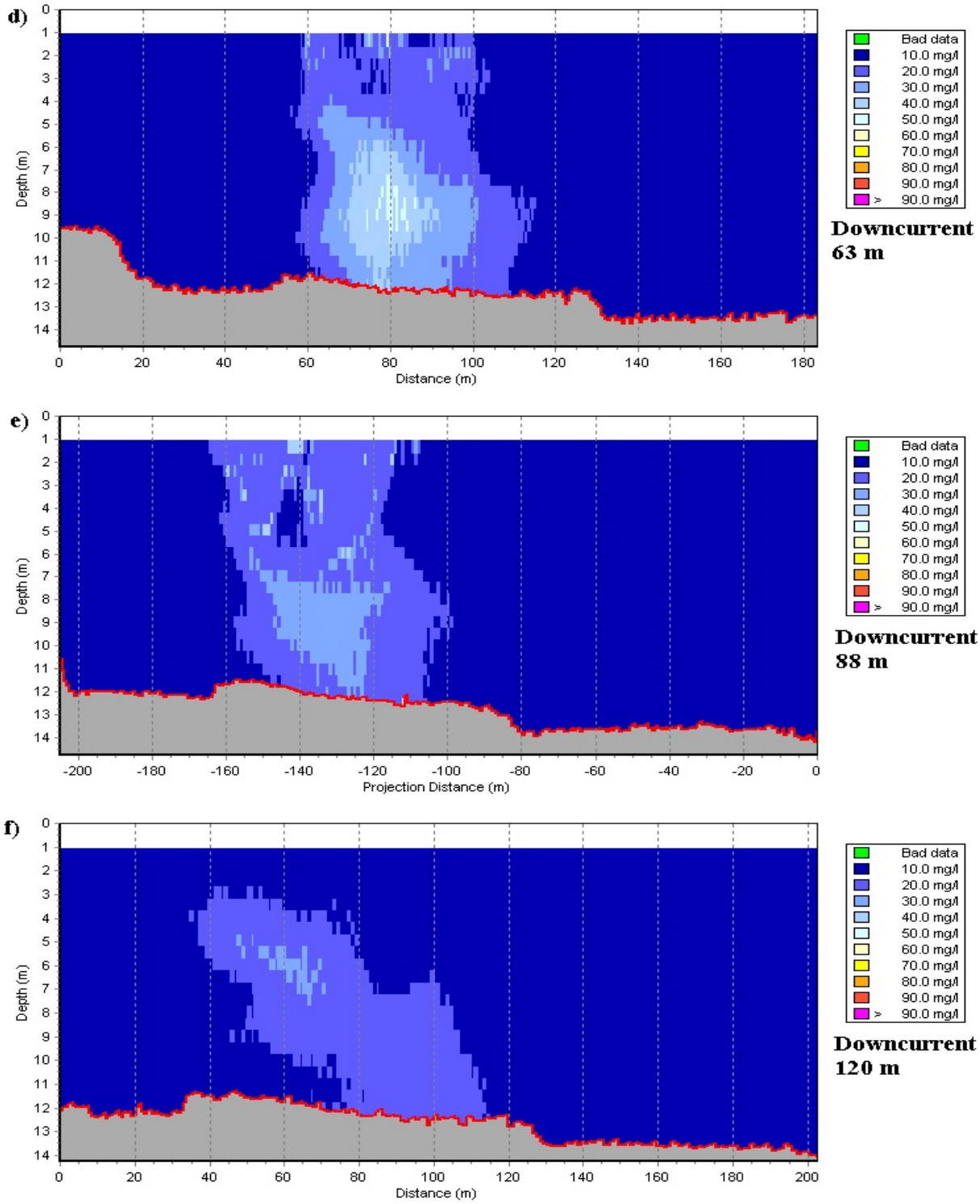

Figure 26 (cont.). Vertical profiles (Survey NJEB) of TSS concentration across Shooters Island Reach during an ebbing tide, 19 June 2006.

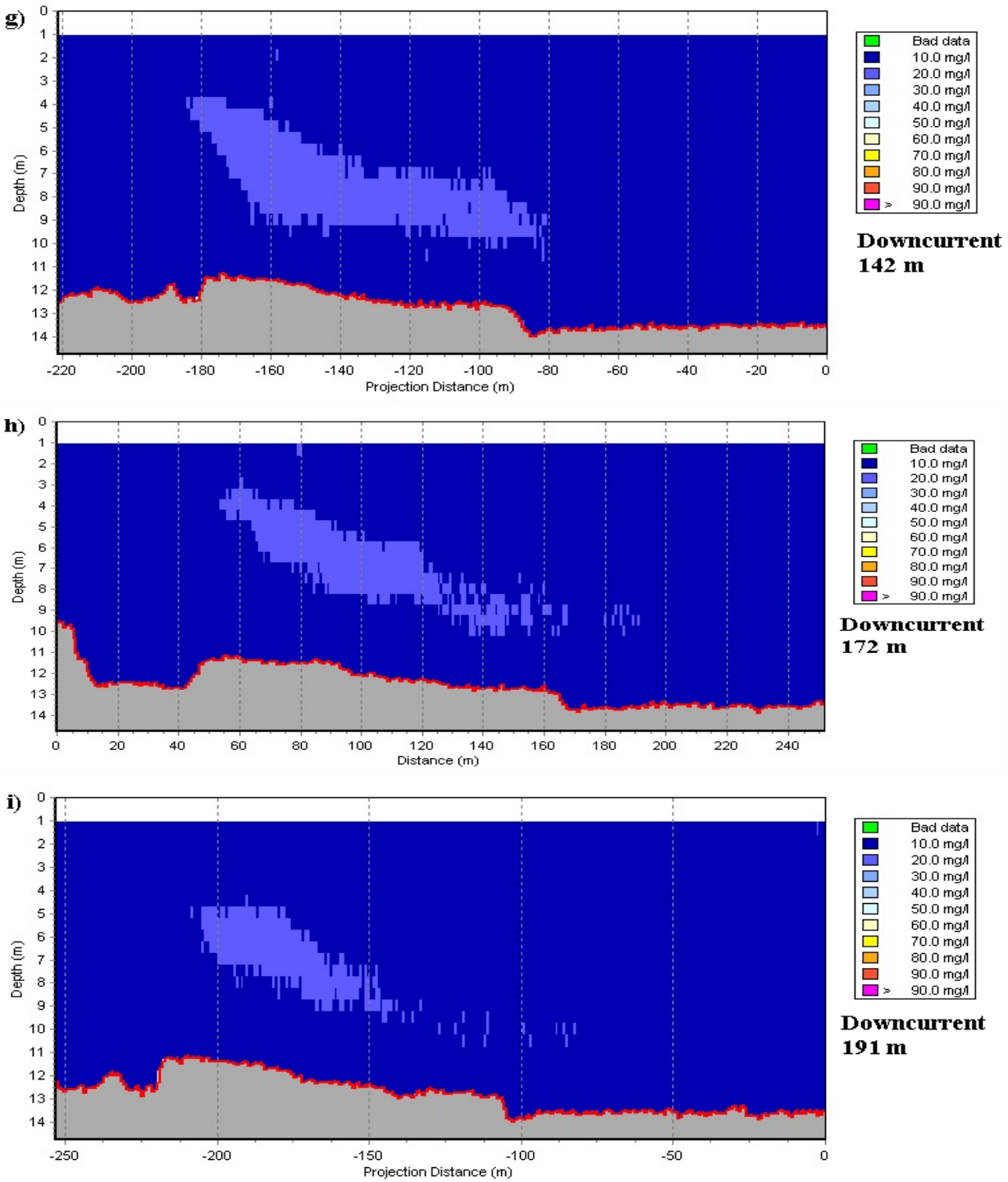

Figure 26 (cont.). Vertical profiles (Survey NJEB) of TSS concentration across Shooters Island Reach during an ebbing tide, 19 June 2006.

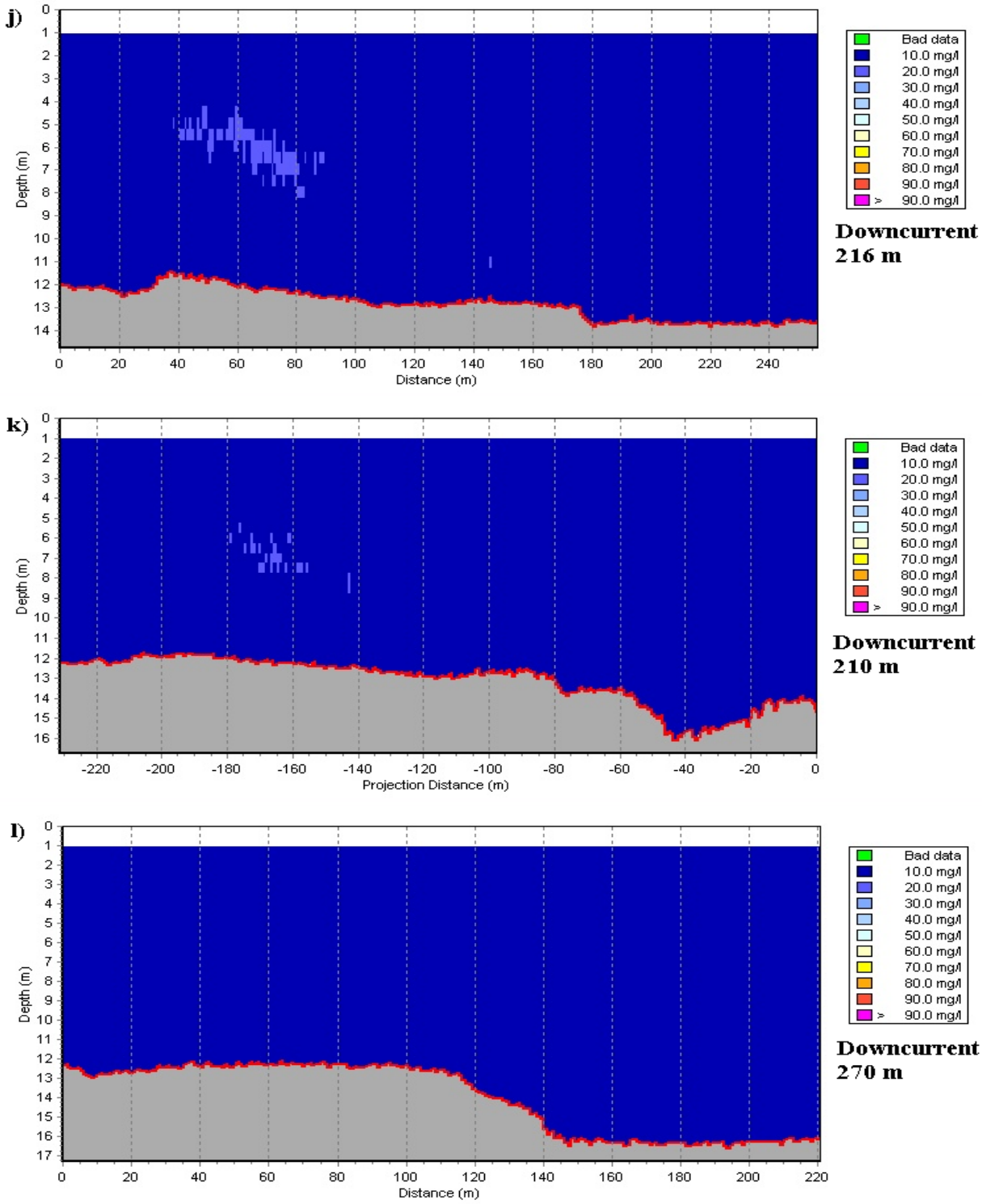

Figure 26 (cont.). Vertical profiles (Survey NJEB) of TSS concentration across Shooters Island Reach during an ebbing tide, 19 June 2006.

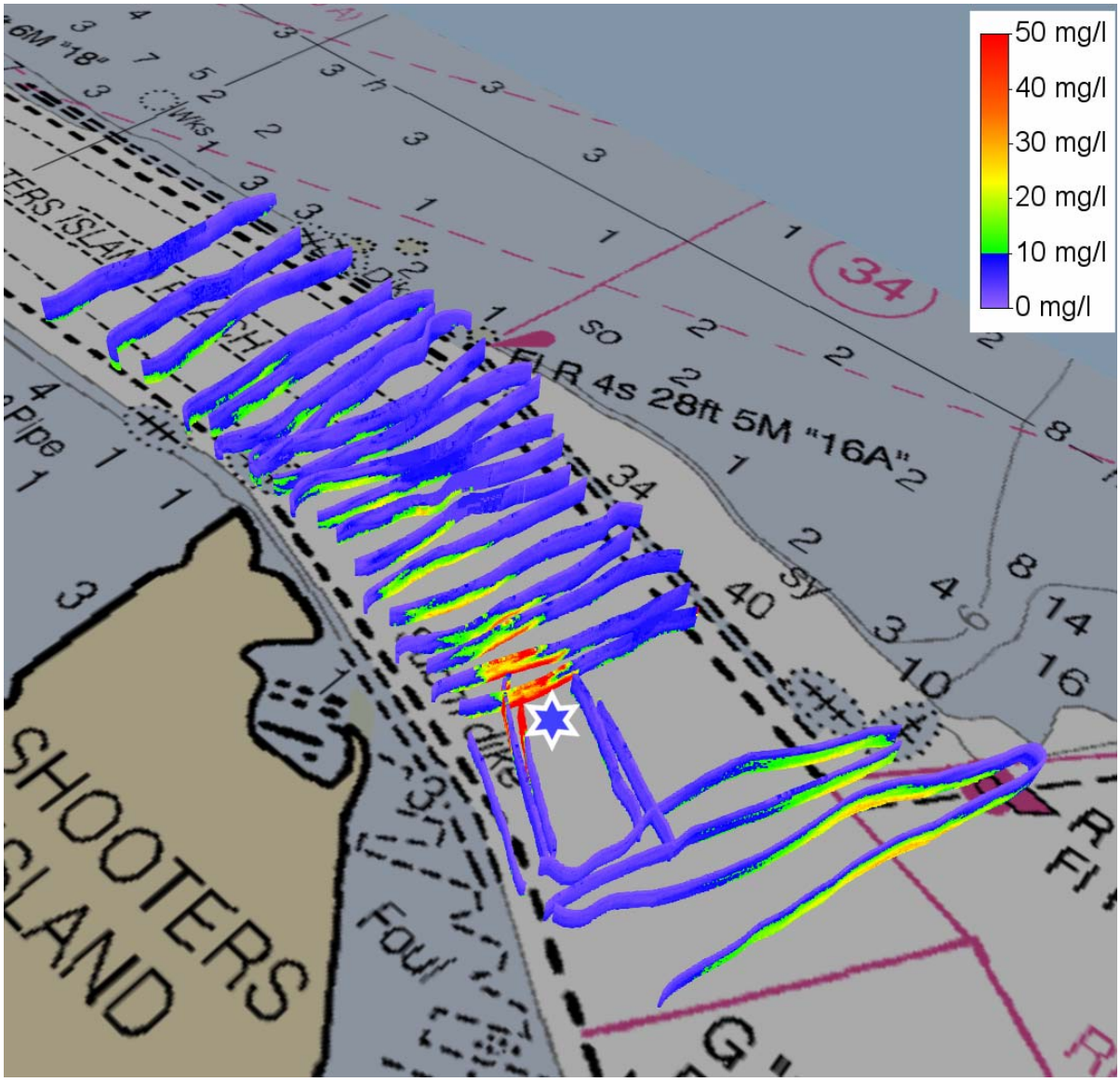

Figure 27. TSS concentrations for Survey NJFD plotted in x, y z coordinates. (Dredge location indicated by star).

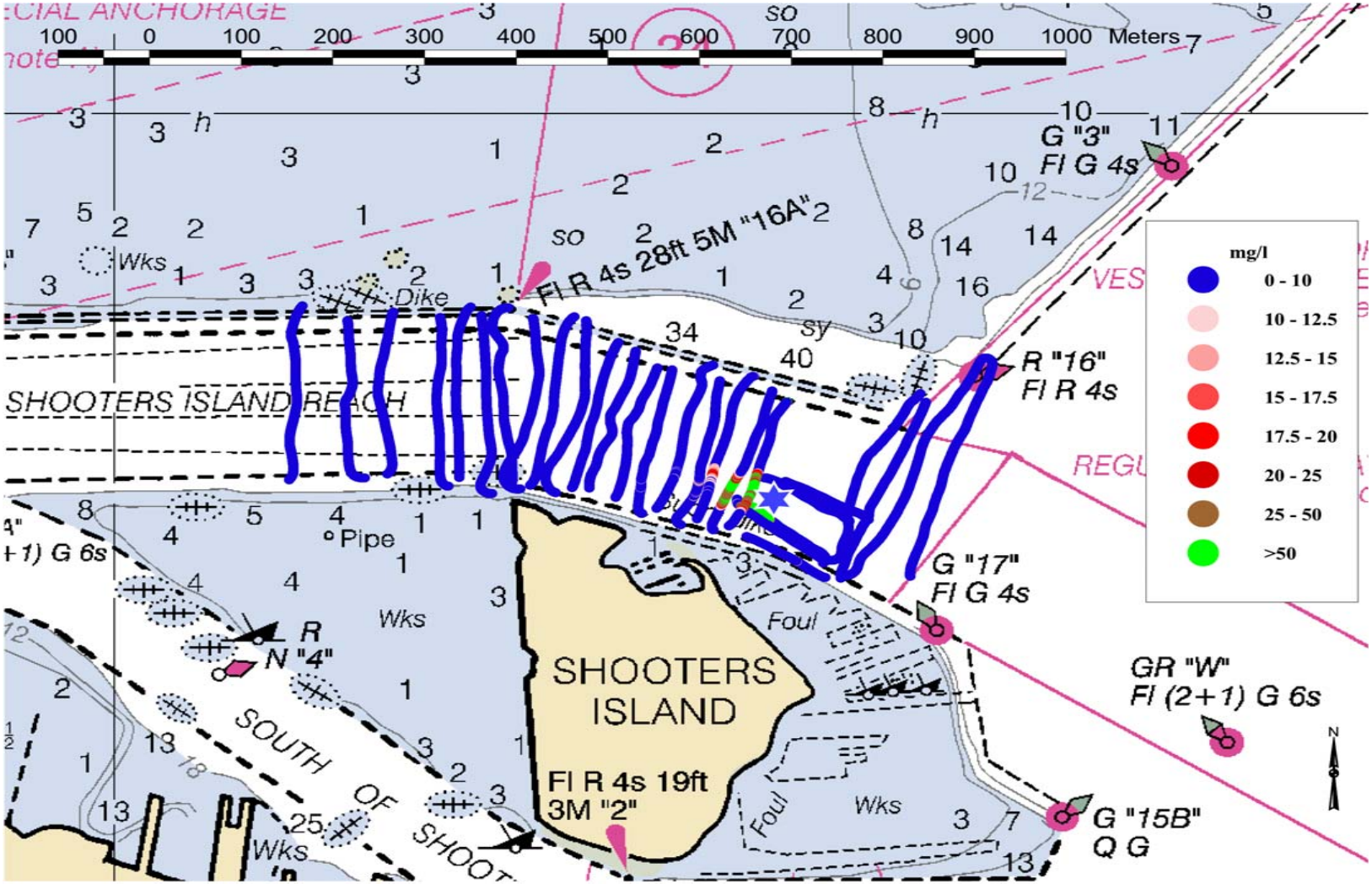

Figure 28. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 2 meters for Survey NJFD, completed during a flooding tide on 20 June 2006.

