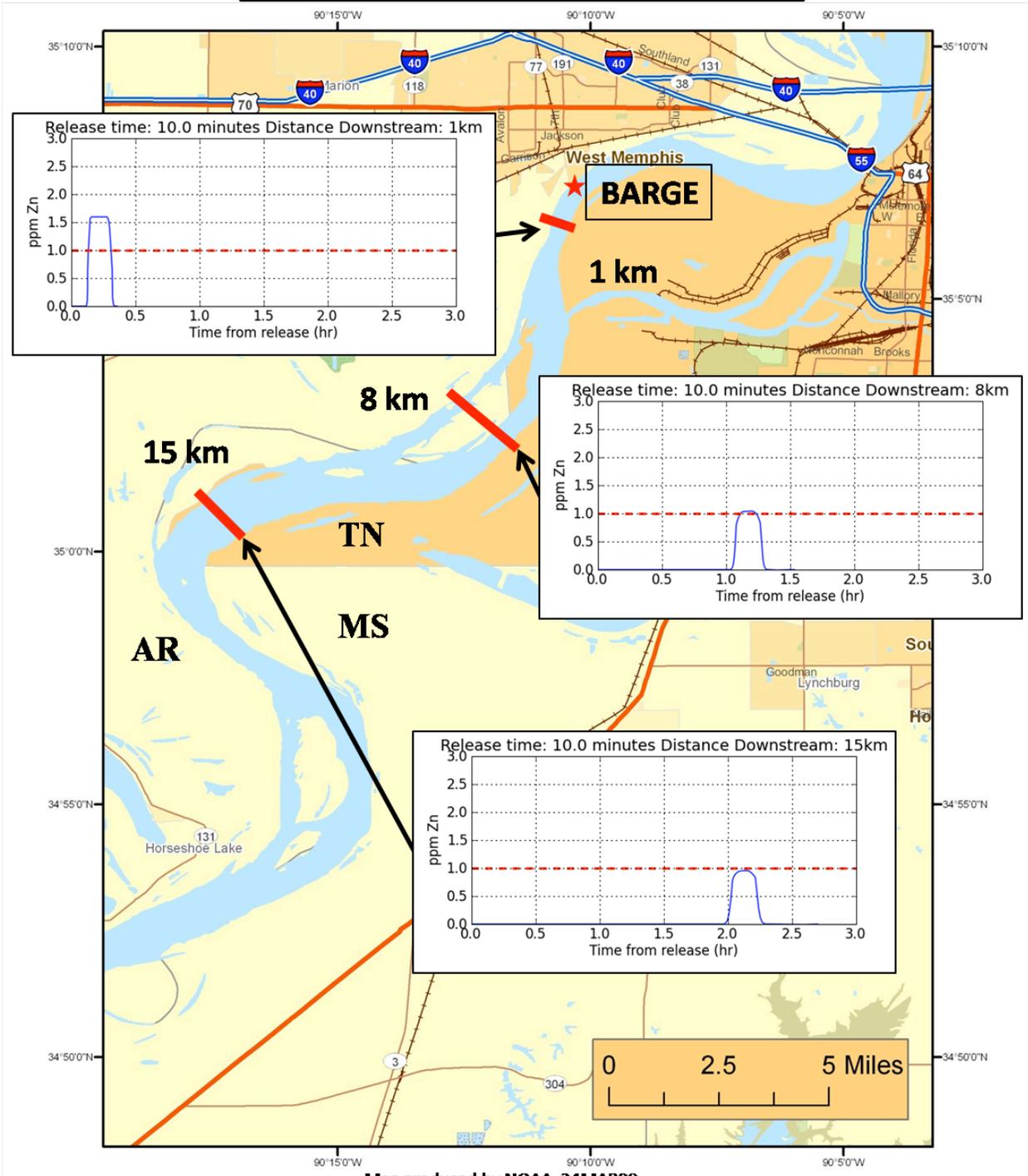


**FIGURE 1: Zinc-Calcium Bromide Barge, Mississippi River, West Memphis, AR
Potential Exposure at point from a 10 min. duration release of 4,400 bbls**

- Location of river cross section described by exposure graph
- Expected concentration
- - - Level of Concern (1 ppm, see Zn Aquatic Risk Assessment)



Map produced by NOAA, 24MAR09



**FIGURE 2: Zinc-Calcium Bromide Barge, Mississippi River, West Memphis, AR
Potential Exposure at point from a 2 hour duration release of 4,400 bbls**

- Location of river cross section described by exposure graph
- Expected concentration
- - - Level of Concern (1 ppm, see Zn Aquatic Risk Assessment)

