APPENDIX N - Expanded Wind Directionality Analyses for those Contaminants Below NYSDEC's AGCs

The analyses presented herein are for air contaminants which were below their respective NYSDEC health-based guidelines, so only a brief summary of each is provided.

Polar Plots

The carbon disulfide polar plots indicate directionality and are shown on both the standardized and maximized scales because of the differences in relative concentrations at the different monitoring locations (Appendix M). Directionality for carbon disulfide is indicated by the BTRS and the SPWT polar plots to the southwest/south, southwest (at 202.5-225°) and by the GIBI polar plot to the south (at 180°) but, while the BISP polar plot has one isolated high point to the south/southwest, overall it only slightly indicates directionality to the northeast. There were isolated high points in several directions in the GIBI carbon disulfide polar plot and in the southeast direction in the BTRS polar plot.

The hexanal polar plots indicate directionality and are shown on both the standardized and maximized scales because of the differences in relative concentrations at the different monitoring locations. Hexanal, m,p-xylene, o-xylene, n-butyraldehyde, 1,2,4-trimethylbenzene, benzaldehyde, ethylbenzene, and valeraldehyde had at least one monitoring location where it was not a Category C or B contaminant so the polar plots were not done for them at those particular sites (Appendix M). The remaining hexanal and ethylbenzene polar plot all indicate directionality to the south-west with only isolated high concentrations in the other directions. The n-butyraldehyde polar plots all indicate weaker directionality to the south/southwest and again only have isolated high concentrations in the other directions. The dichloromethane, toluene, 2-butanone, propionaldehyde, m,p-xylene, o-xylene, and benzaldehyde polar plots indicate very little or weaker directionality. Rather, the polar plots for these contaminants have elevated concentrations in several directions (many of which appear to be only isolated higher concentration points) with the exception of the GIBI polar plots for toluene, m,p-xylene, and o-xylene, which do show some directionality to the southwest. The chloromethane, dichlorodifluoromethane, trichlorofluoromethane, trichlorotrifluoroethane, 1,2,4-trimethylbenzene, and valeraldehyde polar plots do not show any real directionality at all and only have isolated high concentrations in various directions. The dichloromethane, toluene, 2-butanone, m,p-xylene, o-xylene, and 1,2,4-trimethylbenzene polar plots were interesting in that the only two days where the prevailing wind direction was from the southeast (at 135°) resulted in one or both of the measured concentrations to be elevated at all four monitoring locations.

TWA Pollution Roses

The carbon disulfide TWA pollution roses all point in towards the industrial area (Figure N.1). The vector lines intersect in the southern end of the industrial area

and triangulate on the largest emitter of this air contaminant in the area. The carbon disulfide TWA pollution roses have maximum concentrations that differ from one monitoring site to the next indicating influences from local source effects. The m,p-xylene and o-xylene TWA pollution roses at three of the four sites very closely resemble one another (Figure N.2 and Figure N.3). The BISP TWA pollution rose for m,p-xylene and o-xylene are the only pair that differ somewhat. The pollution roses for both of the xylenes at GIBI indicate that both the industrial area and the adjacent roads influence the monitored concentrations, and at SPWT and BTRS they indicate a drift into the area from the direction of Buffalo. The BISP pollution roses for both xylenes indicate influences from the north/northwest and from the industrial area to the northeast, but only the BISP pollution rose for o-xylene indicates the drift into the area from the direction of Buffalo. The TWA pollution roses for the xylenes have some differences between the maximum concentrations from one monitoring site to the next indicating some influences from local source effects. The toluene TWA pollution roses show many similarities to those for the xylenes (as would be expected having similar sources) with the largest variation occurring at the GIBI monitor (Figure N.4). The GIBI toluene TWA pollution rose shows slight indications that the concentrations observed at this monitor are influenced by both the mobile sources on the adjacent roads and the industrial area. The SPWT and BTRS toluene TWA pollution roses indicate a drift into the area from the direction of Buffalo with BTRS also indicating additional sources to the north/northwest, the northeast, and the southwest (which potentially indicates an influence from the adjacent highway). The BISP toluene TWA pollution rose indicates an influence from the industrial area and to the north/northwest. The toluene TWA pollution roses also have some differences between the maximum concentrations from one monitoring site to the next indicating some influences from local source effects.