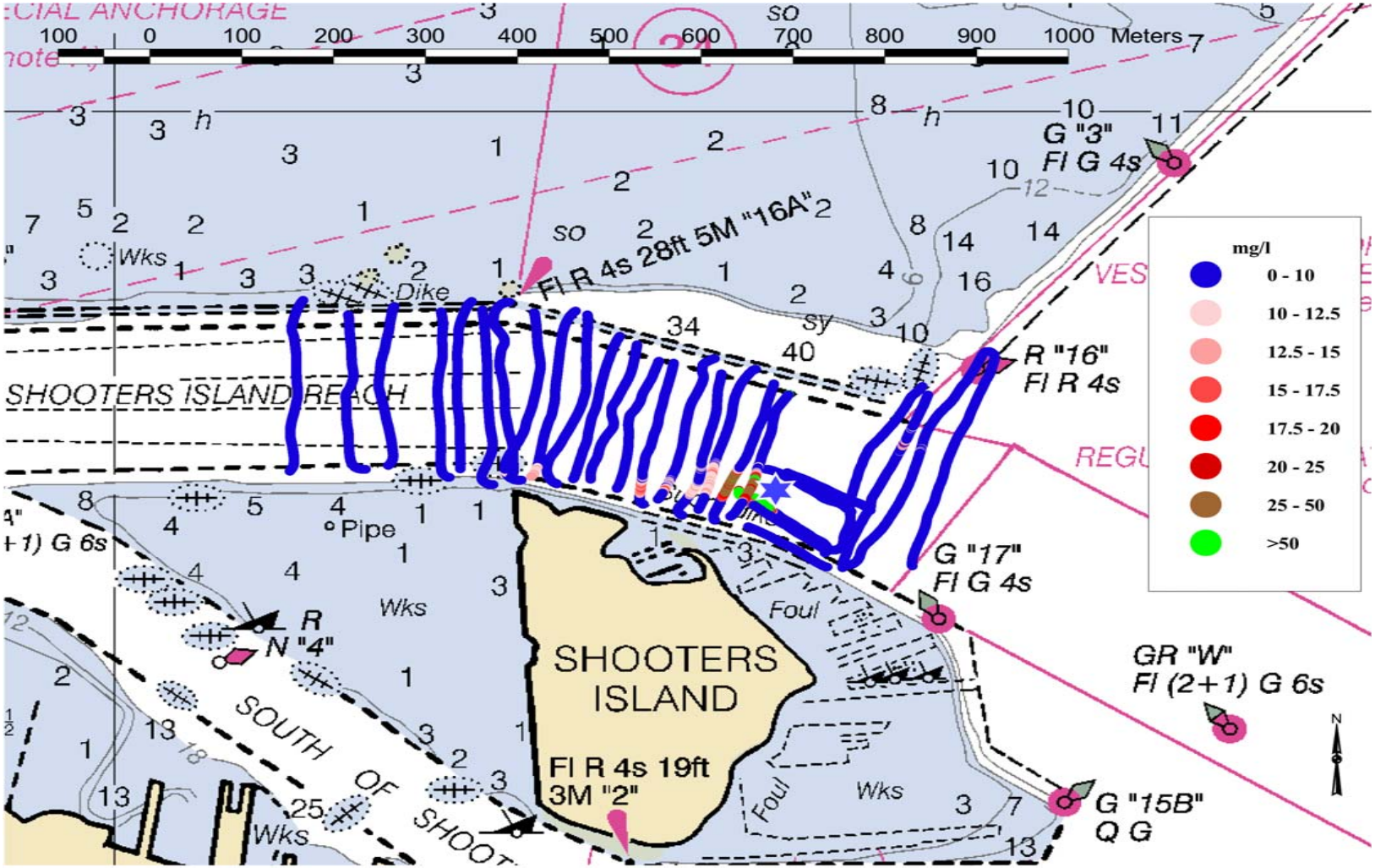

Figure 29. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 4 meters for Survey NJFD, completed during a flooding tide on 20 June 2006.

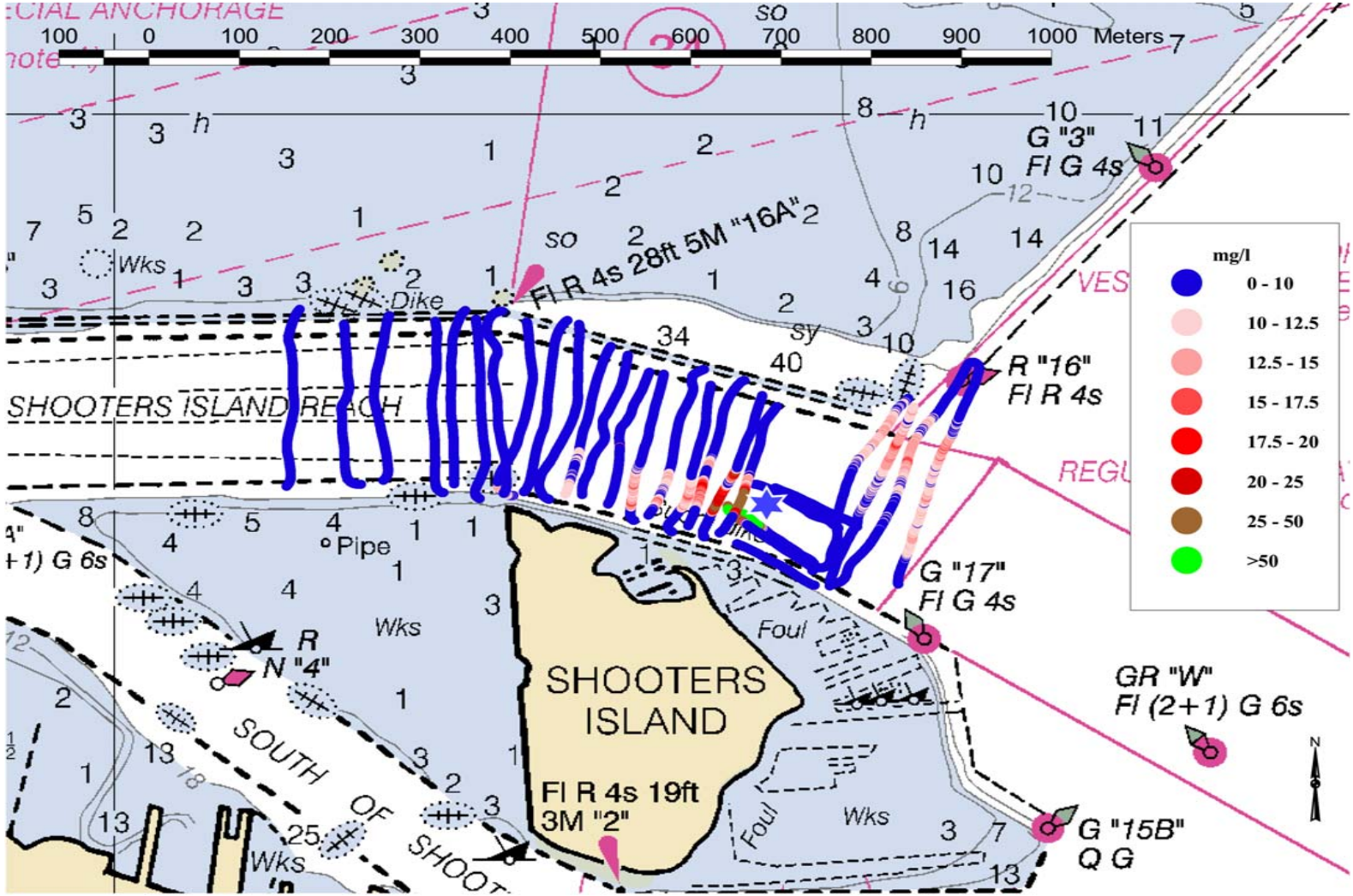

Figure 30. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 6 meters for Survey NJFD, completed during a flooding tide on 20 June 2006.

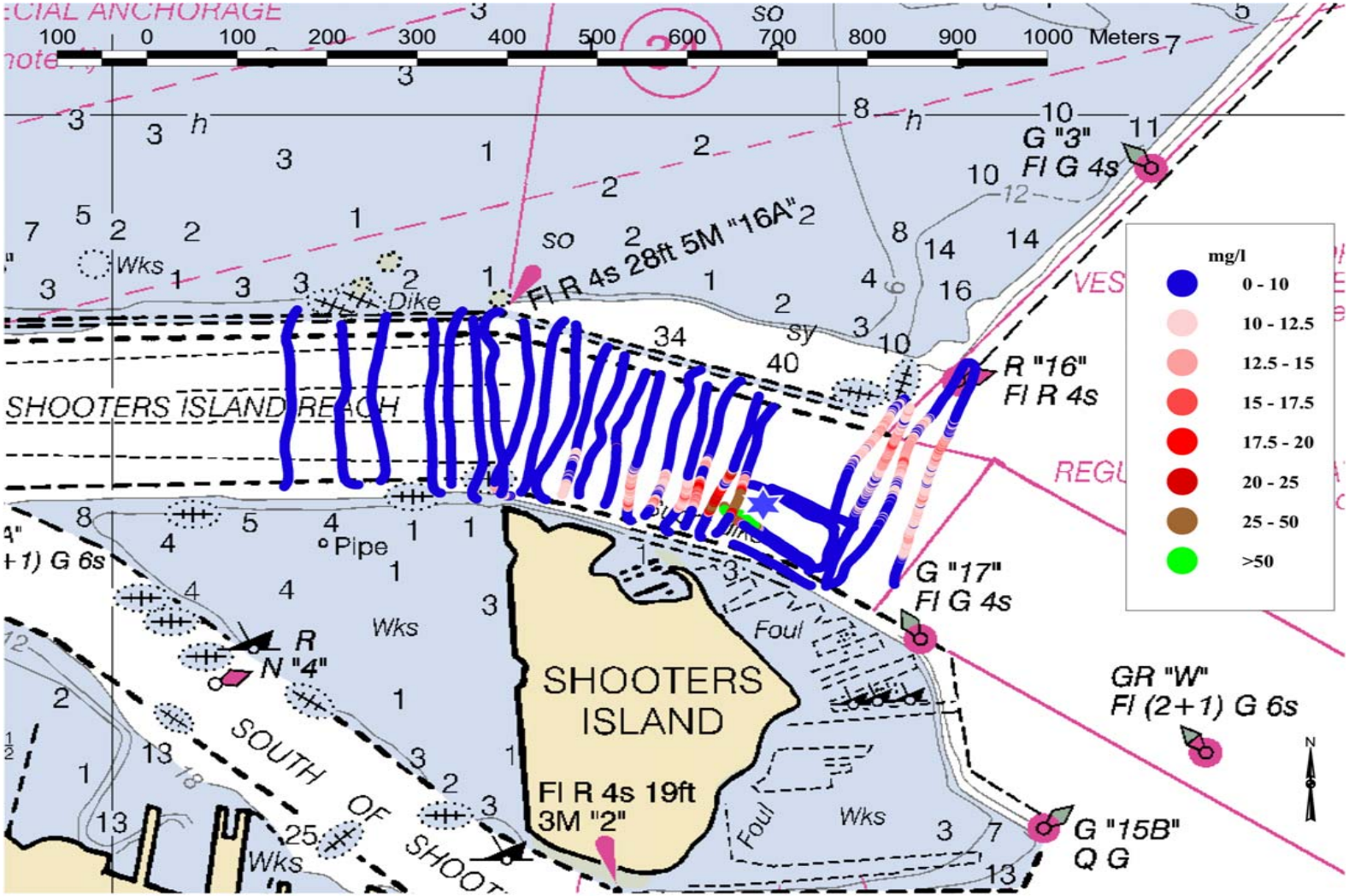

Figure 31. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 8 meters for Survey NJFD, completed during a flooding tide on 20 June 2006.

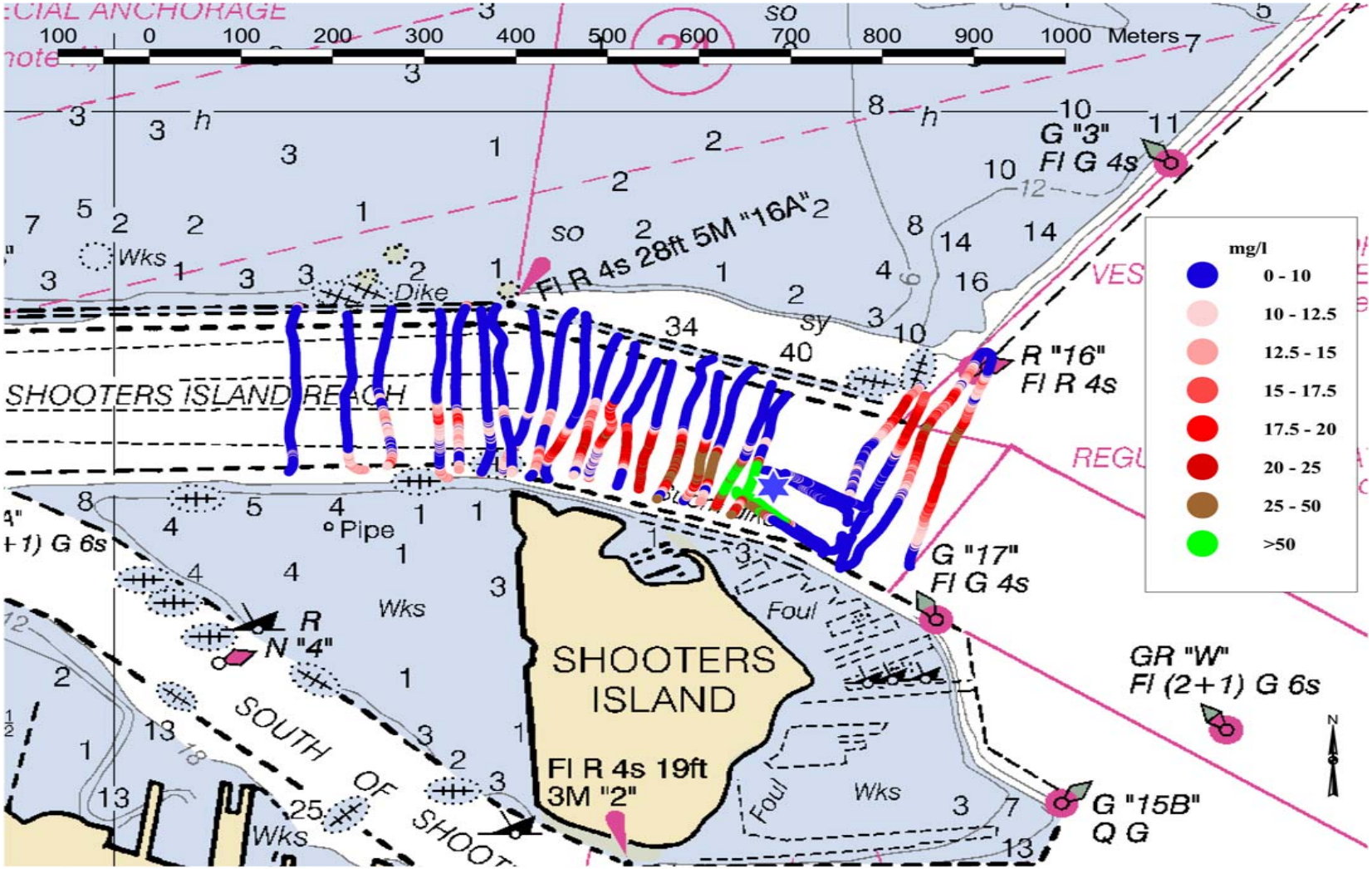

Figure 32. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 10 meters for Survey NJFD, completed during a flooding tide on 20 June 2006.

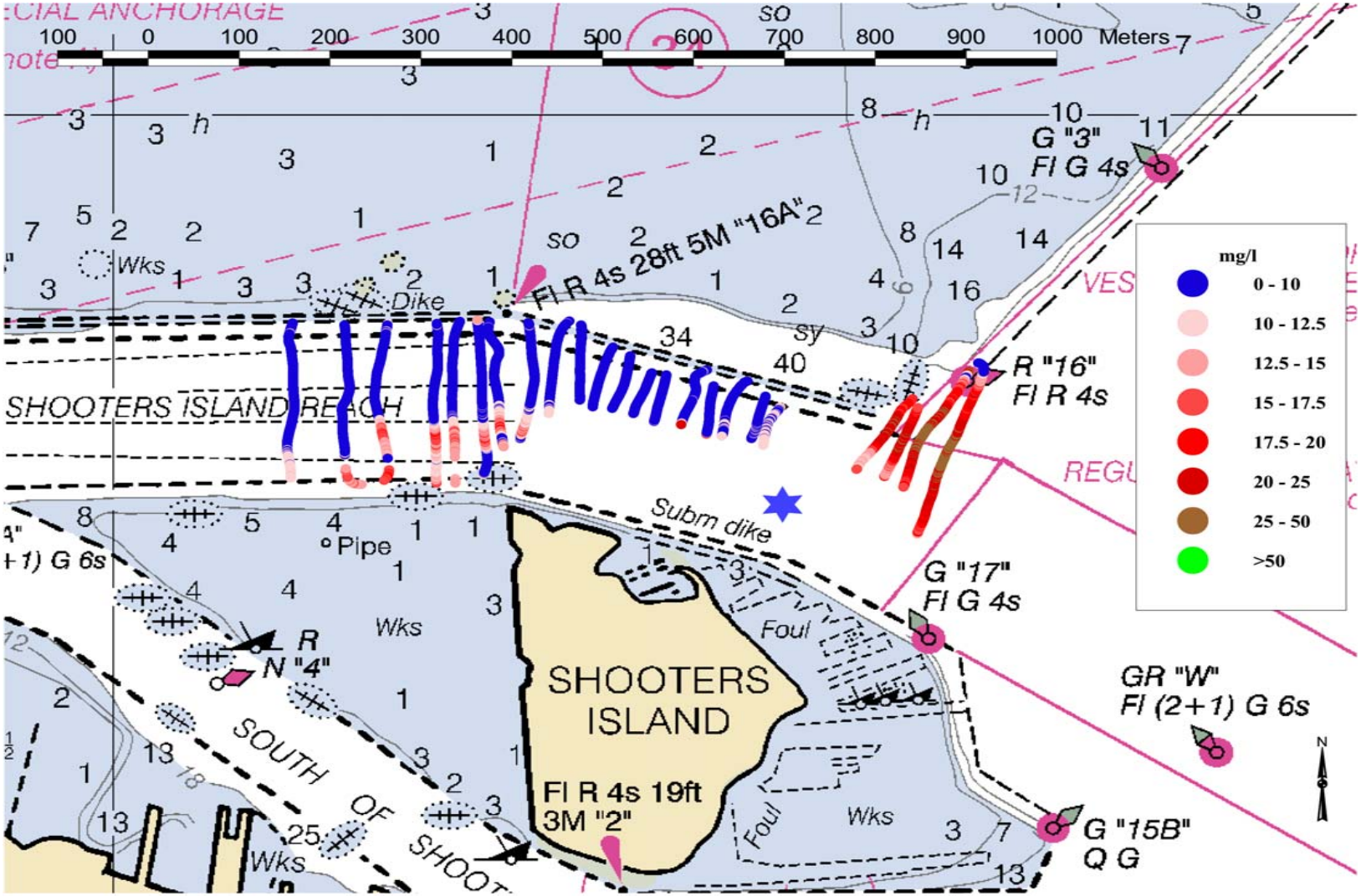

Figure 33. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 12 meters for Survey NJFD, completed during a flooding tide on 20 June 2006.