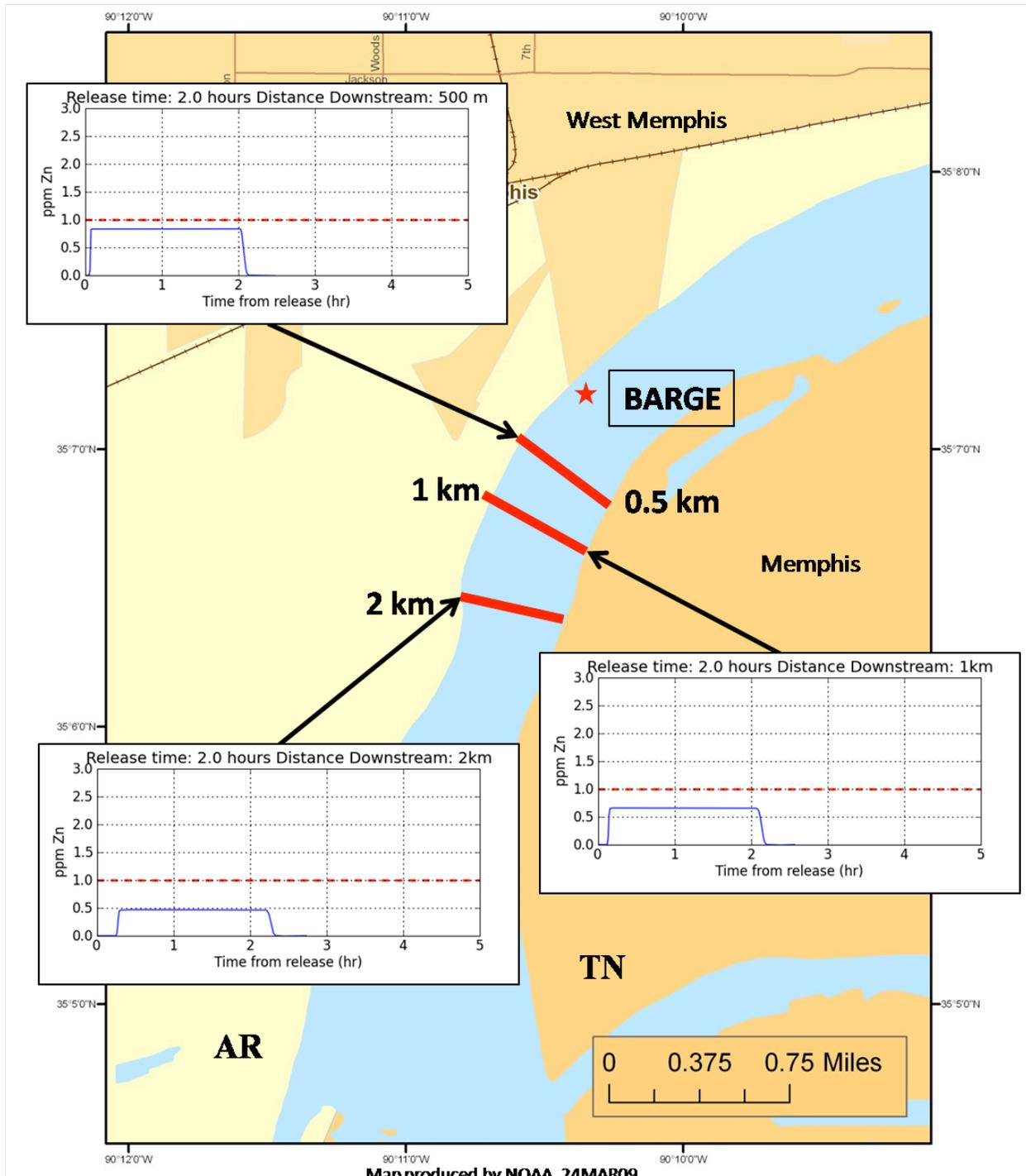
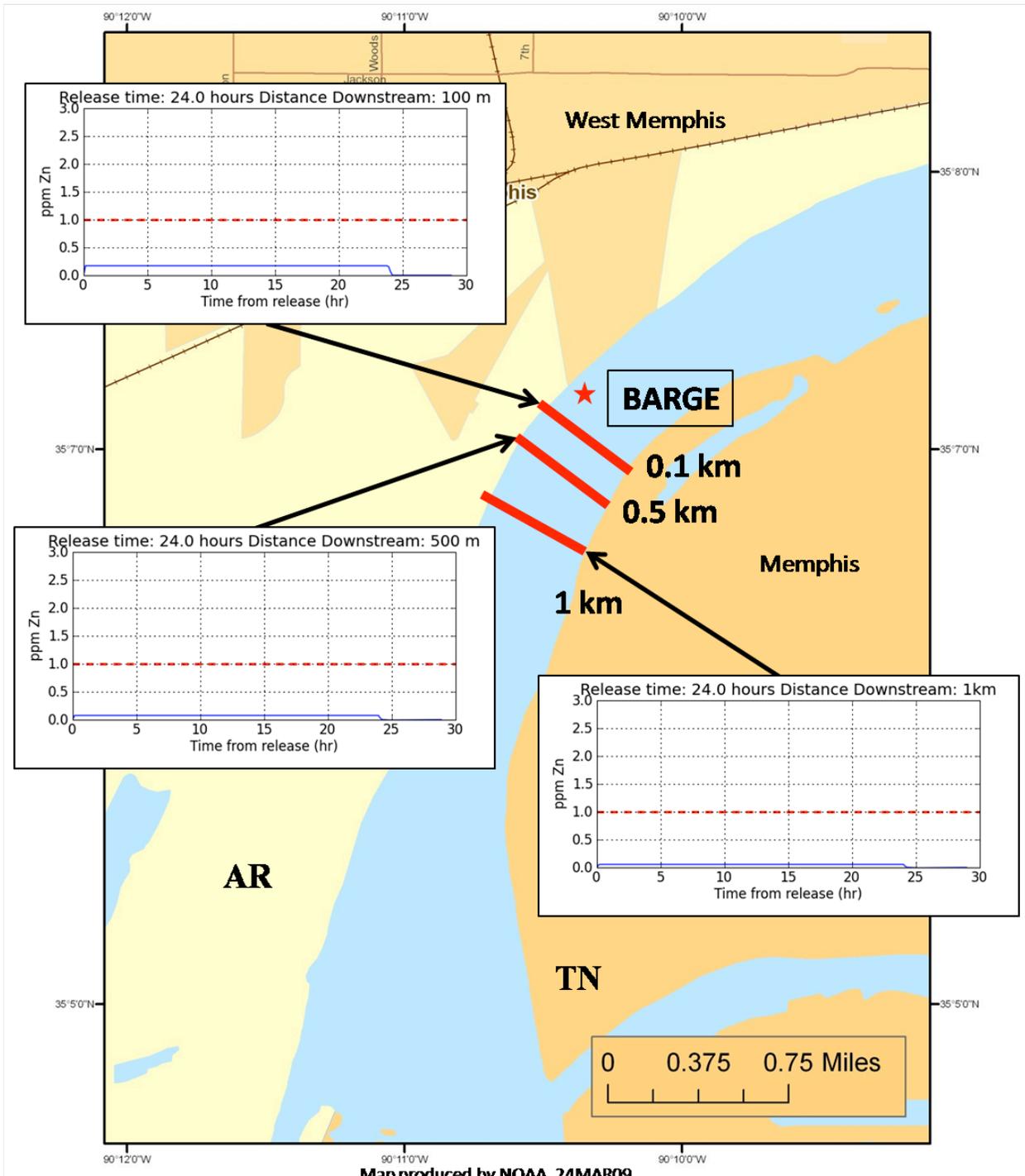
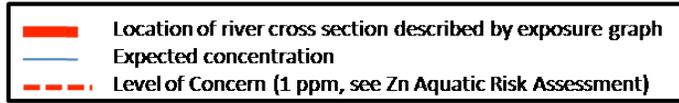
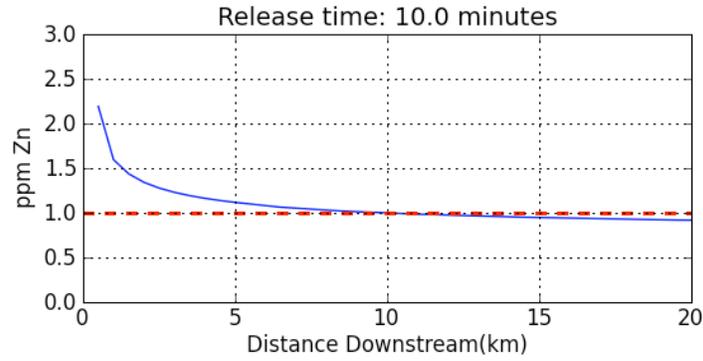