Wind Roses

The benzene/toluene ratio wind roses show some interesting similarities and differences as compared to those for benzene (Appendix O). The highest 10% benzene/toluene ratio days at the GIBI and BTRS monitors also have winds that are predominantly from the southwest as well as the south, southwest, but the lowest ratio days indicate a predominance of winds in the opposite direction (from the northeast), as opposed to, just an absence of winds from the southwest like with benzene. This indicates that the toluene from the mobile sources of the adjacent roads helps drive down the benzene/toluene ratio, along with the obvious reduction of benzene contributions from the industrial area and the largest local benzene source. The SPWT benzene/toluene ratio wind roses closely resemble those for benzene in that the highest ratios resulted when the winds were from a westerly direction and the lowest ratios were when this wind was absent. The BISP wind rose for the highest benzene/toluene ratio days differed from that of benzene in that it did not indicate predominant winds from the direction of the industrial area (from the northeast), but there were more winds from that direction than in the wind rose for the lowest ratio days.

Because a known large source of carbon disulfide was located in the southern portion of the industrial area, wind roses for the highest and lowest 10% carbon disulfide concentration days were also generated in order to observe if influences from this local source were apparent (Appendix O). The source is located to the southwest of the SPWT site and the wind roses indicate that this wind direction is predominant for the highest 10% carbon disulfide concentration days and absent in the lowest 10%. The source is south of the GIBI monitor and again the highest 10% carbon disulfide concentration days indicate winds from this direction whereas the lowest 10% do not. It is also clear by looking at the BISP wind roses that the source is to the northeast. The BTRS also shows local source effects with the source to the south, southwest/southwest of the monitor and this direction accounting for over 70% of the wind directionality for the highest carbon disulfide concentration days as opposed to only 12% for the lowest concentration days with much more wind in the opposite direction (from the northeast).

Because the xylenes appeared to track together, they were combined in order to investigate the wind patterns for the highest and lowest concentration days (Appendix H). The wind roses for the GIBI and BISP sites indicate influences from the industrial area. There were winds from the southwest at the GIBI site and from the northeast at the BISP site for the highest total xylenes concentration days but few and no winds from those same directions, respectively, for the lowest concentration days at these monitors. The BTRS and SPWT total xylenes wind roses do not show the same influences from the industrial area. In fact, the BTRS wind rose indicates that the highest total xylenes concentrations occur when the winds are predominantly out of the north, northeast to the east, northeast in addition to the southeast, and that the lowest concentrations occur when the winds are more out of the south, southwest to west direction. The primary differences between the highest and lowest total xylenes concentration days at the SPWT are fewer winds from the south, southwest direction and the additional winds from the south, the southeast, and the east, northeast directions for the highest 10% concentration days.

Upwind/Downwind Analysis

An upwind/downwind analysis for carbon disulfide was also performed because the local area emissions are well understood and limited primarily to one main source (Figure N.5). For this analysis, only two monitors were able to be used because of the position of this facility with respect to the monitor locations. The opposite wind directions were both used to compare the various situations with the two monitors acting as both upwind and downwind sites. As expected, the results indicated that when the winds were out of the west, southwest (from 247.5°), the average carbon disulfide concentrations were lower at the BISP monitor (upwind) and higher at the SPWT monitor (downwind), and when the winds were out of the east, northeast (from 67.5°), the average carbon disulfide concentrations were lower at the SPWT monitor (now upwind) and higher at the BISP monitor (now downwind). It was surprising that the average carbon disulfide concentration at the SPWT was so close to that at the BISP monitor

when the winds were coming from the 67.5° degree sector, so the concentrations for the individual days were reviewed. It was found that one day with low wind speeds resulted in a high carbon disulfide concentration at the SPWT, even though the direction of the wind would mean that the monitor was upwind of the facility. It is believed that the low wind speeds for that day allowed the carbon disulfide to spread out over the area and result in the high concentration observed. When this day was removed, the average carbon disulfide concentration at the SPWT monitor plummeted from 1.60 $\mu g/m^3$ to 0.11 $\mu g/m^3$ while the average concentration at the BISP monitor only changed from 1.68 $\mu g/m^3$ to 1.64 $\mu g/m^3$, so the difference between the site upwind to that downwind became much greater.