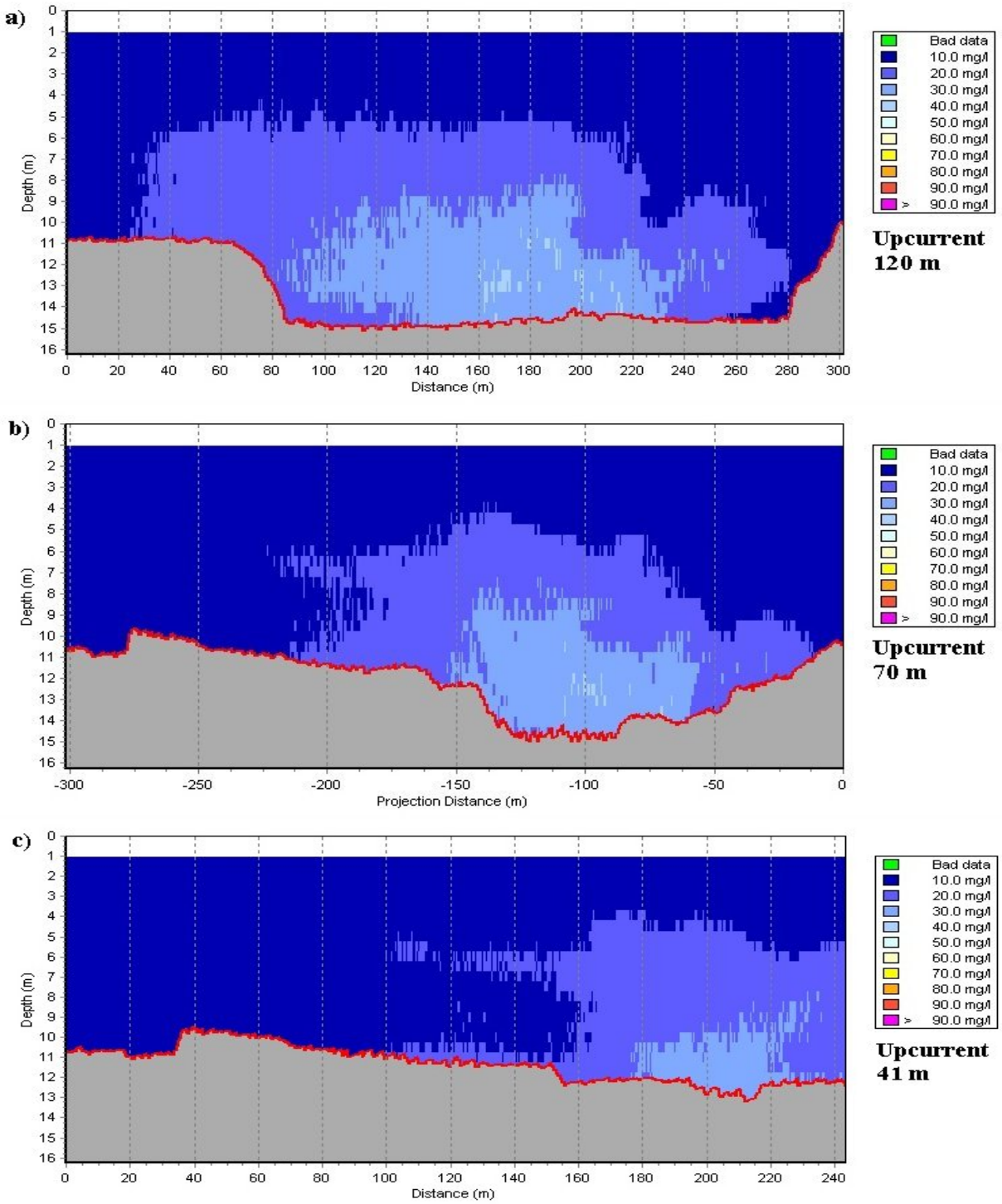

Figure 34. Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

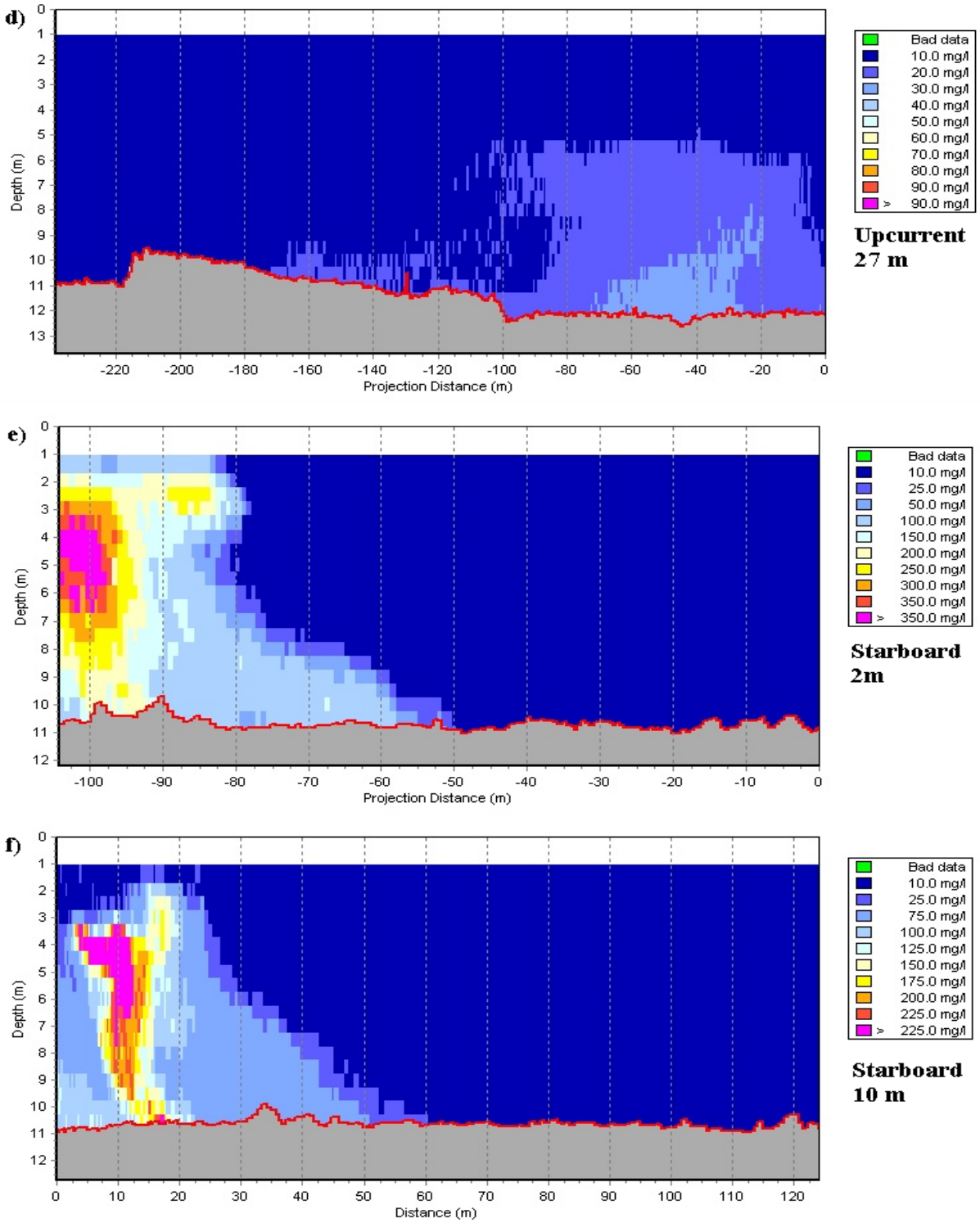

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

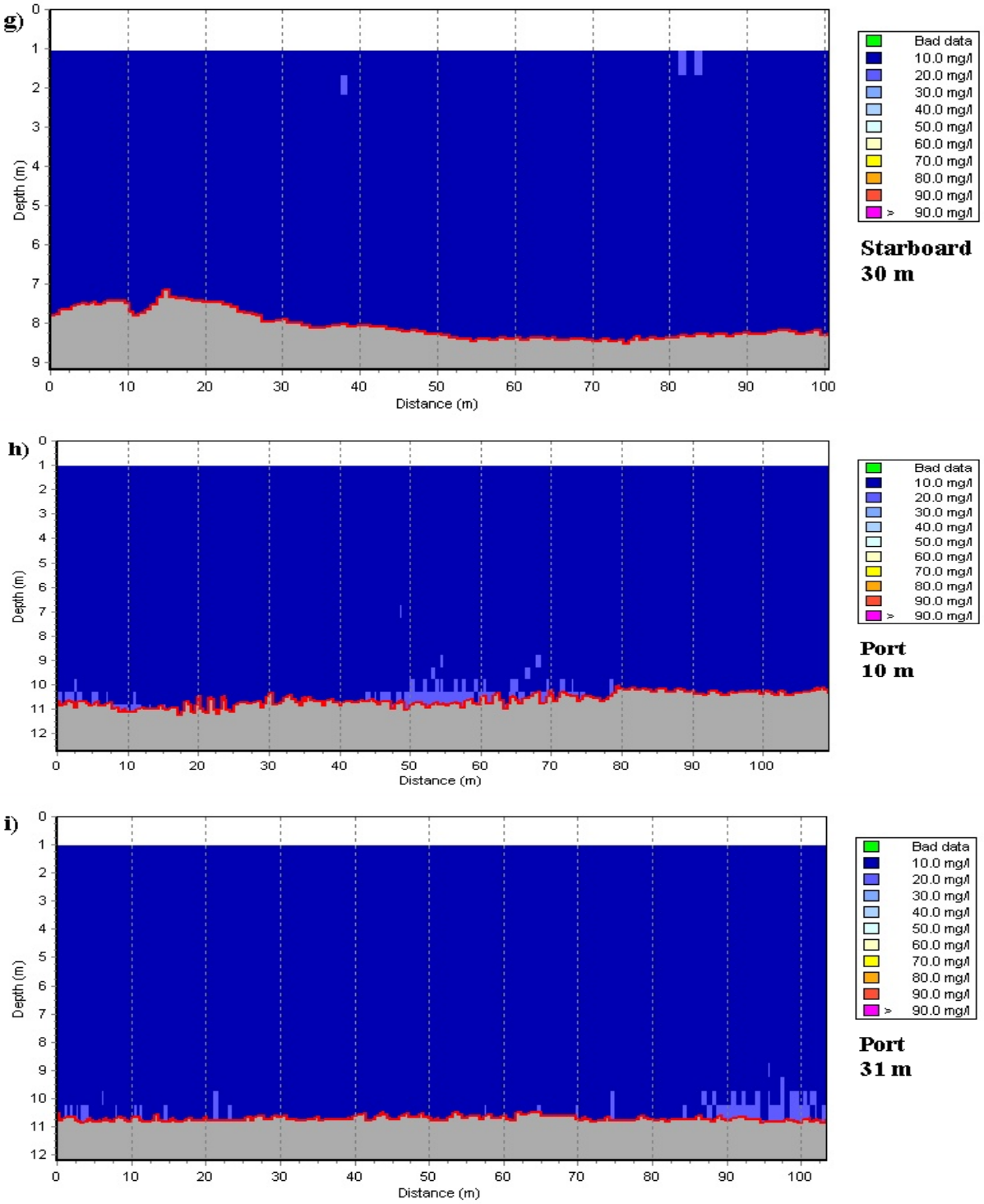

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

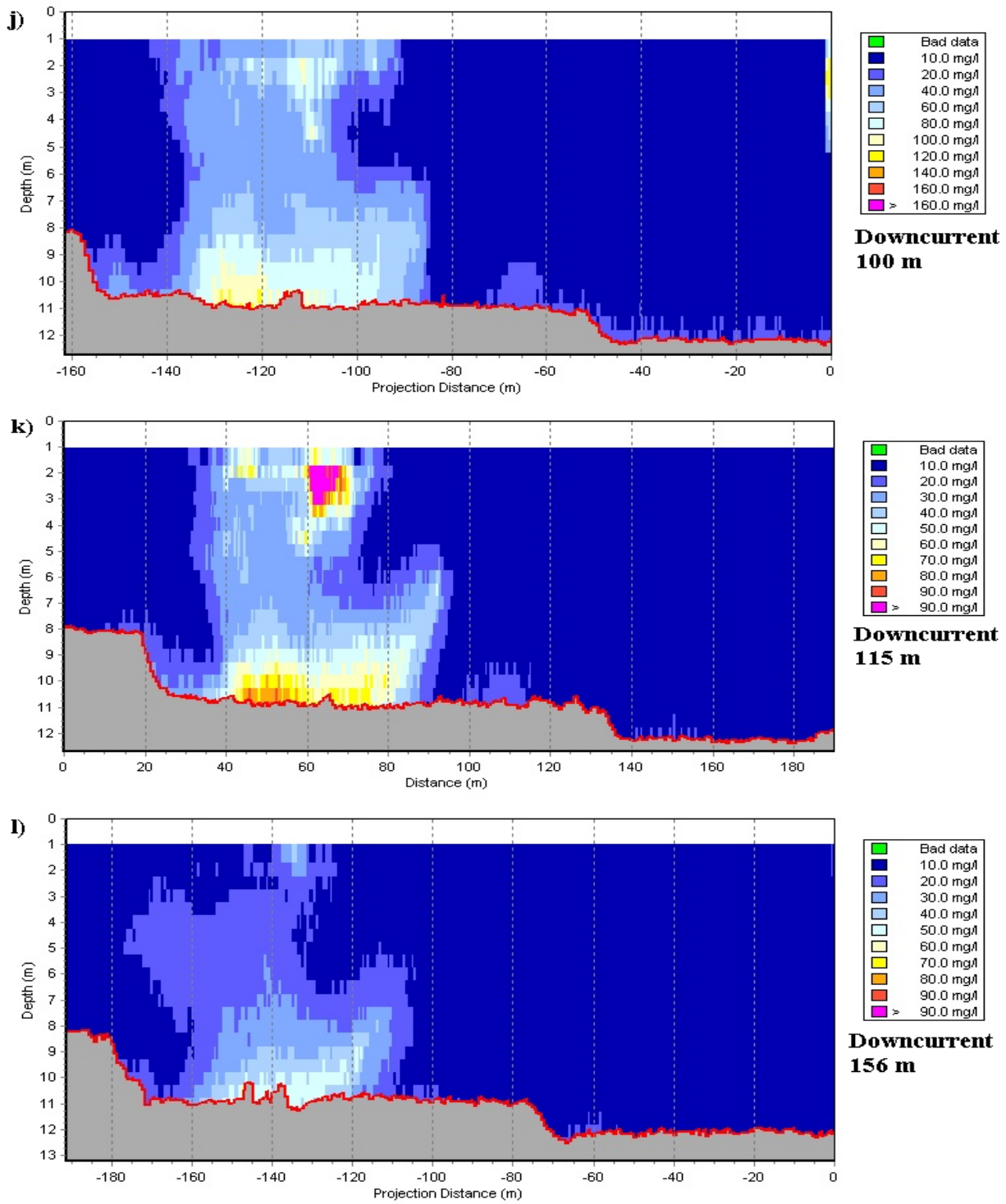

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

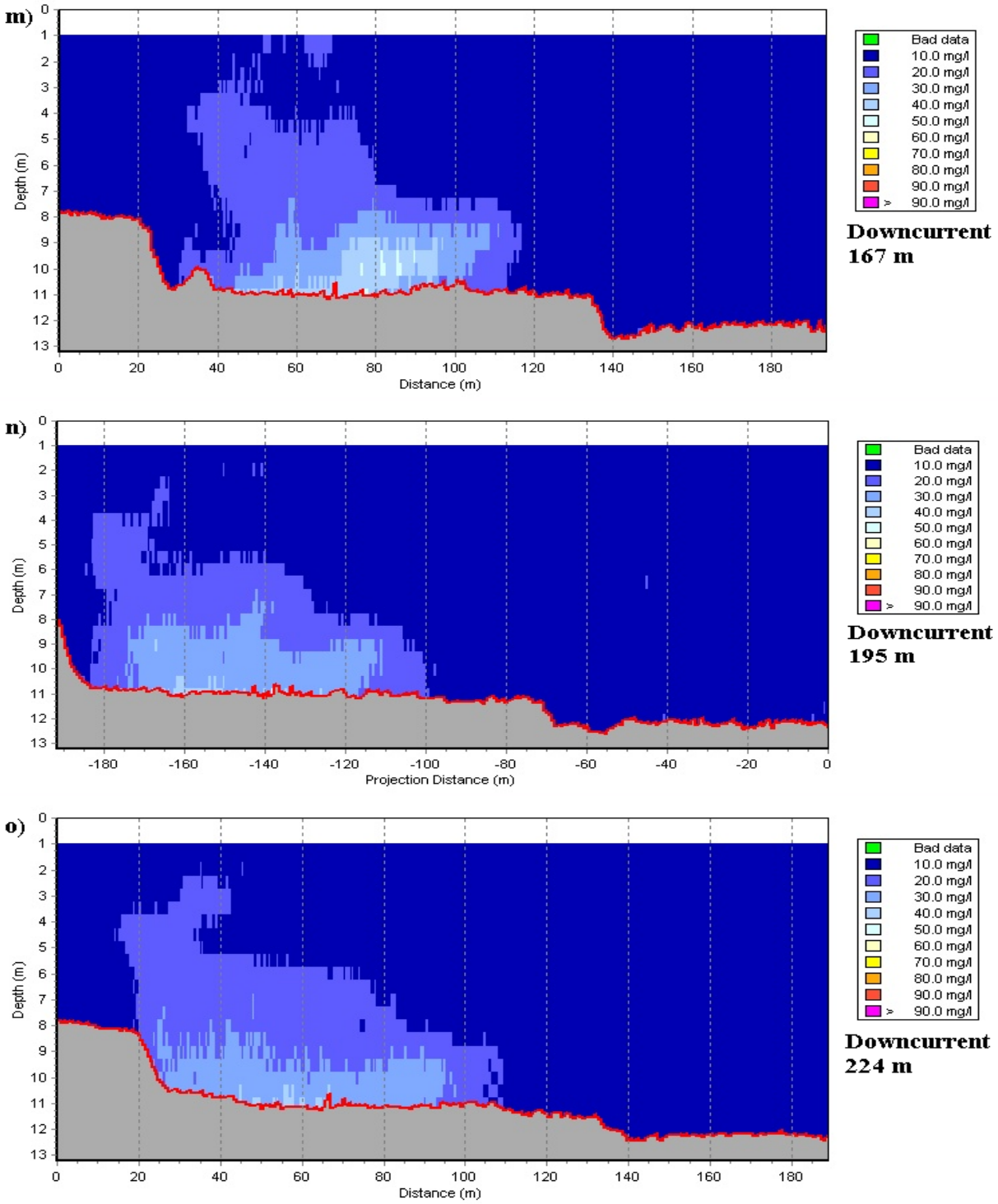

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

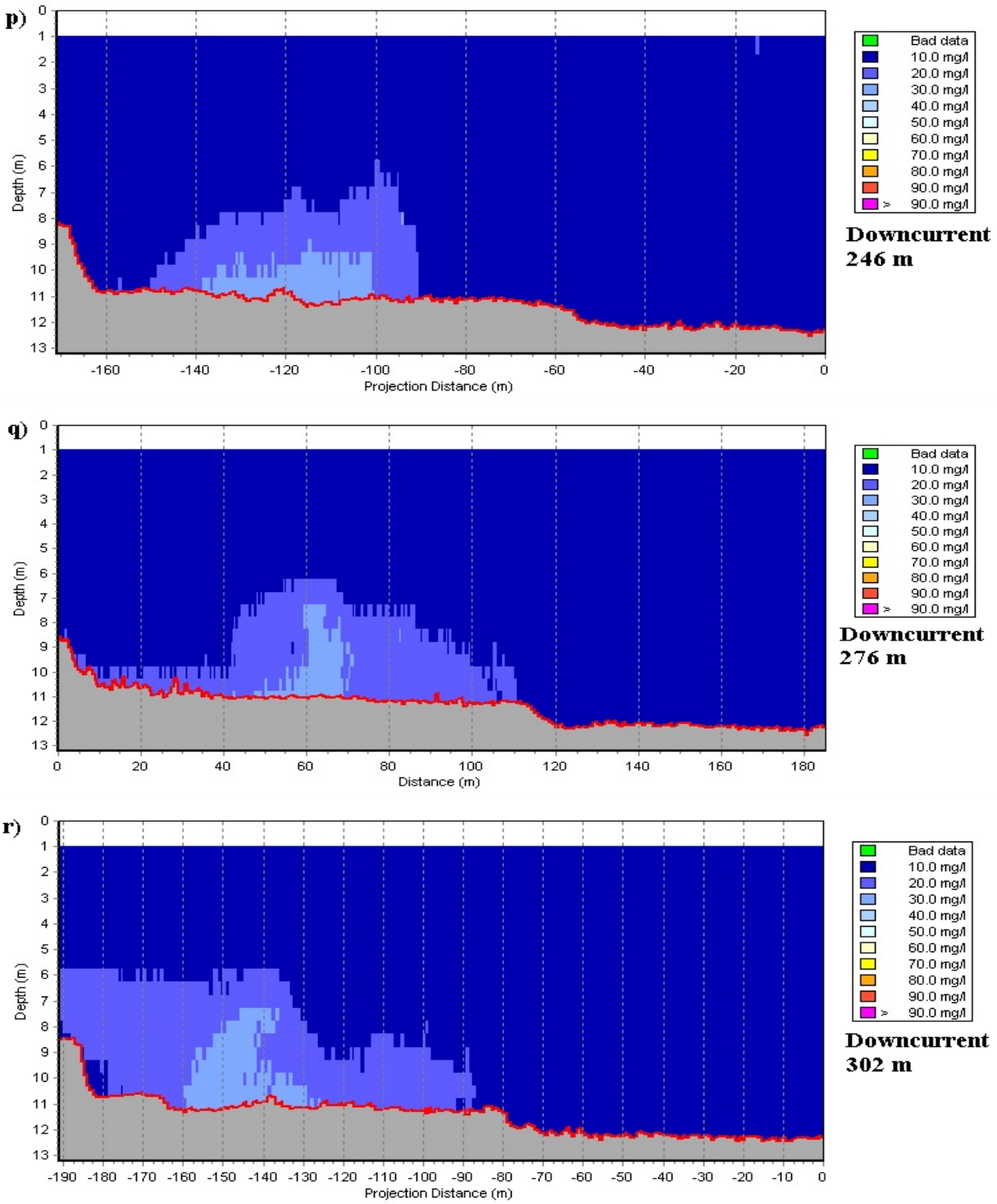

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

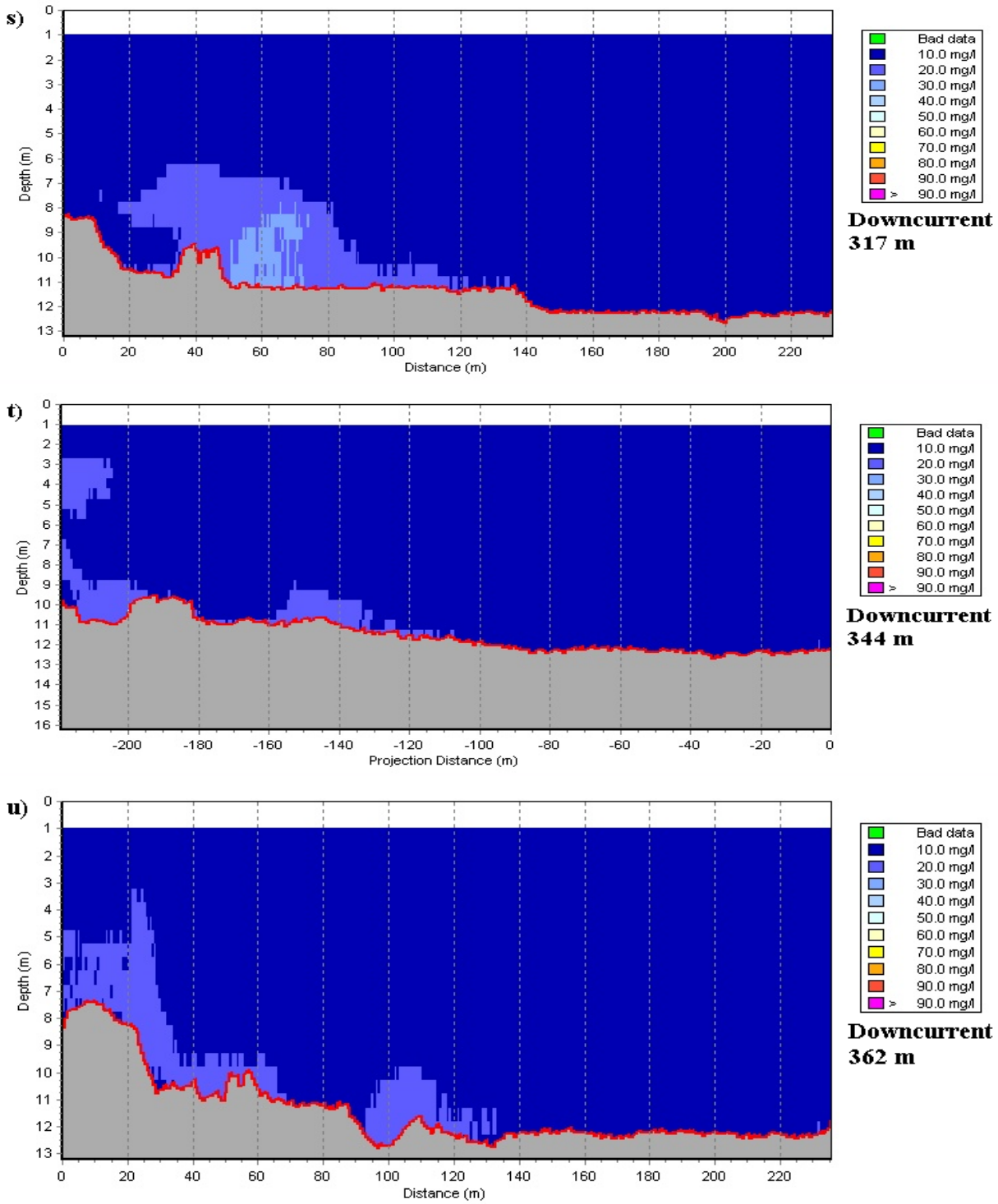

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