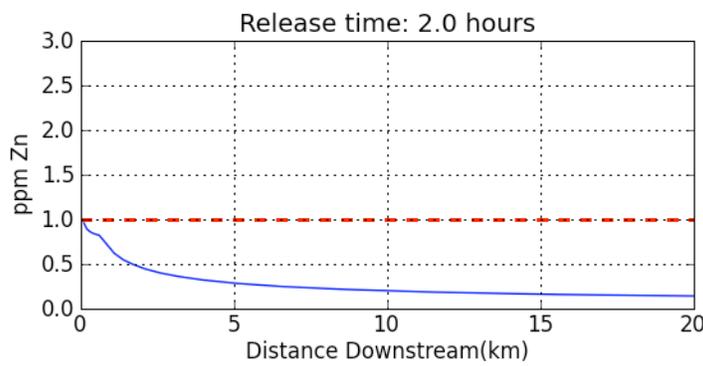


FIGURE 3: Zinc-Calcium Bromide Barge, Mississippi River, West Memphis, AR
Potential Exposure at point from a 24 hour duration release of 4,400 bbls

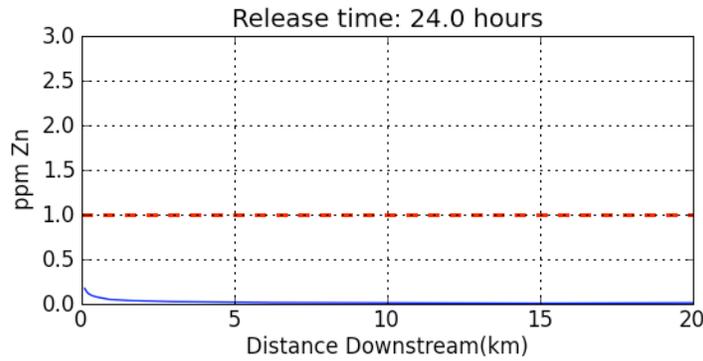




(a)



(b)



(c)

FIGURE 4. Estimates of peak concentration of soluble Zinc as a function of distance downstream. These plots indicate a release scenario of all 4,400 barrels over (a) 10 minutes, (b) 2 hours, and (c) 24 hours. Dashed red line indicates a level of concern for acute toxicity to aquatic organisms (1ppm - see document “Zinc Risk Assessment 1.2”). Blue curve indicates estimate of maximum expected concentration at the given river mile. Note that for the 10 minute release scenario, concentrations are estimated to be above the 1 ppm threshold for approximately 12-20 km downstream from the source. For other scenarios, concentrations are expected to be below 1 ppm very close to the source.

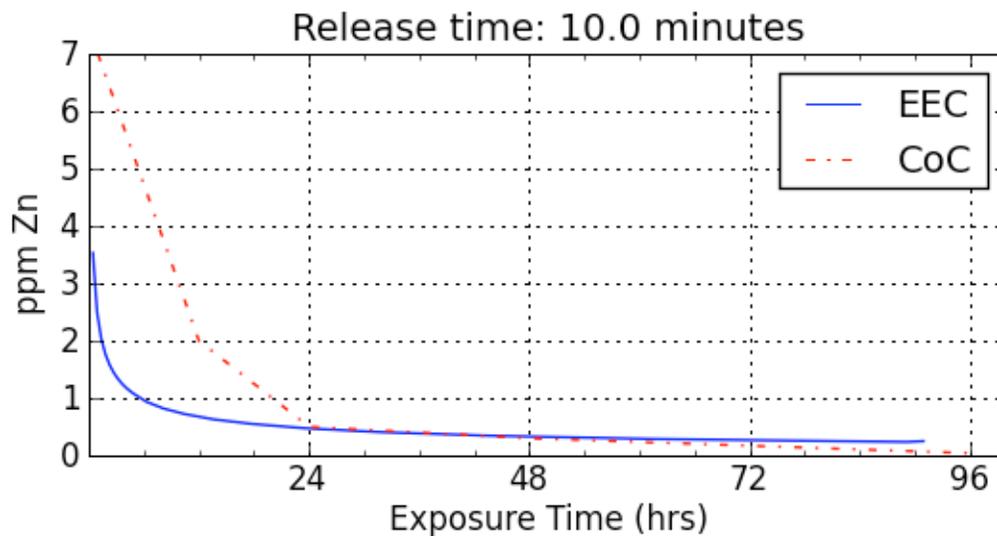


FIGURE 5. Time course of peak Expected Environmental Concentration (EEC) of dissolved zinc (ppm) in a plume compared with Concentrations of Concern (CoC) for planktonic (drifting) organisms initially entrained in the plume. The plume represents concentrations resulting from a 10 minute release of all zinc calcium bromide in the barge. The plume is about 0.5 kilometers long and travels down river at about 4 knots. It mixes with clean water thus slowly reducing the peak concentration. The plume moves down river as a plug flow, followed by uncontaminated river water. The concentrations of concern decline because the effects of zinc on entrained organisms increases with exposure time. In this release scenario the peak plume concentration occurs in a small portion of the plume and it does not approach or exceed the concentrations of concern. Both values converge after many hours, suggesting increasing concern for effects on originally entrained organisms such as water fleas and fish eggs and larvae. However, there is considerable uncertainty about both curves. If entrained organisms are affected within the plume the effects will be limited to the dimensions of the plume. Once plume concentrations approach background, newly-entrained planktonic organisms will not be affected and will replace those injured.

The safest time to minimize effects of the plume on planktonic organisms will be now, before plankton and fish spawn and larvae colonize the river in late spring and summer.