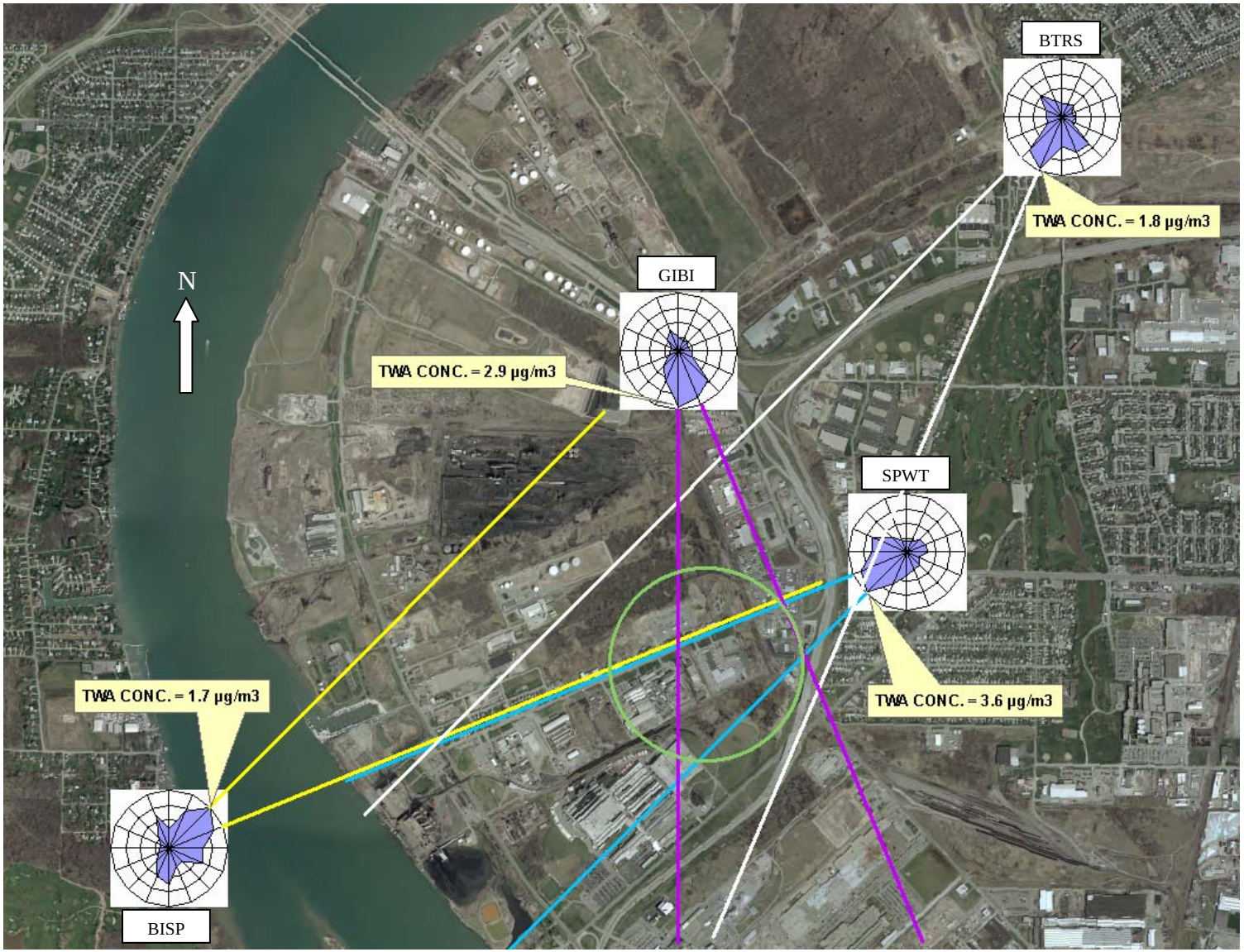

Figure N.1. Carbon Disulfide TW Pollution Roses

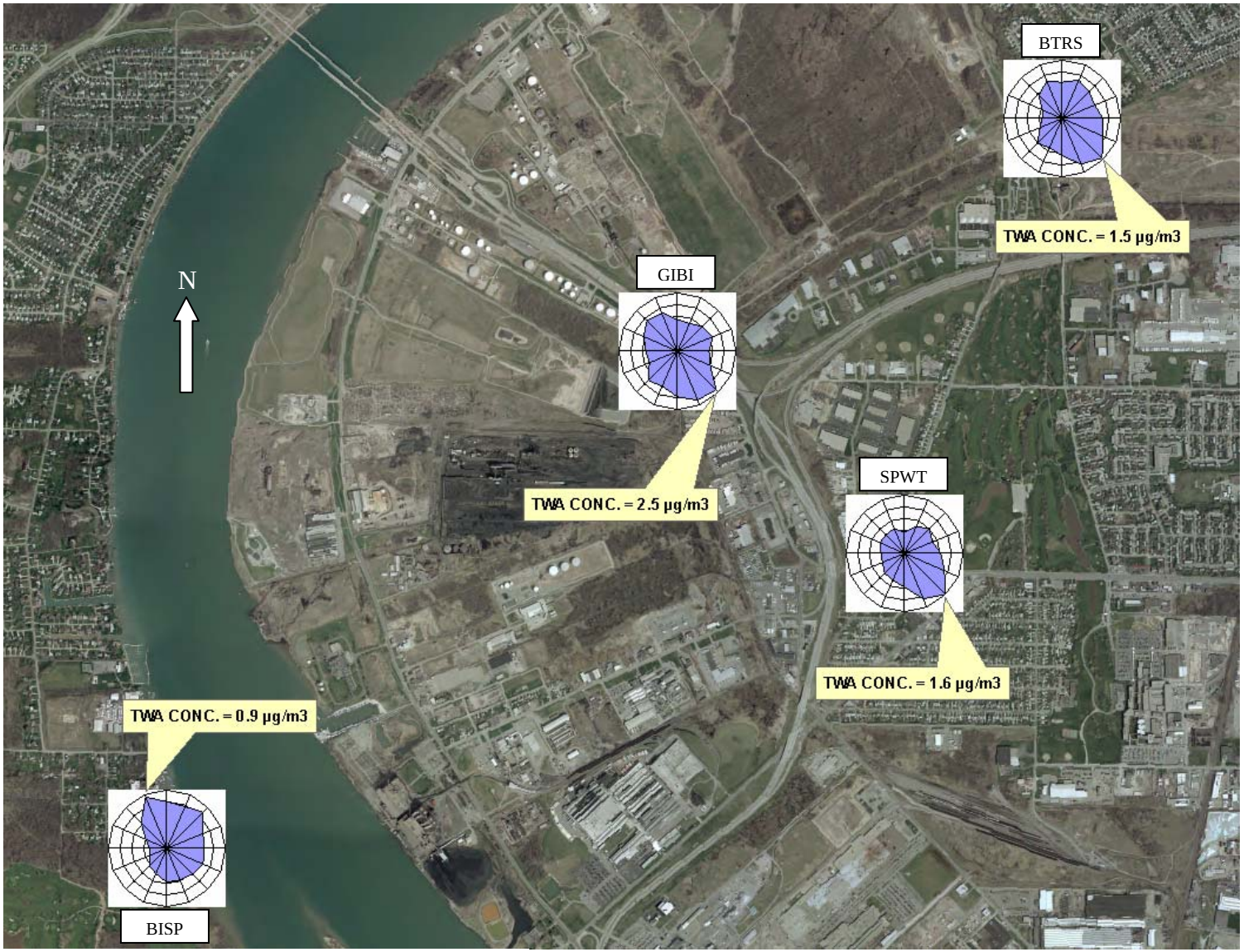

