Appendix J
ENVIRONMENTAL AND HISTORIC BENEFIT ESTIMATION

This appendix summarizes the benefit transfer methodology for particular types of environmental and historical benefits provided by hazard mitigation. Benefits that accrue for more than one year are discounted using 2 percent and 7 percent rates.

Water quality. Benefit estimate transfer is used to measure the water quality benefits obtained from mitigation of flood hazards. Water quality benefits are primarily enjoyed by freshwater recreational anglers in the form of increased catch. The total water quality benefit is the product of the number of anglers affected by the policy and the value of additional catch. A report from the 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation estimates the value of an additional bass/trout caught per year using the contingent valuation method (Waddington, Boyle, and Cooper, 1994).

The number of anglers in the population is the percentage of those who fish but do not also hunt in the relevant state obtained from the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. The number of anglers affected by the hazard mitigation policy is equal to the product of the percentage of anglers in the relevant state, the portion of anglers assumed to enjoy the water quality improvement, and the relevant population. The negative recreational impacts of a flood event last for various amounts of time.

Drinking Water. Benefit estimate transfer is used to measure the drinking water quality benefits. A review of averting behavior and contingent valuation studies of the value of safe drinking water provides a monthly mean value of safe drinking water per household (Whitehead and Van Houtven, 1997). The drinking water benefits are equal to the expected value of the product of household benefits, the number of households affected, and the time period affected.

Outdoor Recreation Trips. Benefit estimate transfer and meta-analysis transfer are used to measure outdoor recreation benefits other than recreational fishing. The benefit estimate transfer is the average recreation value per person per activity day provided by Rosenberger and Loomis (2000). The meta-analysis transfer function is from Rosenberger and Loomis (2000). Values for state-of-the-art valuation methodology variables are chosen to calibrate the meta-analysis function.

The estimate of the number of recreation trips is the product of recreation participants and the number of trips per participant. Recreation participation estimates are from the 1995 National Survey of Recreation and the Environment. The total outdoor recreation benefits are equal to product of the individual benefit and the number of trips.

Hospitals and Hazardous Waste. The benefit estimate transfer method is used to estimate the benefits of avoiding health risk from exposure to hospital hazardous wastes. The willingness to pay estimate used is from duVair and Loomis (1992) who estimate the value of avoiding premature death from hazardous waste exposure for 25 percent, 50 percent, and 75 percent

reduction in the risk of death. The willingness to pay for a percentage reduction in the risk of premature death is extrapolated from the benefit estimates assuming linearity and various assumptions about the magnitude of the risk of exposure to hazardous waste from a hospital experiencing a natural hazard event. The total benefit is equal to the product of the household benefit, the number of households affected and the exposure time.

Wetlands. Meta-analysis transfer is used to estimate the benefits of mitigation projects that involve the purchase and removal of flooded residences that create open space areas and, potentially, functioning wetlands. The environmental benefits of these projects are estimated by applying wetland values to each acre created. We use a meta-analysis of wetland values (Woodward and Wui, 2001) and low, medium, and high assumptions for the number of acres of open space/wetlands created for each property purchased. The meta-analysis model is calibrated for the hazard mitigation application by using the mean values for independent variables included in the model and adjusting the benefit estimate for the number of wetland acres provided by the project. Wetland values are aggregated across time using various assumptions about how long the open space areas might function as wetlands.

Aesthetic, Health and Safety Benefits from Underground Power Lines. The benefit estimate transfer method is used to estimate the benefits of projects that bury power lines and provide aesthetic, health and safety benefits. A recent unpublished study estimates the willingness to pay to bury power lines (Palm Beach County, 2002). No other study has specifically addressed this issue. Annual aesthetic, health, and safety benefits are measured by the product of per household total power line benefit and the household population under various assumptions about the number of households affected.

Cultural and Historical Resources. Cultural and historical values provided by mitigation projects are estimated with the meta-analysis function in Noonan (2003). To calibrate the model, values for state-of-the-art methodology variables and site variables to best fit the case study are chosen. The cultural and historical benefits are the product of the household benefit and the number of households under various assumptions about the number of households affected by protection of the cultural and historical resources.