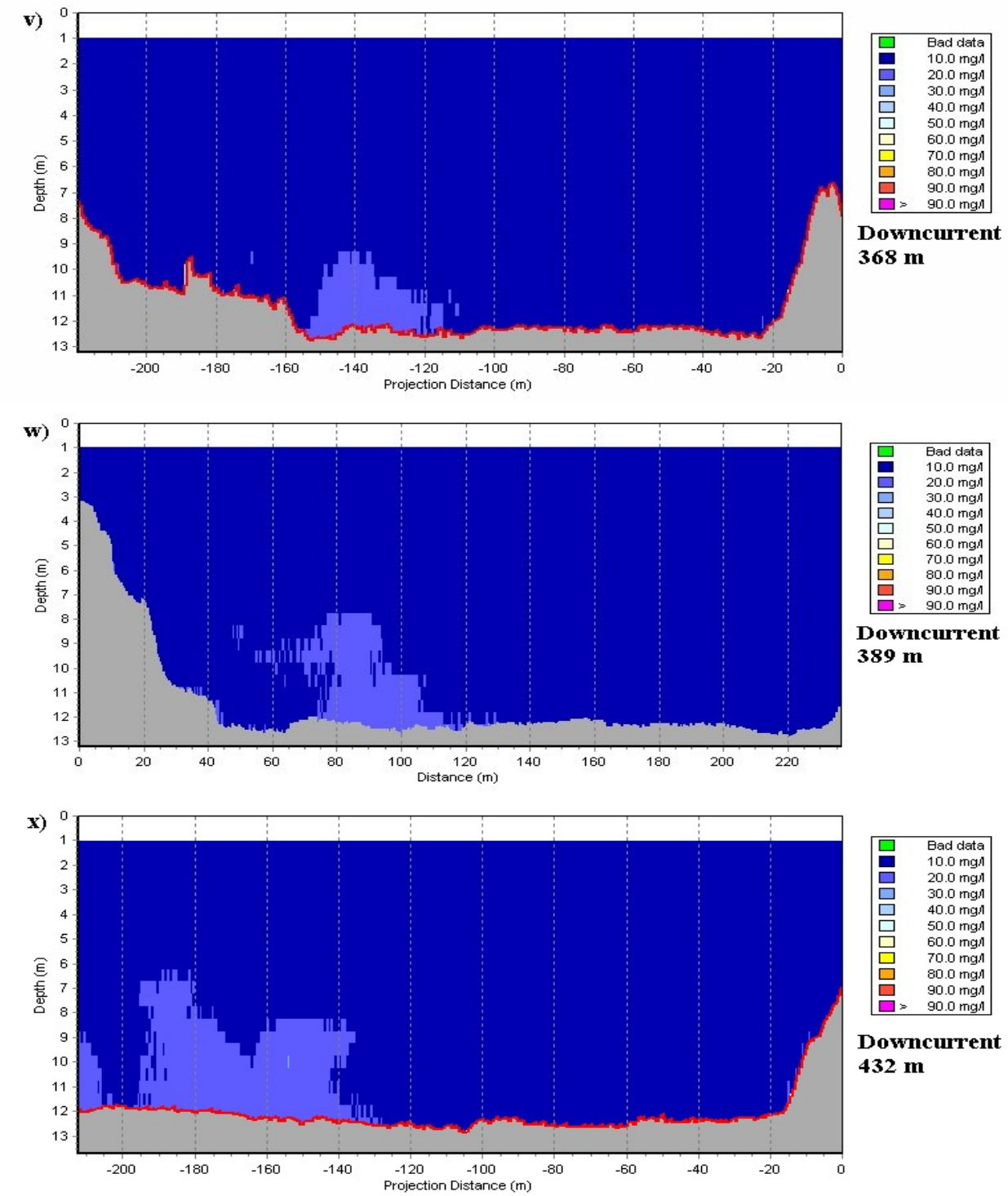

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

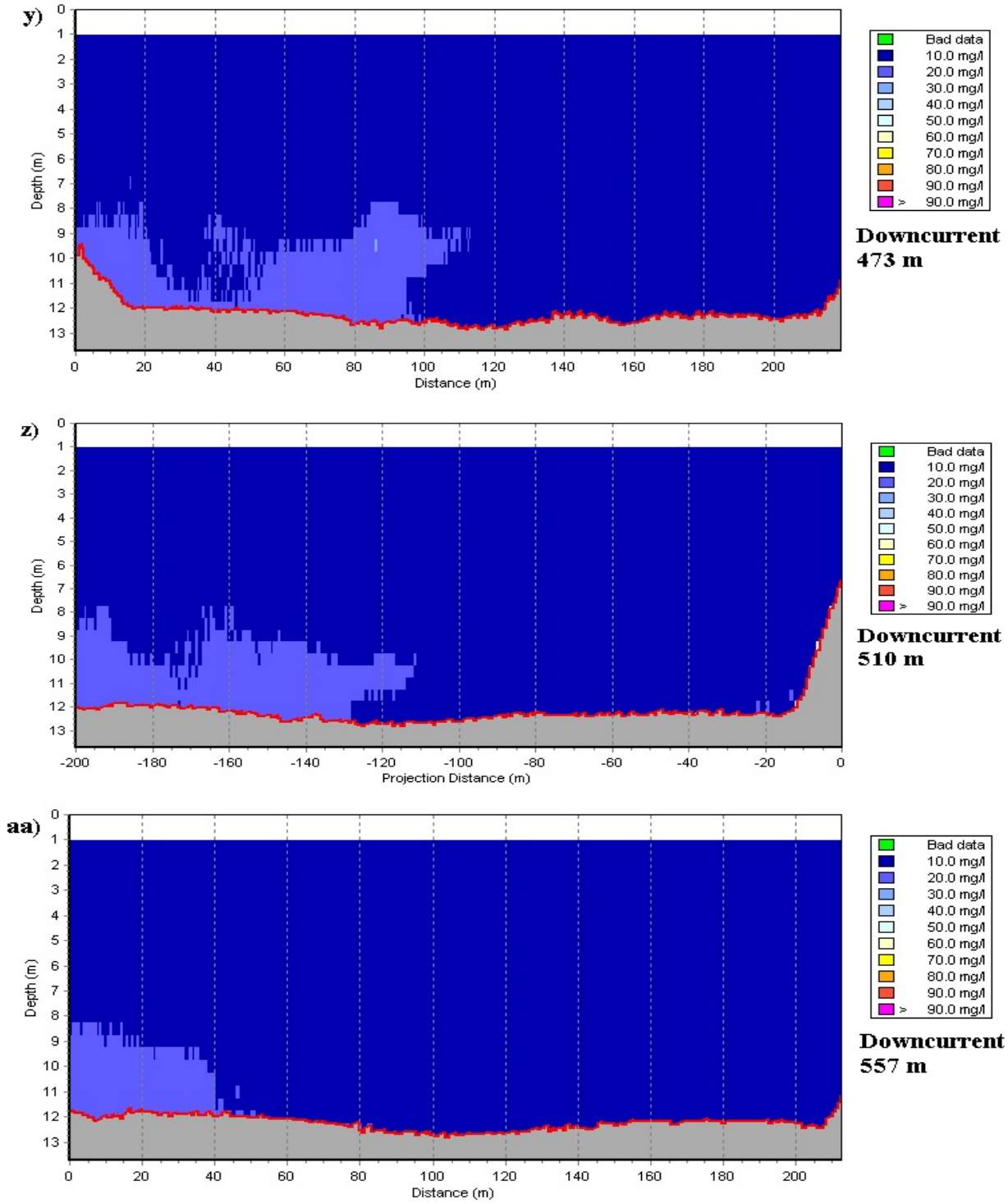

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

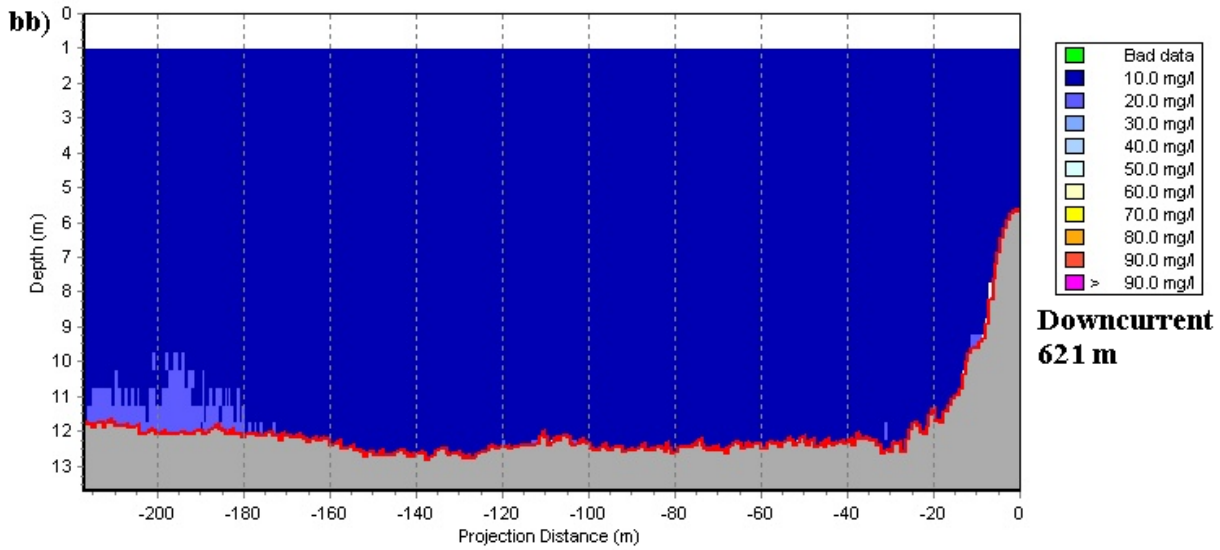

Figure 34 (cont.). Vertical profiles (Survey NJFD) of TSS concentrations across Shooters Island Reach during a flooding tide, 20 June 2006. Distances from the source are given for each transect in the legend at the right of the graph. Note that three vertical profiles: "E" (10-350 mg/l), "F" (10-225 mg/l) and "J" (10-160 mg/l) have different concentration scales when compared to all others in the series (10-90 mg/l).