Figure N.2. m,p-Xylene TW Pollution Roses

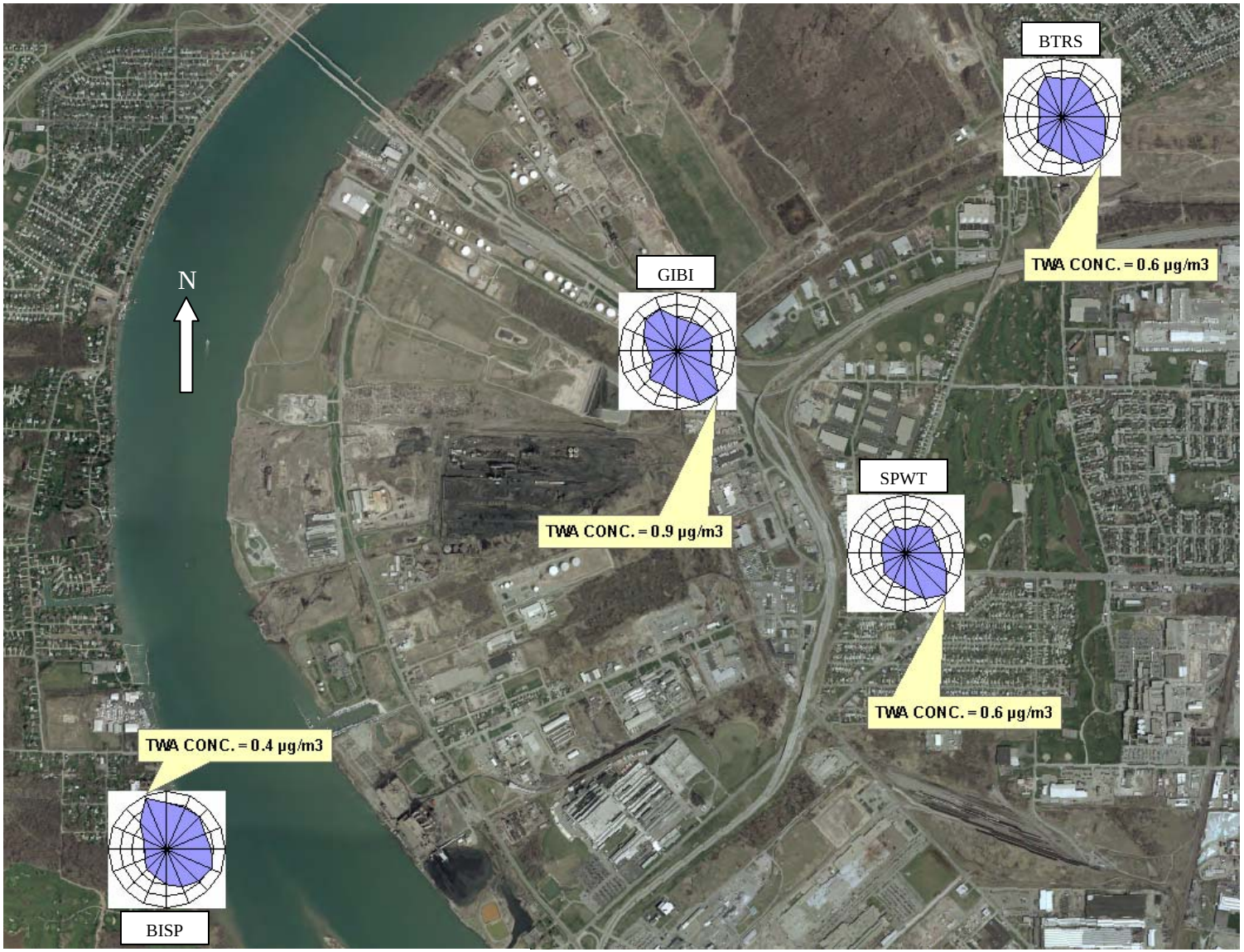

Figure N.3. o-Xylene TW Pollution Roses

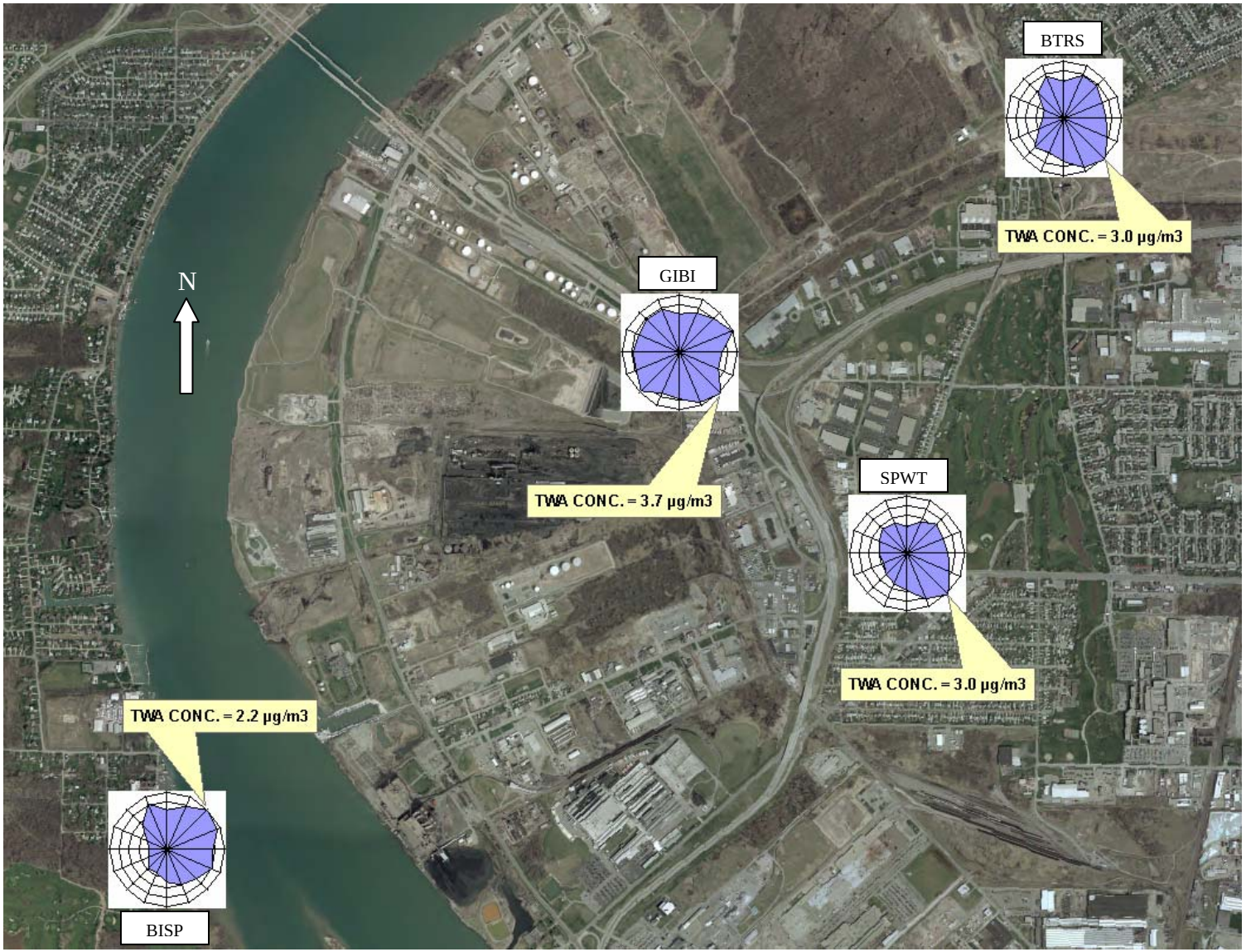