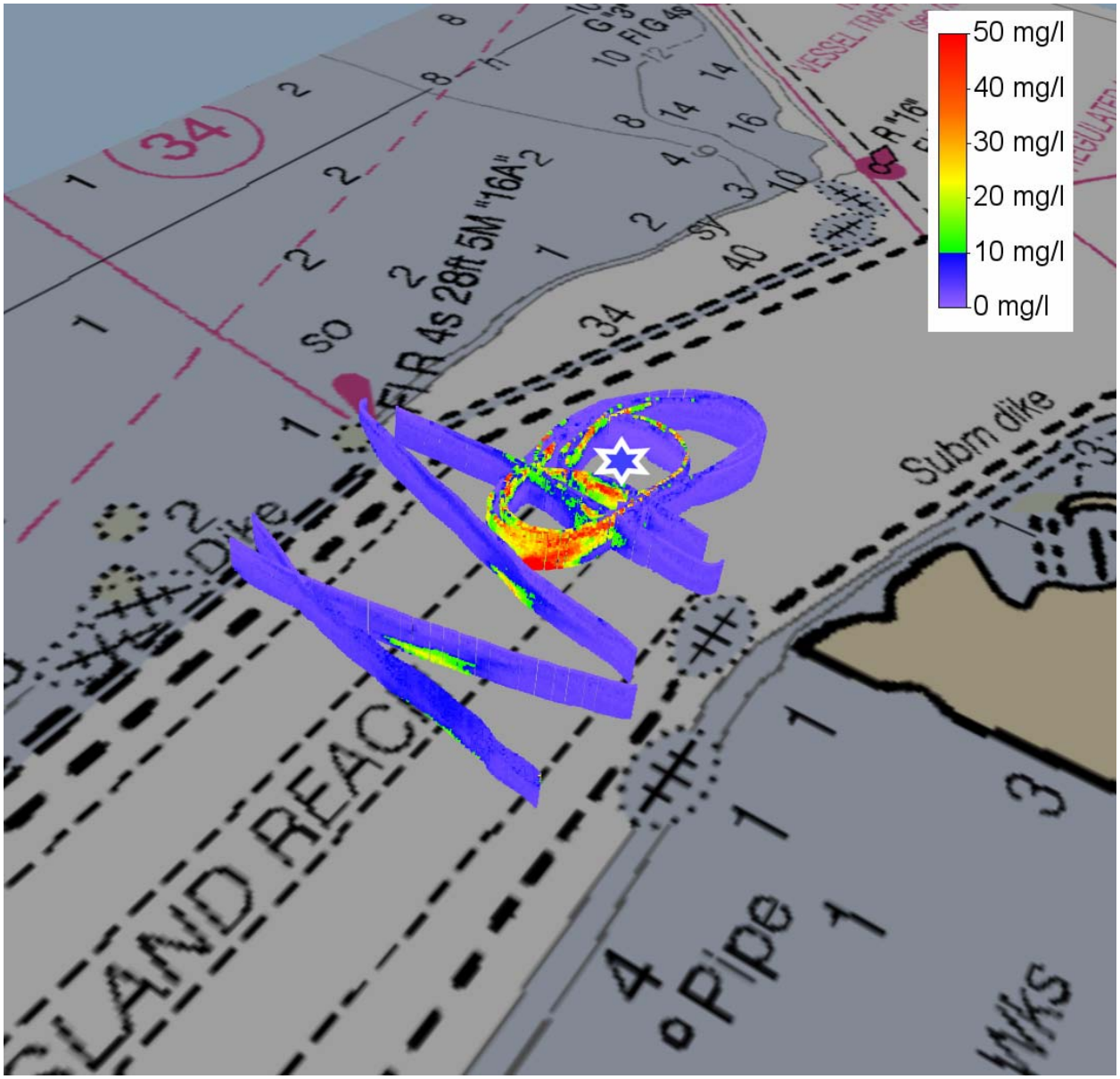

Figure 35. TSS concentrations for Survey NJAB plotted as to their x, y and z coordinates. (Note: dredge position indicated by star.)

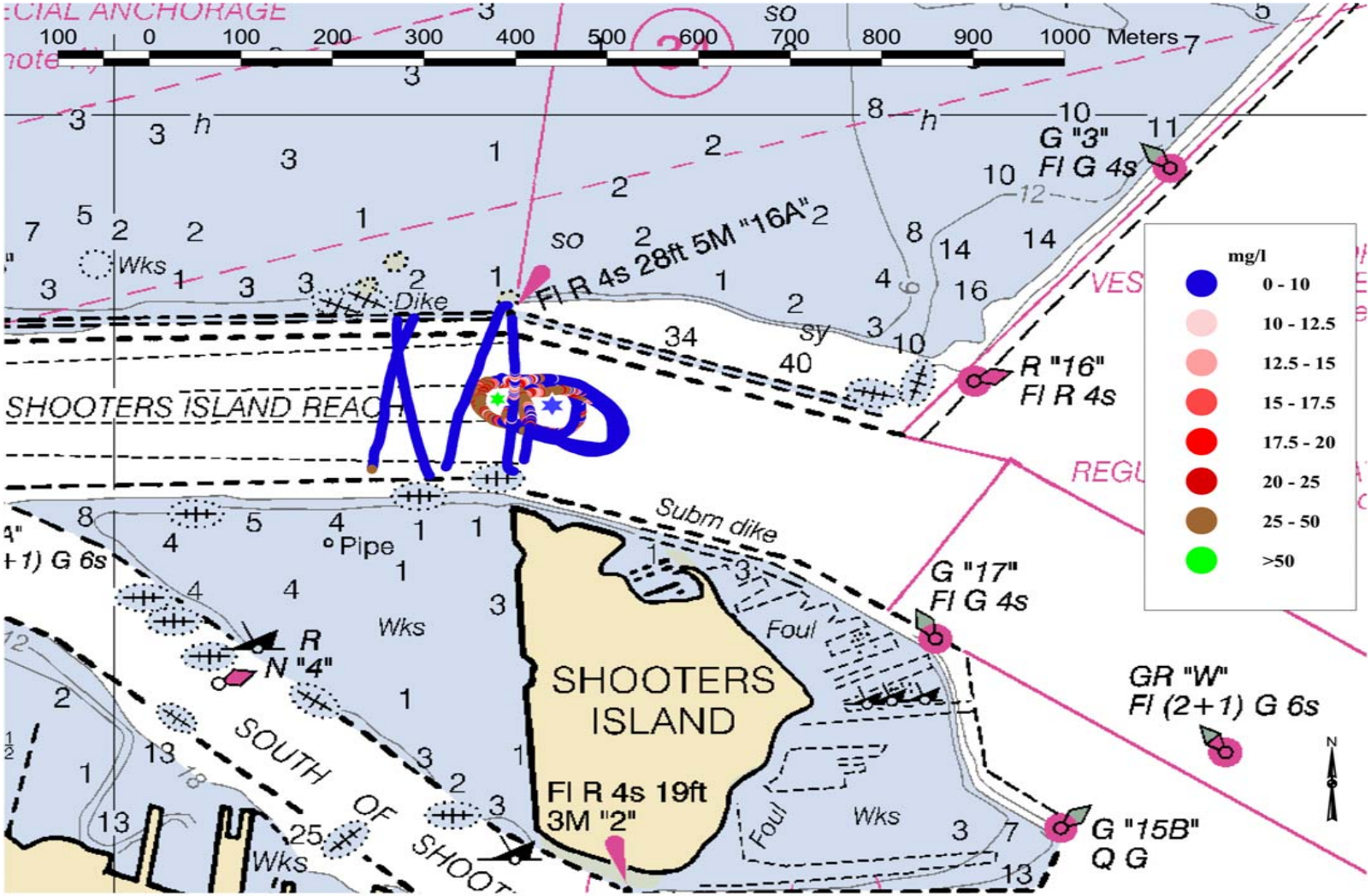

Figure 36. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 2 meters for Survey NJAB, completed during a flooding tide on 22 June 2006. Note: Initial dredge location indicated by a green star, and final position indicated by a blue star, as in following figures.

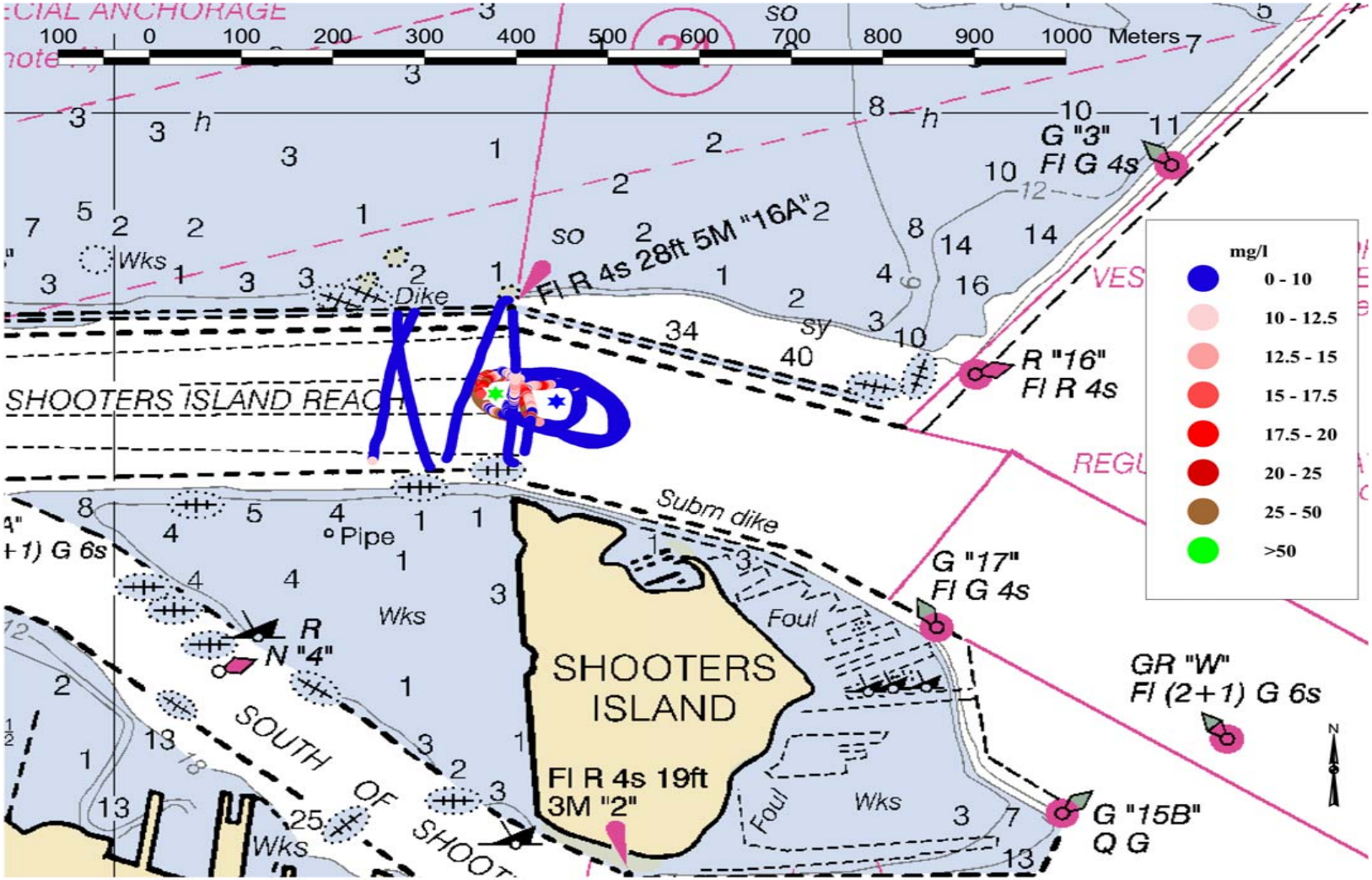

Figure 37. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 4 meters for Survey NJAB, completed during a flooding tide on 22 June 2006.

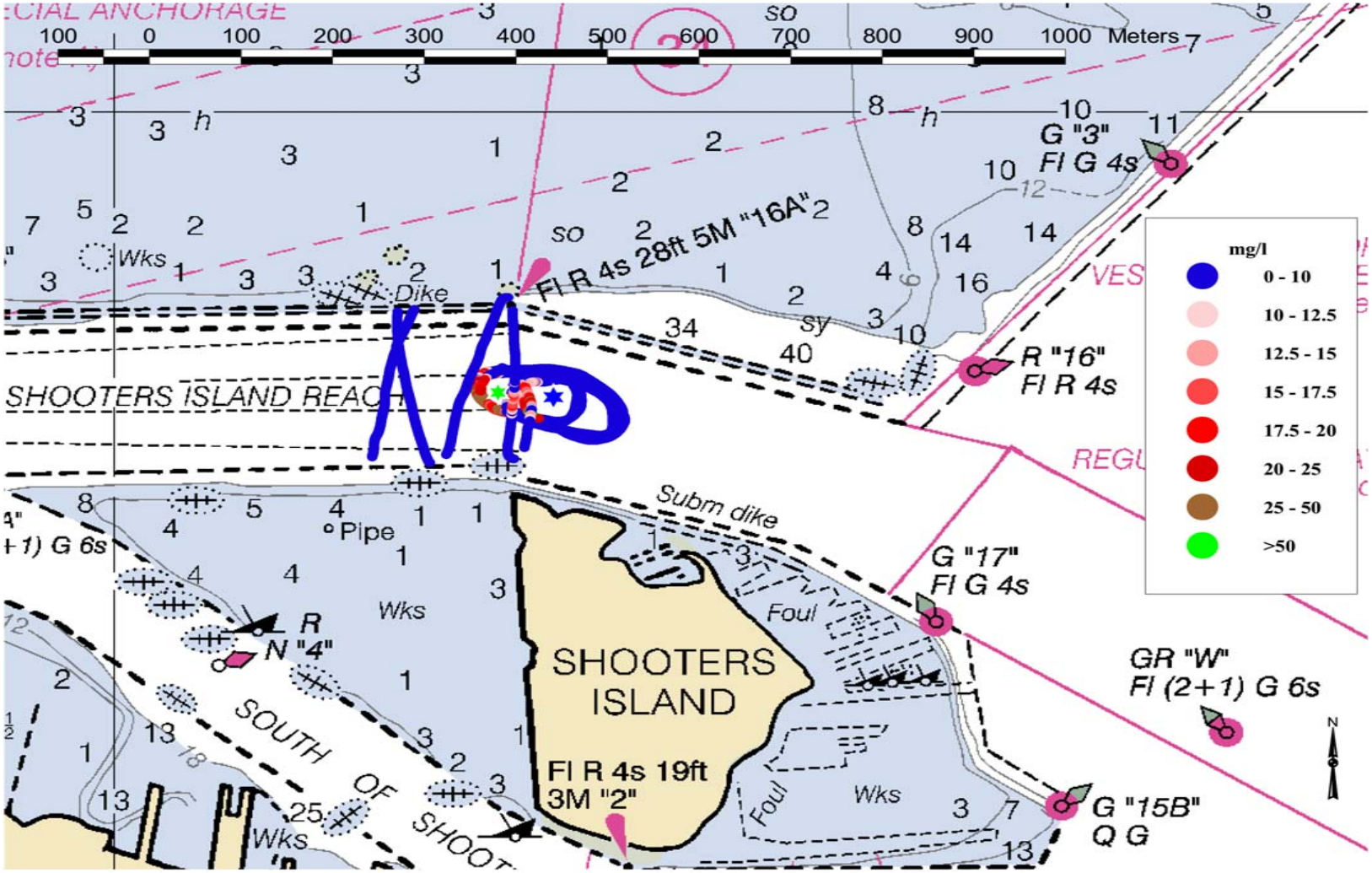

Figure 38. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 6 meters for Survey NJAB, completed during a flooding tide on 22 June 2006.

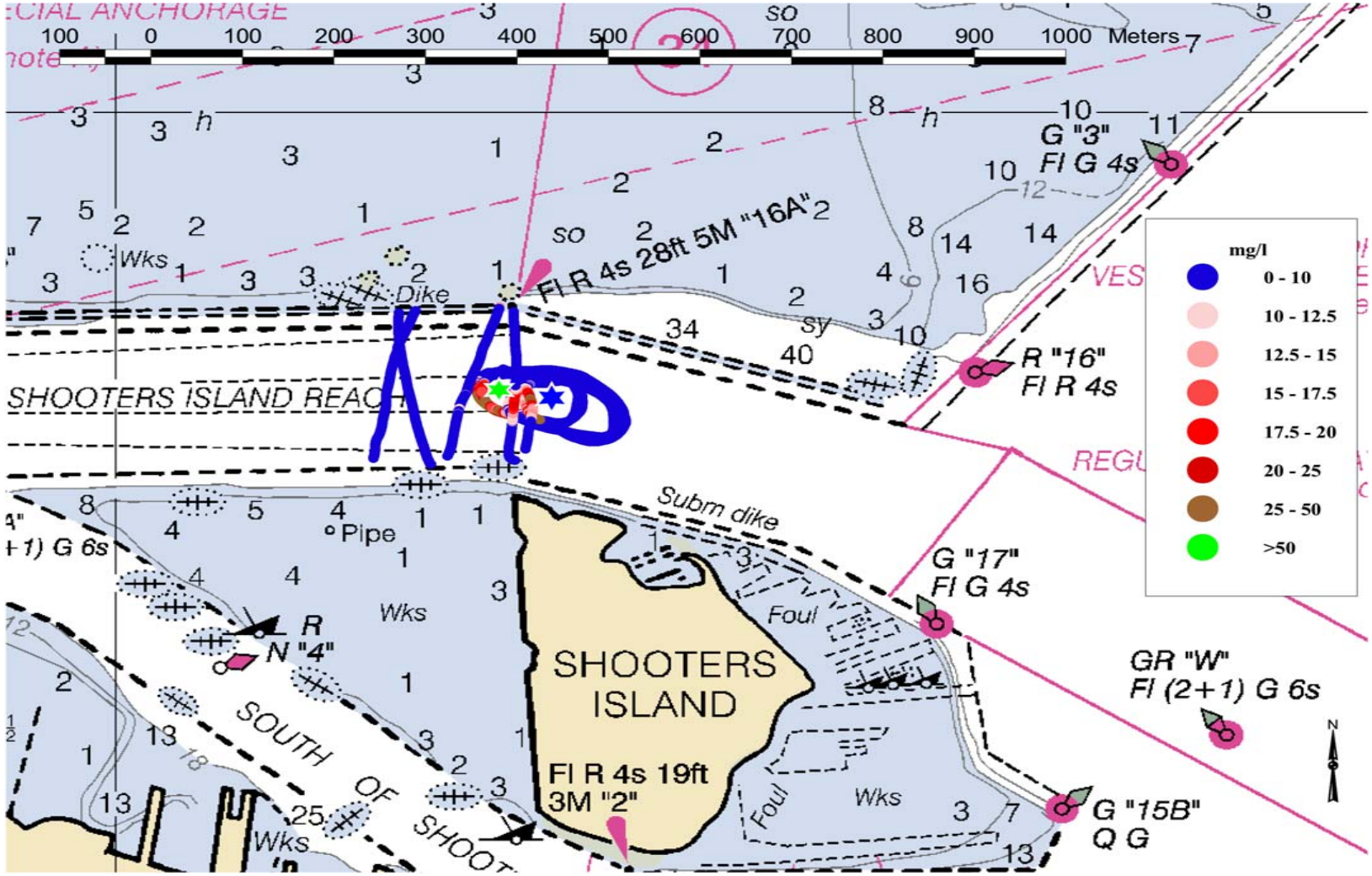

Figure 39. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 8 meters for Survey NJAB, completed during a flooding tide on 22 June 2006.

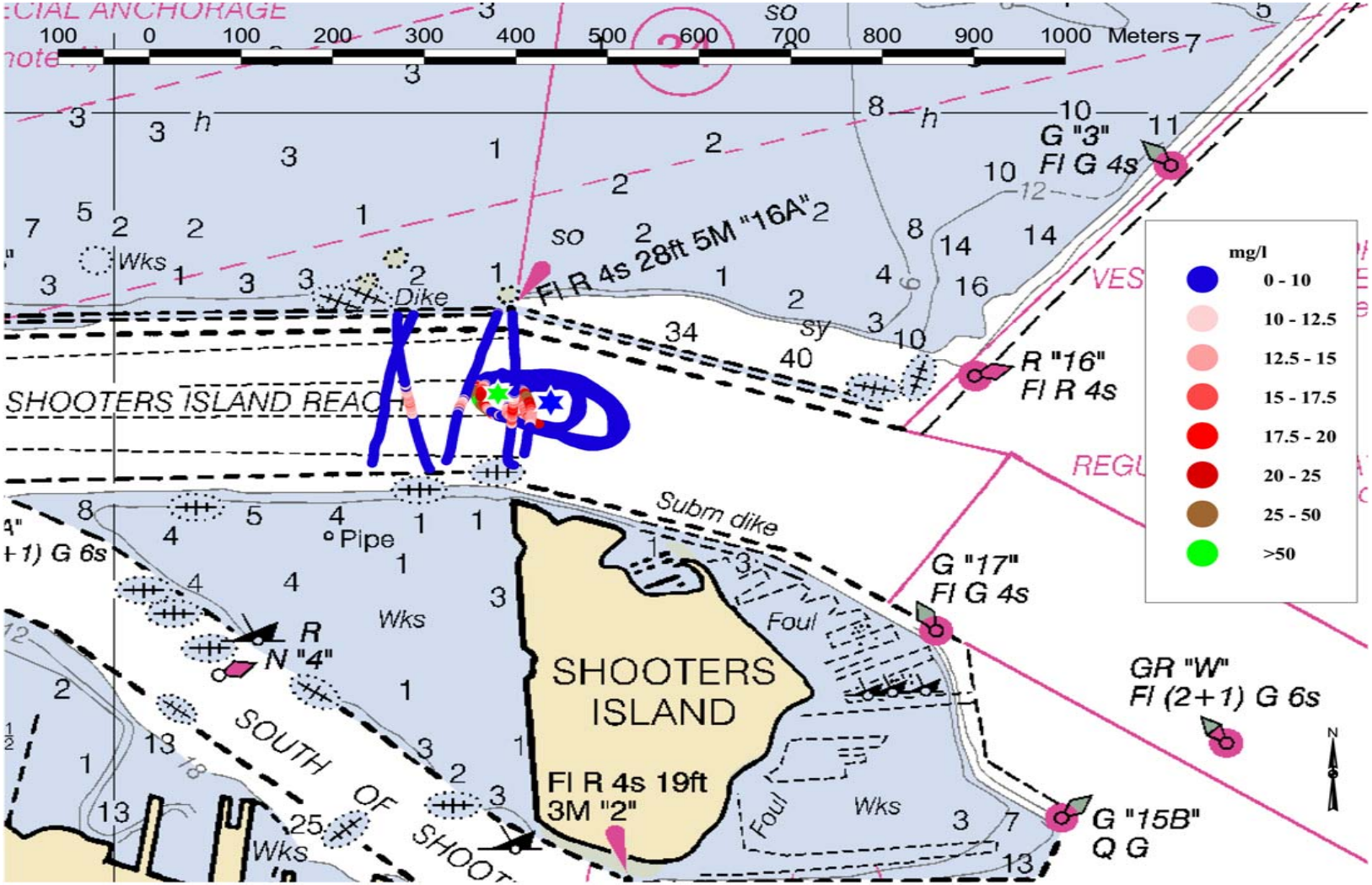

Figure 40. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 10 meters for Survey NJAB, completed during a flooding tide on 22 June 2006.

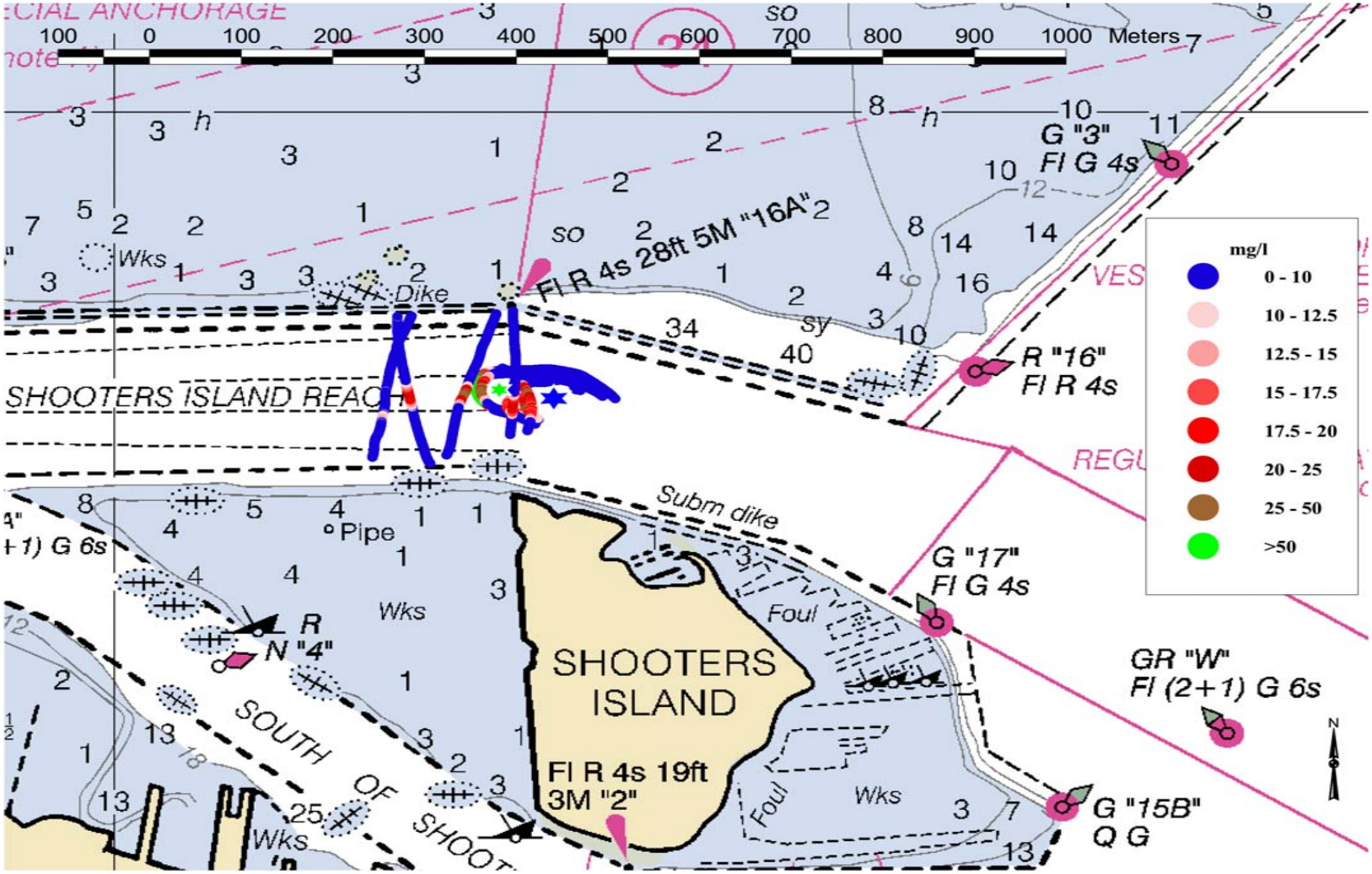

Figure 41. Plan view of detected plume spatial coverage and TSS concentrations at a depth of 12 meters for Survey NJAB, completed during a flooding tide on 22 June 2006.

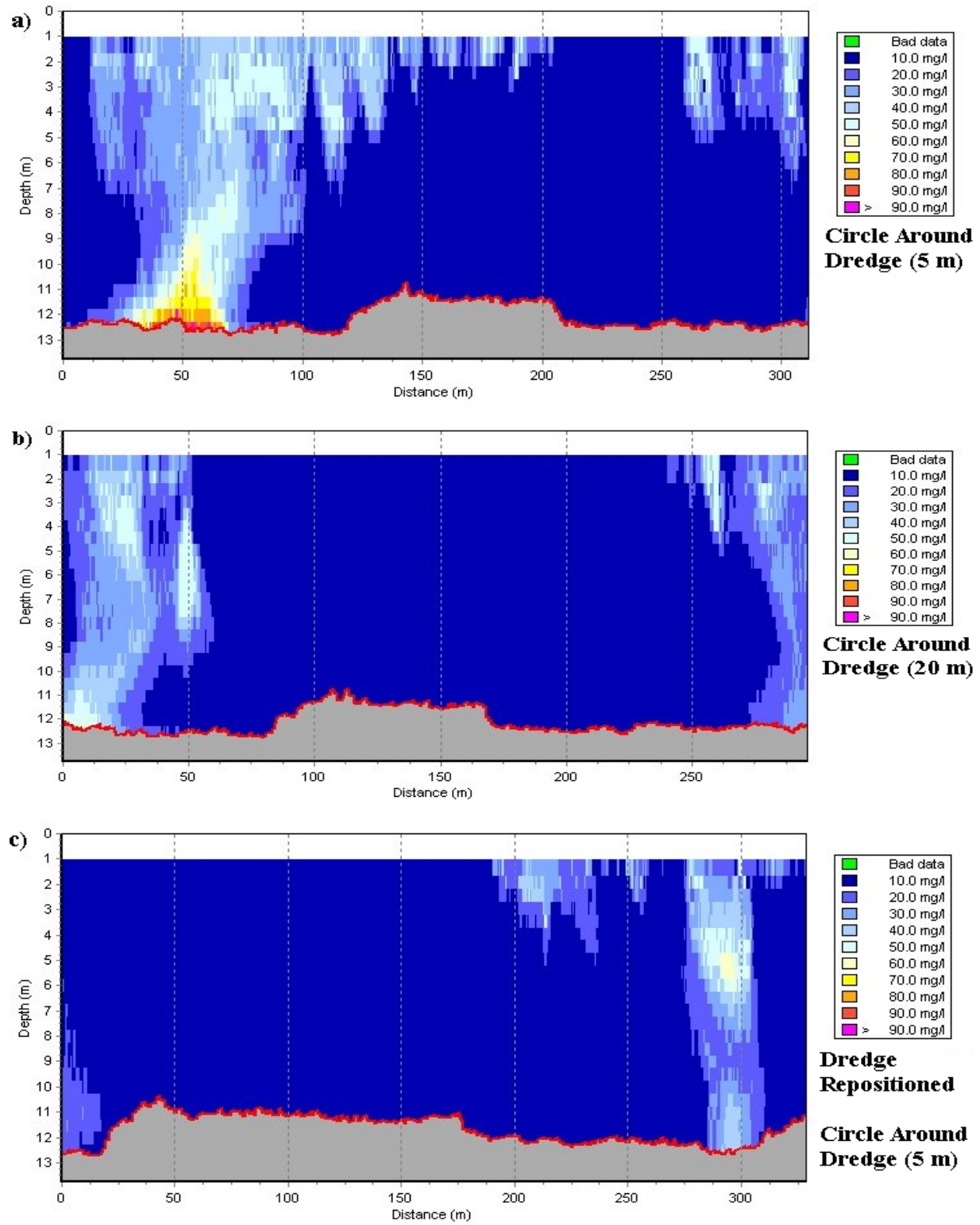

Figure 42. Vertical profiles (Survey NJAB) of TSS concentration across Shooters Island Reach during a flooding tide, 22 June 2006.

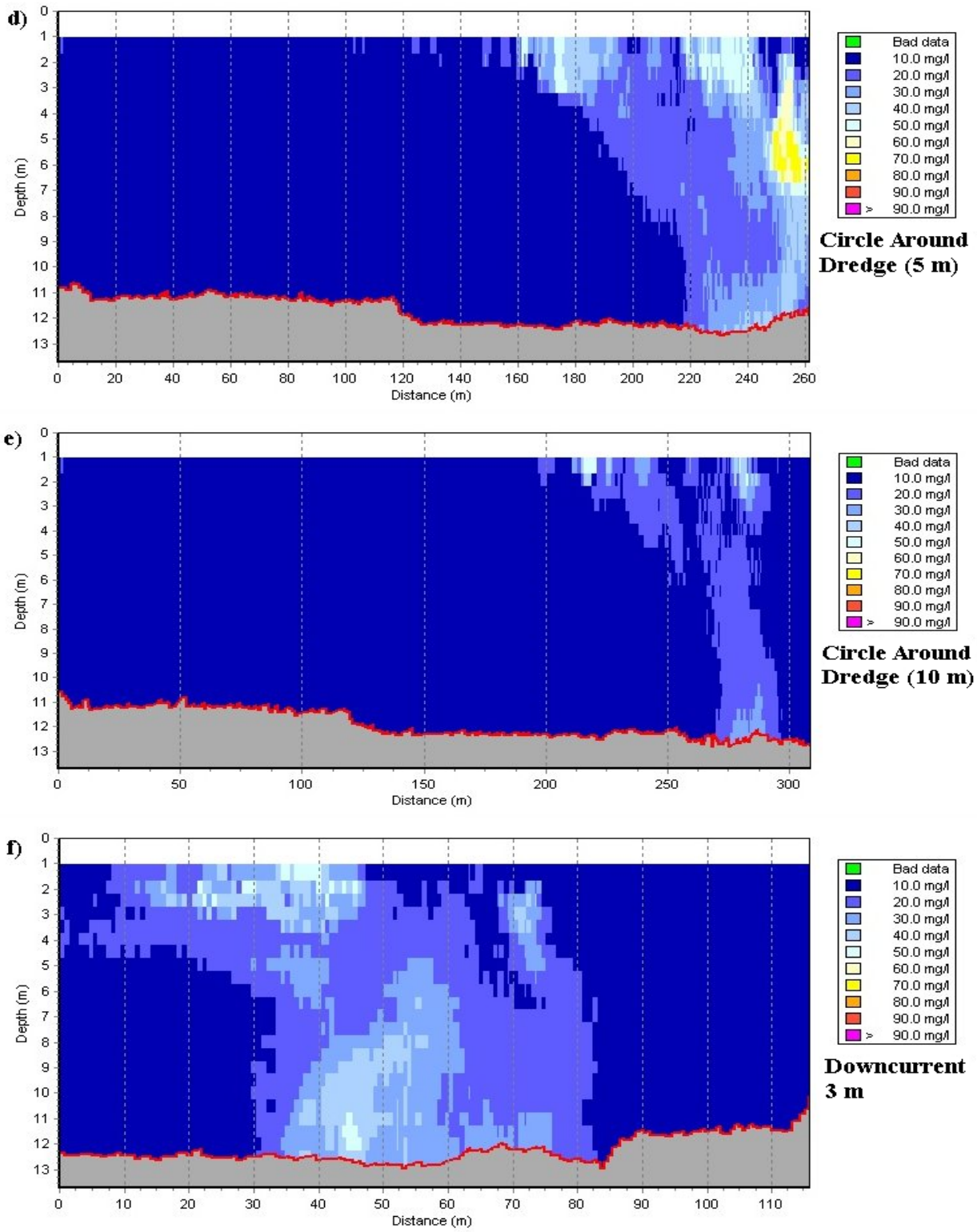

Figure 42 (cont.). Vertical profiles (Survey NJAB) of TSS concentration across Shooters Island Reach during a flooding tide, 22 June 2006.