Figure N.4. Toluene TW Pollution Roses

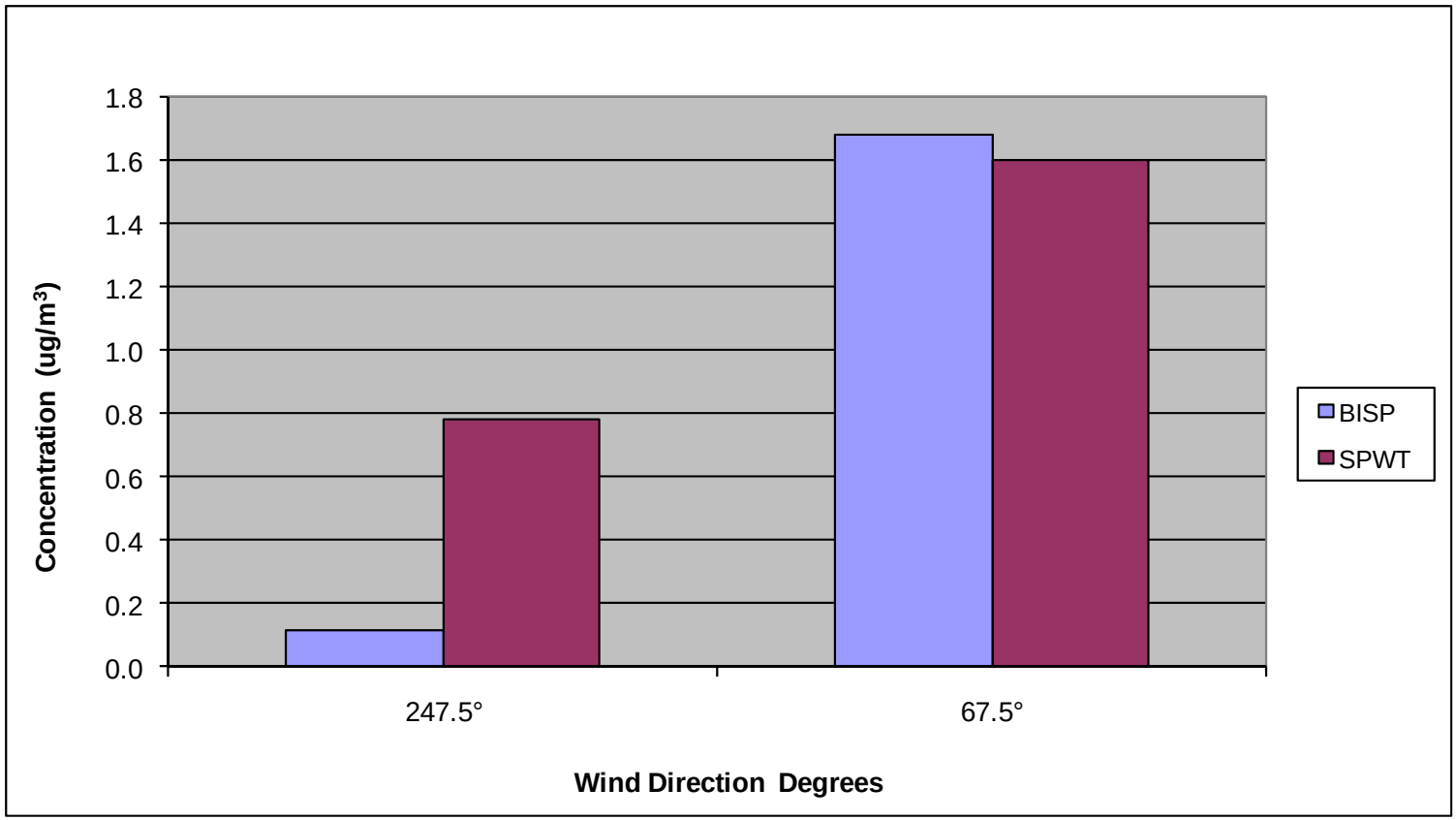

Figure N.5. Carbon Disulfide Concentrations Upwind versus Downwind of the Largest Local Area Source. The BISP monitor is the upwind site and the SPWT monitor is the downwind site with the 247.5° wind scenario and the SPWT monitor is the upwind site and the BISP monitor is the downwind site with the 67.5° wind scenario.