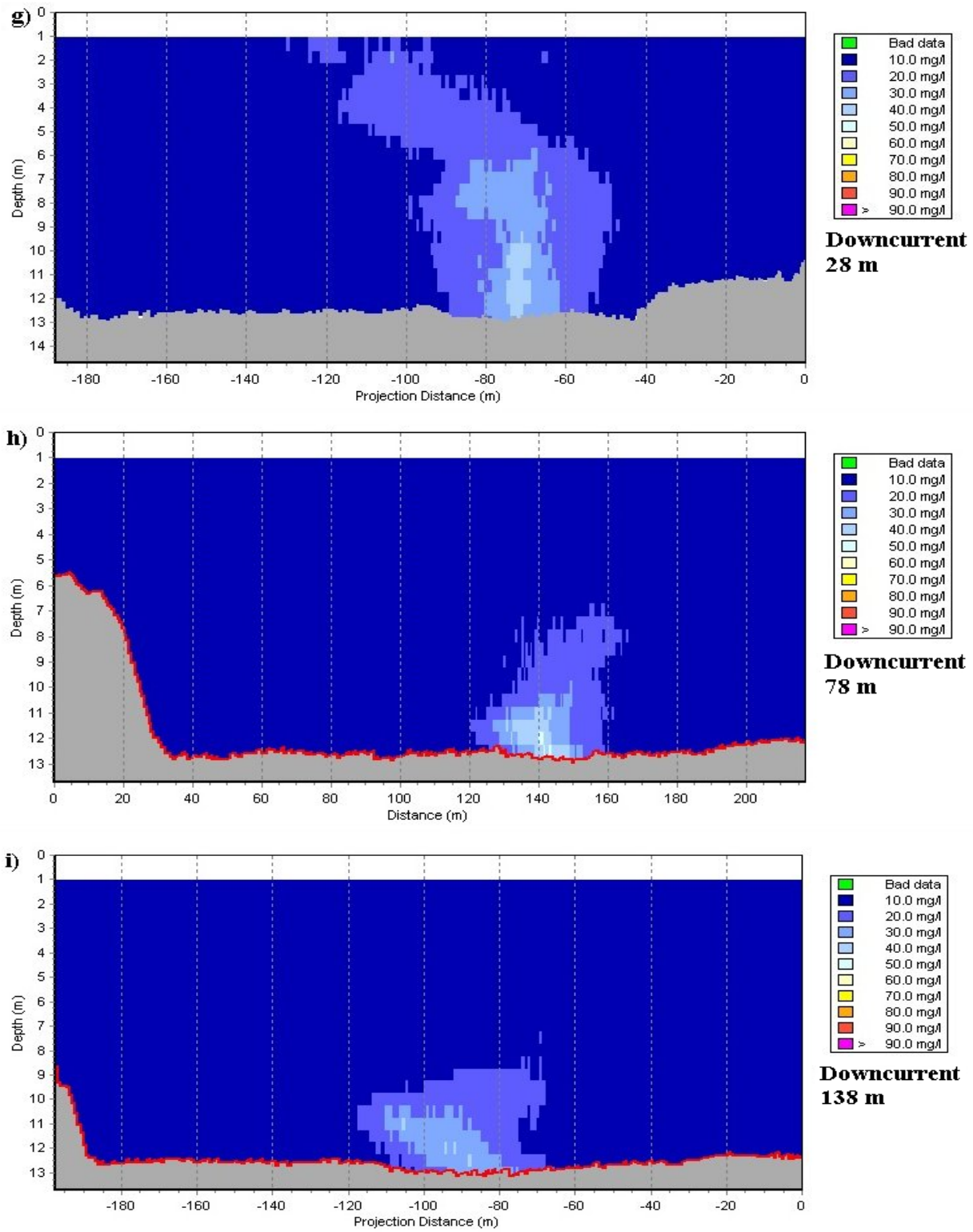

Figure 42 (cont.). Vertical profiles (Survey NJAB) of TSS concentration across Shooters Island Reach during a flooding tide, 22 June 2006.

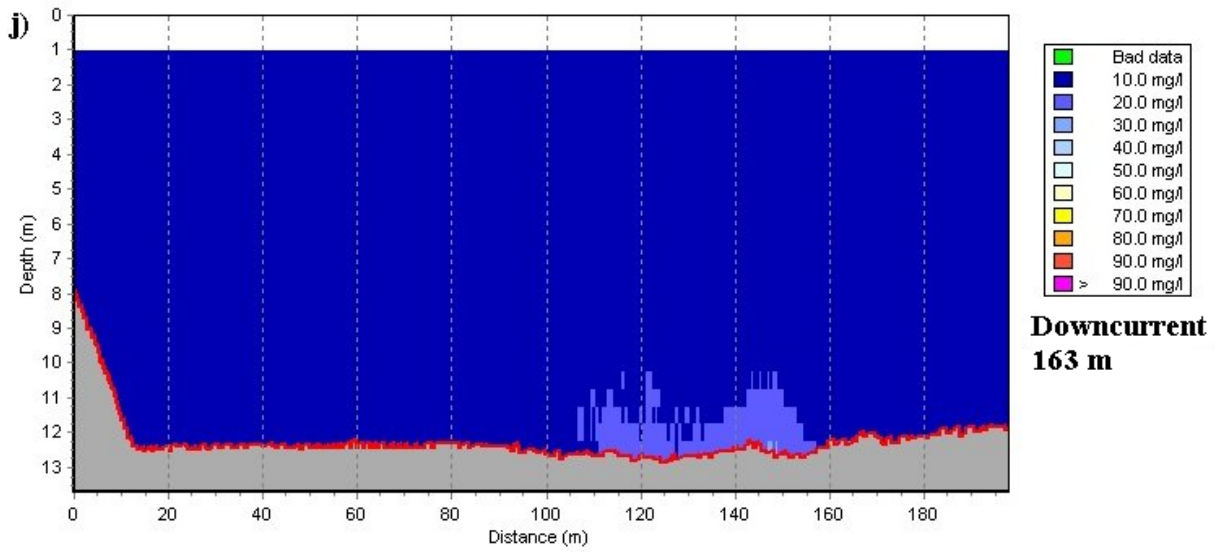

Figure 42 (cont.). Vertical profiles (Survey NJAB) of TSS concentration across Shooters Island Reach during a flooding tide, 22 June 2006.

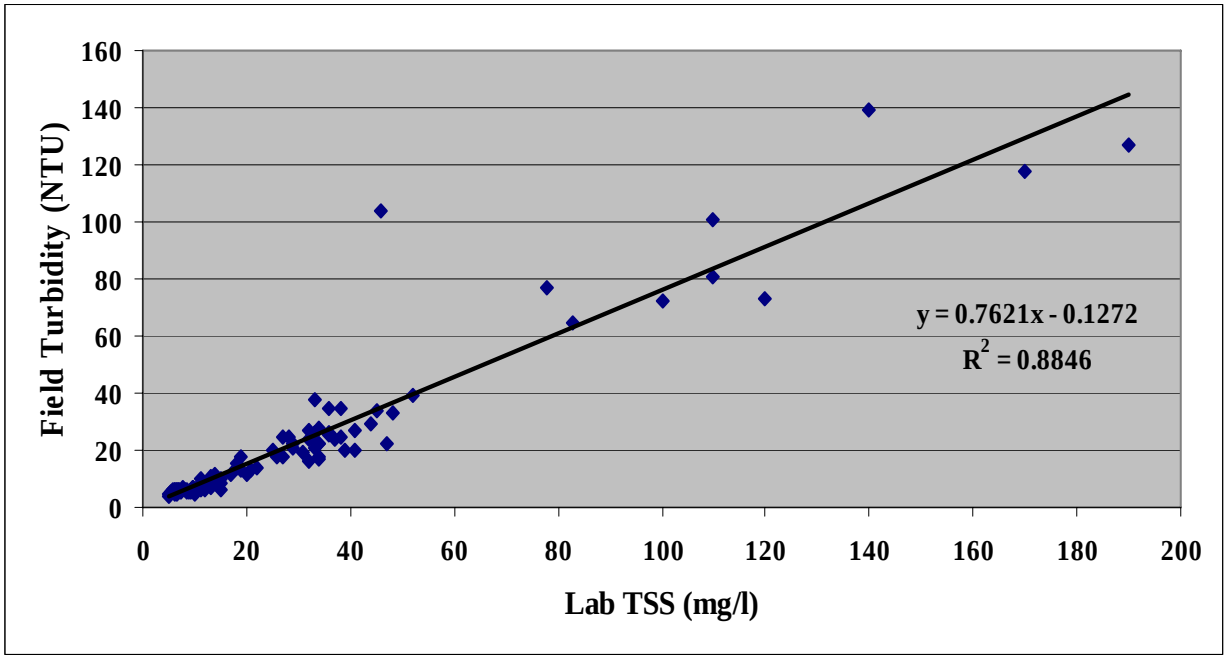

Figure 43. Regression of field turbidity values on TSS concentrations for corresponding samples.

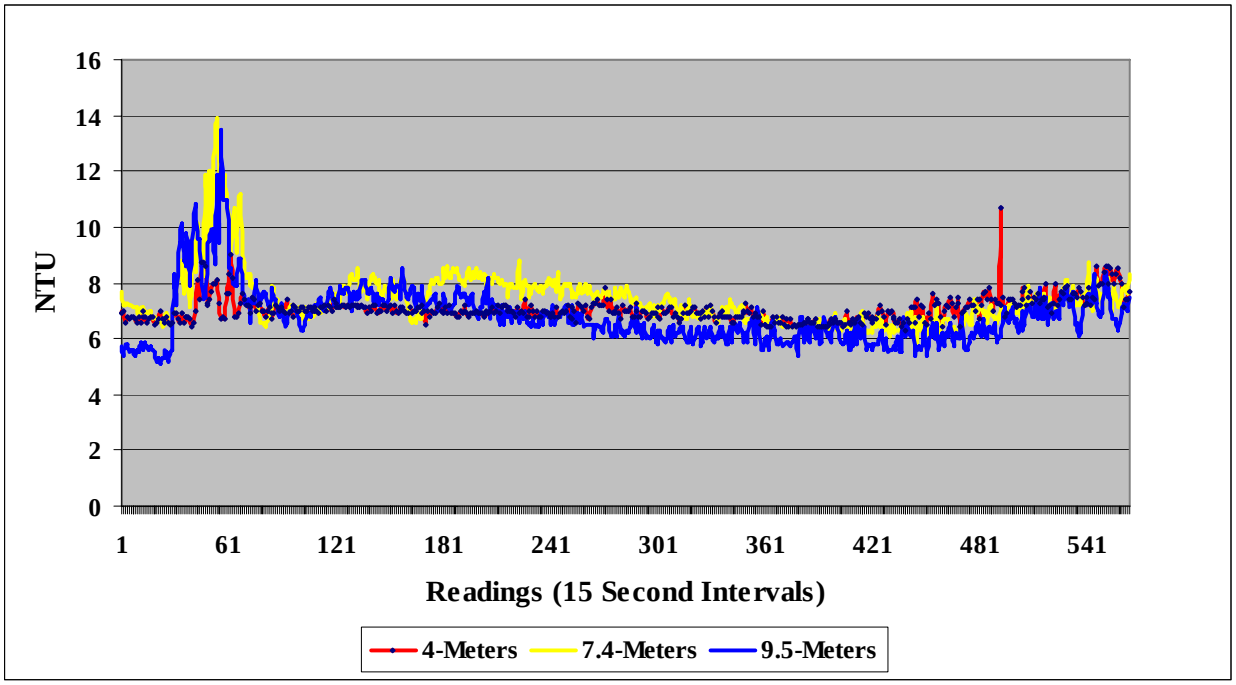

Figure 44. Ambient turbidity measured at depths of 4, 7.4 and 9.5 meters at a distance of 150 meters up-current from the dredging operation during a flooding tide on 20 June 2006.

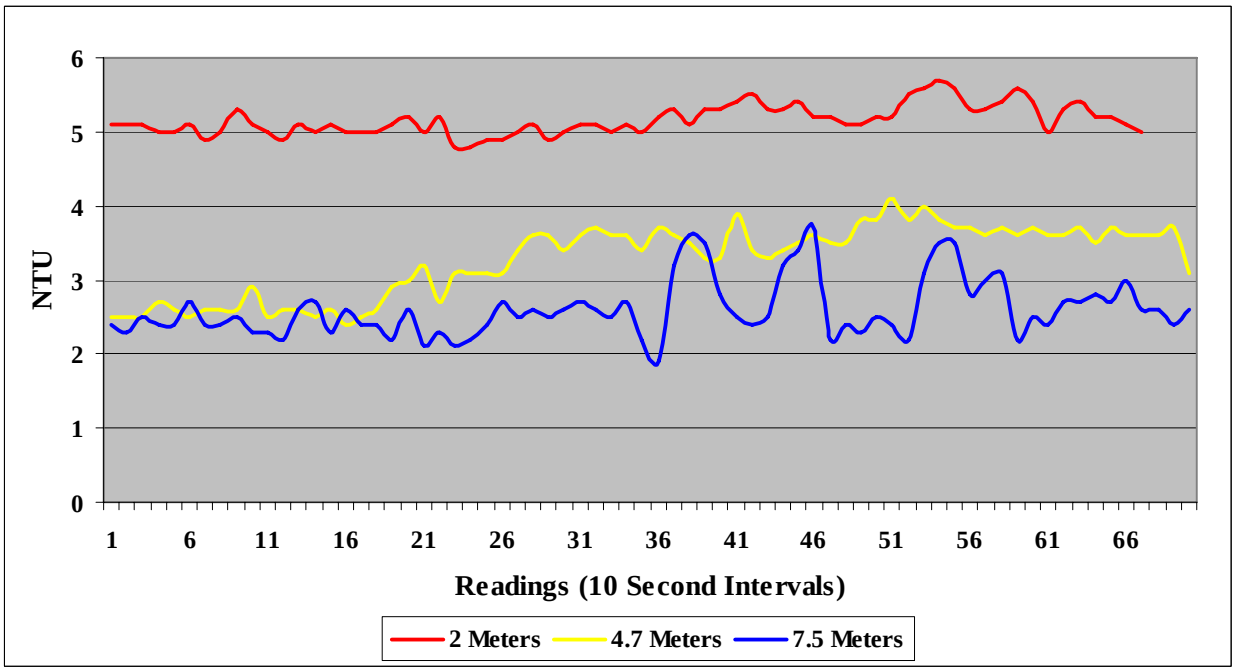

Figure 45. Ambient turbidity measured at depths of 2, 4.7 and 7.5 meters at a distance of 350 meters up-current from the dredging operation during an ebbing tide on 22 June 2006.

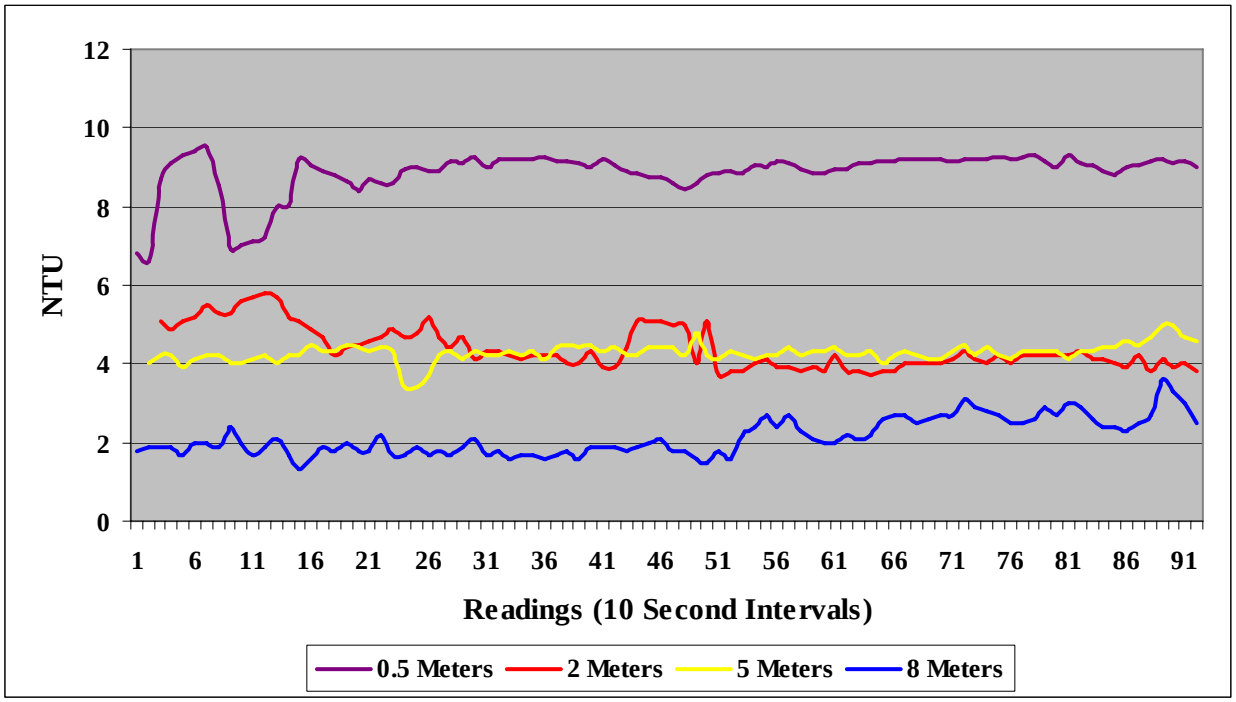

Figure 46. Ambient turbidity measured at depths of 0.5, 2, 5 and 8 meters at a distance of 540 meters up-current from the dredging operation during an ebbing tide on 23 June 2006.

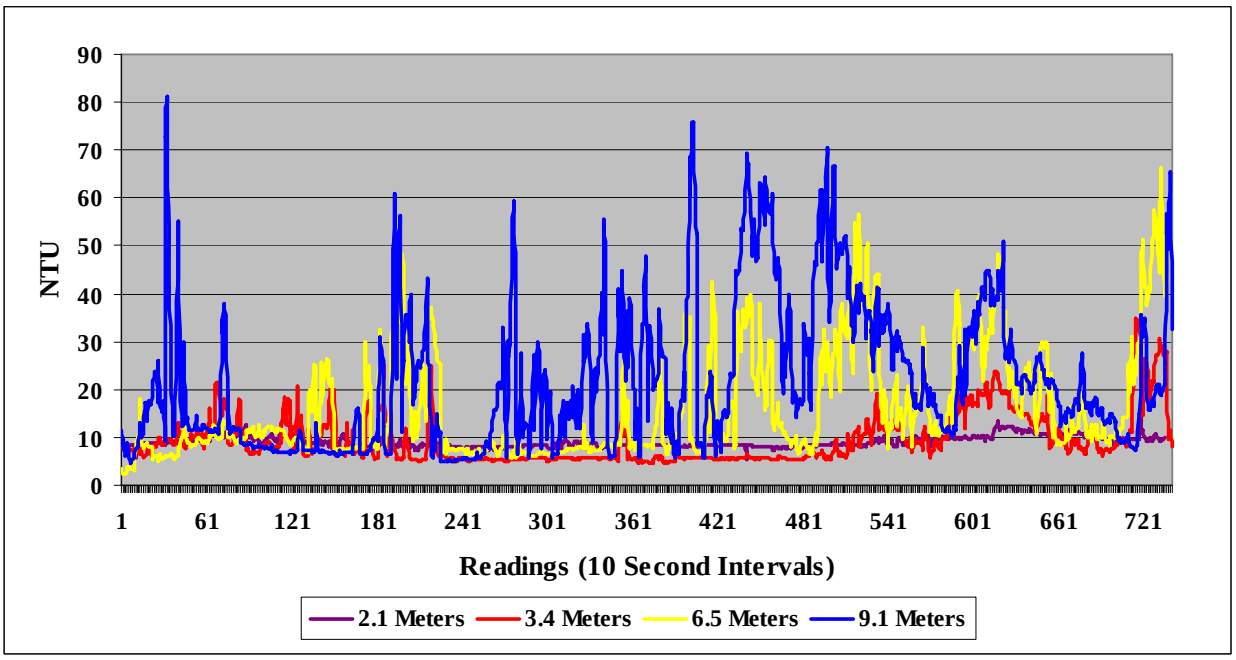

Figure 47. Near-field turbidity measured at depths of 2.1, 3.4, 6.5 and 9.1 meters at a distance of 60 meters down-current from the dredging operation during a flooding tide on 20 June 2006.

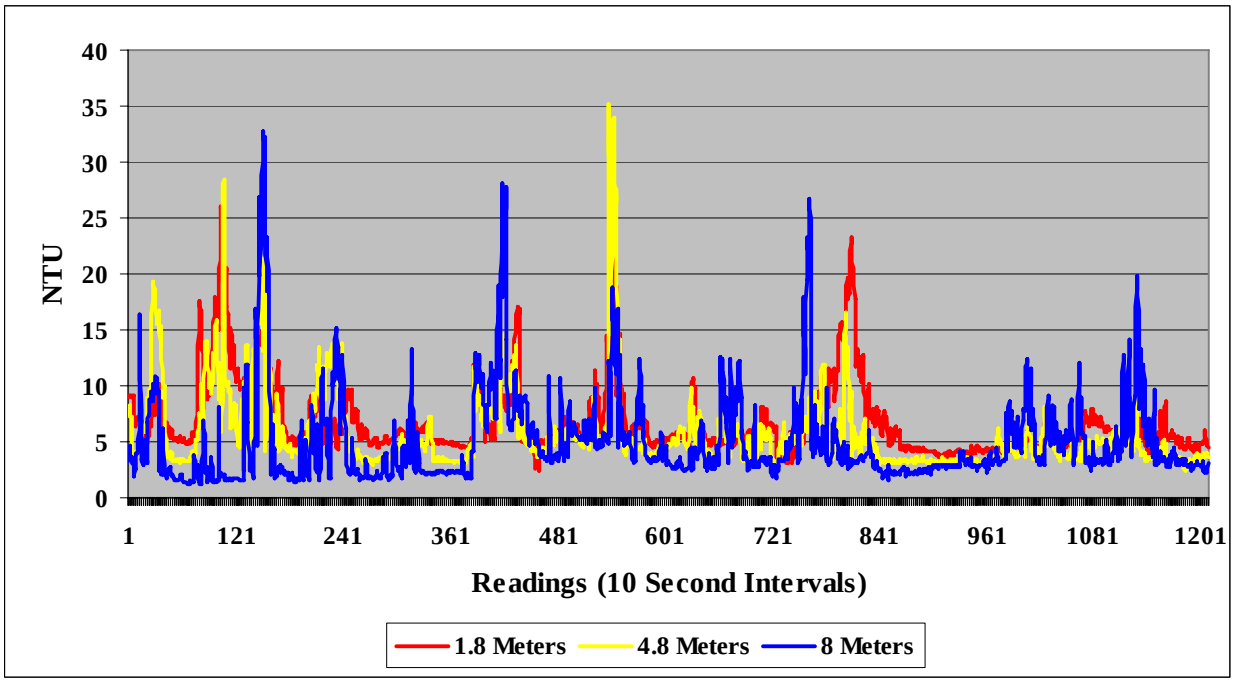

Figure 48. Near-field turbidity measured at depths of 2, 4.8 and 8 meters at a distance of 60 meters down-current of the dredging operation during an ebbing tide on 22 June 2006.

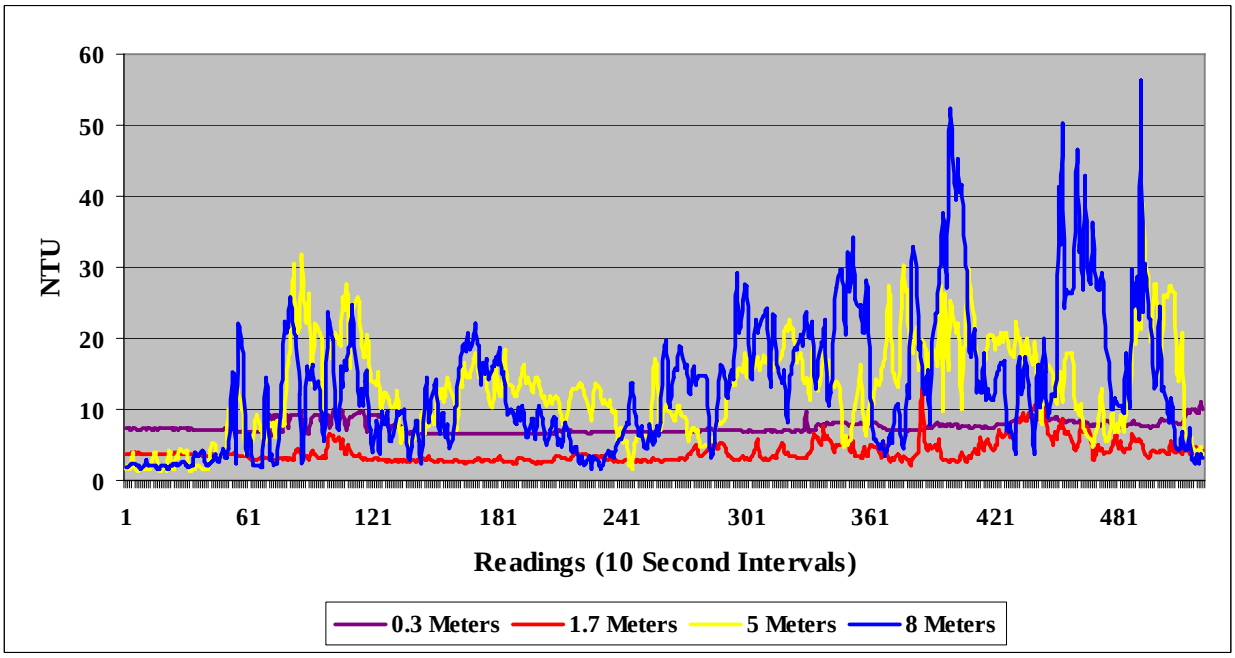

Figure 49. Near-field turbidity measured at depths of 0.3, 1.7, 5 and 8 meters at a distance of 60 meters down-current from the dredging operation during an ebbing tide on 23 June 2006.

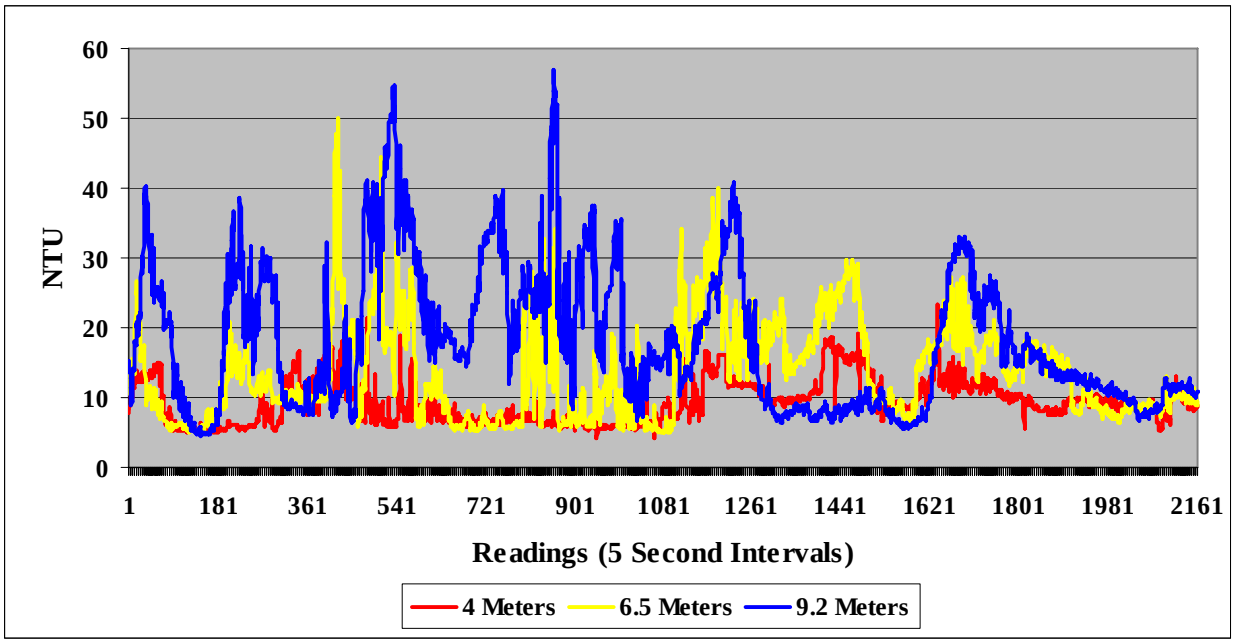

Figure 50. Far-field turbidity measured at depths of 4, 6.5 and 9.2 meters at a distance of 160 meters down-current from the dredging operation during a flooding tide on 20 June 2006.

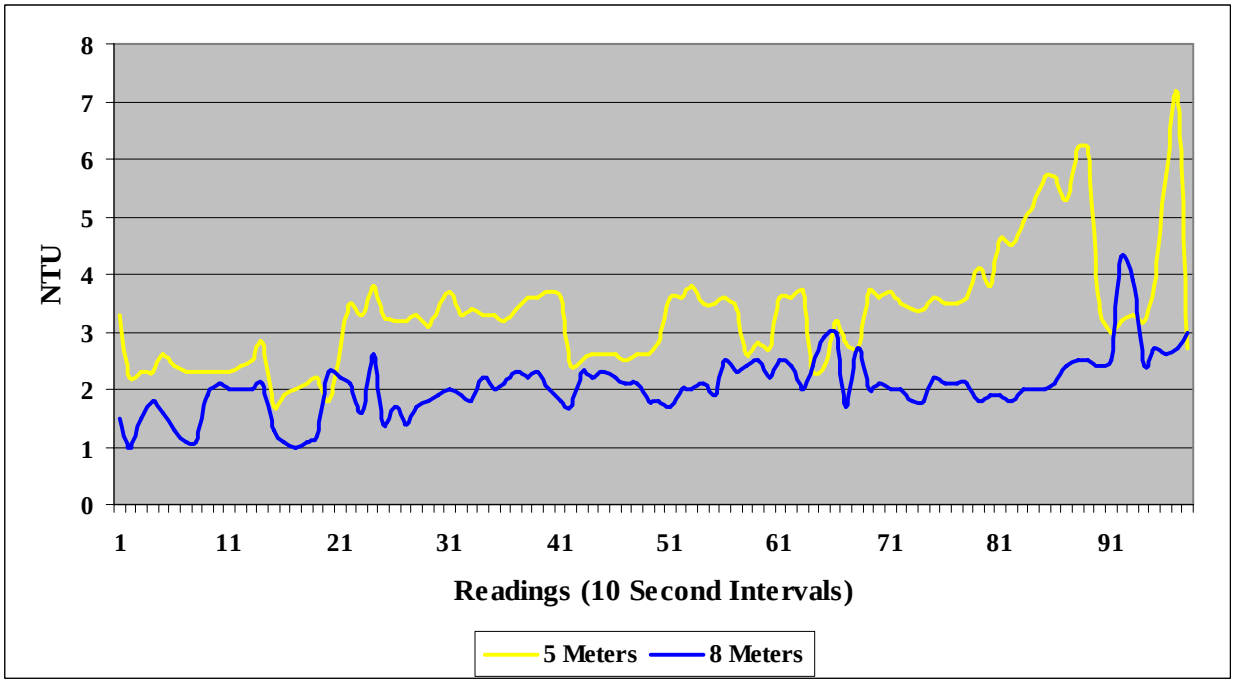

Figure 51. Far-field turbidity measured at depths of 5 and 8 meters at a distance of 150 meters down-current from the dredging operation during an ebbing tide on 22 June 2006. Two OBS units shut down prematurely and recorded no data during this monitoring event.

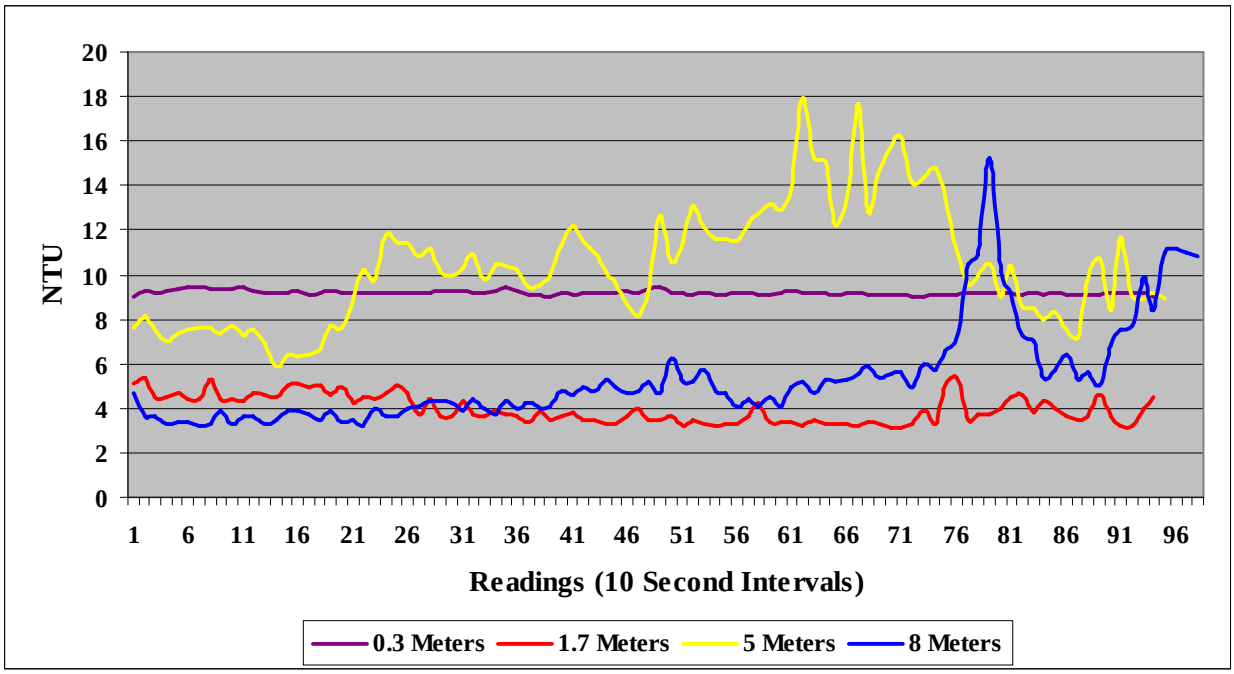

Figure 52. Far-field turbidity measured at depths of 0.3, 1.7, 5 and 8 meters at a distance of 145 meters down-current from the dredging operation during an ebbing tide on 23 June 2006.

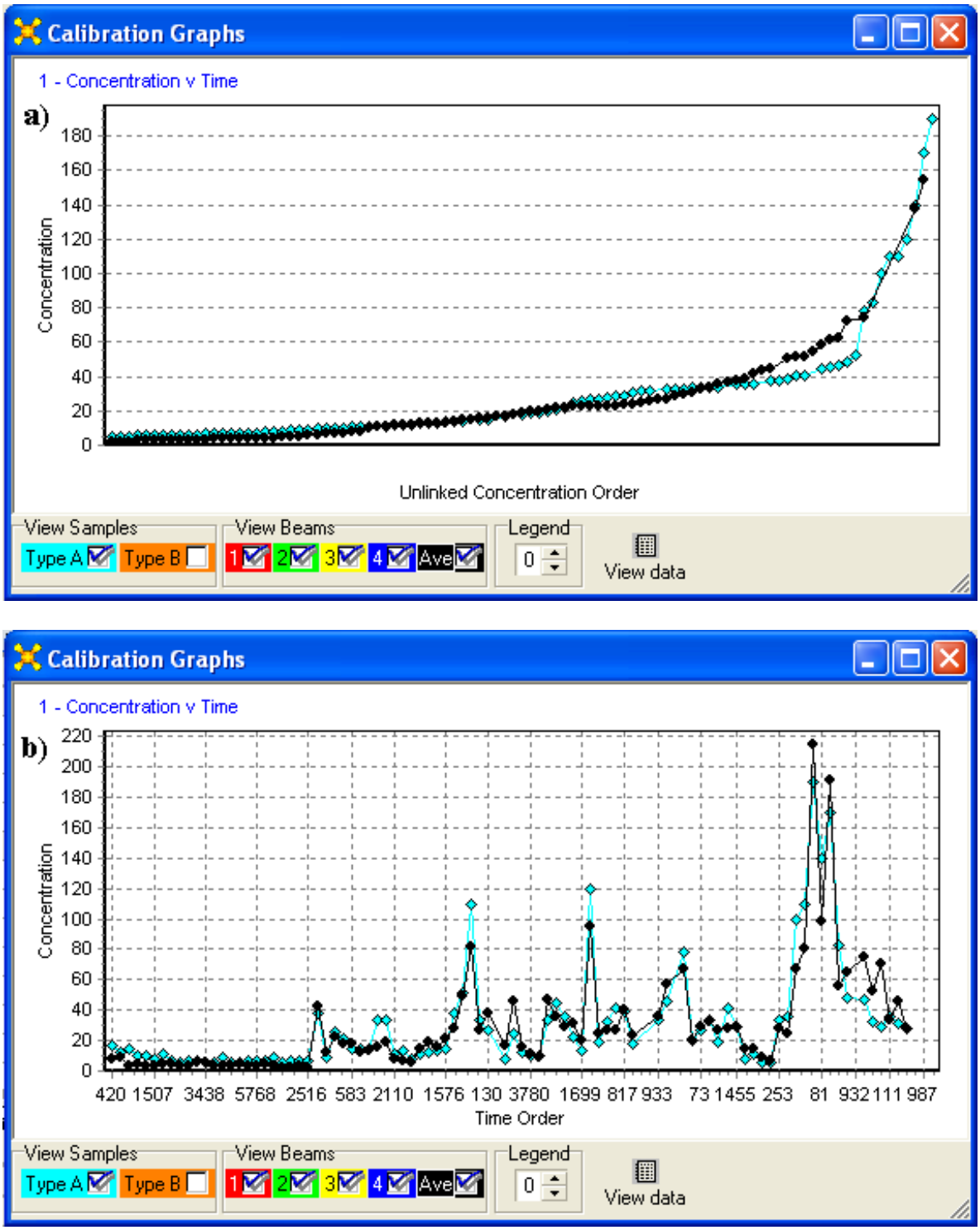

Figure 53. Comparison of gravimetric and acoustic estimates of TSS concentration for the entire population of samples in a) rank and b) paired order. Results of gravimetric analysis (TSS) of water samples are represented in blue, whereas TSS estimates derived from ADCP data are in black.