The results indicate that such an attack, if conducted successfully in an urban area, could result in a population dose of about 48,000 person-rem. Such a population dose would result in about 24 excess LCFs in the exposed population. If the attack occurred in a rural area, the consequences would be much lower, approximately 160 person-rem, and 0 excess LCFs. These are conservative estimates because they assume that the attack results in complete loss of containment and interdiction, and other measures that would lessen the impacts are not accounted for. Shipments associated with waste evaluated in this HSW EIS would have lower radionuclide inventories and would be expected to have correspondingly smaller consequences.

Because of the terrorist attacks on September 11, 2001, DOE and other agencies are reviewing the physical-protection requirements for shipments of radioactive materials. Any findings and recommendations from this re-examination would be incorporated into DOE's plans for shipping solid waste materials to, from, and within the Hanford Site.

H.8 Comparison with Waste Management Programmatic Environmental Impact Statement

The *Final Waste Management Programmatic Environmental Impact Statement* (WM PEIS, DOE 1997b) evaluated the nationwide impacts of managing four types of radioactive waste (LLW, MLLW, TRU waste, and high-level waste) and hazardous waste. The purpose of the WM PEIS was to provide part of the basis for DOE decisions on programmatic configurations of sites for waste treatment and disposal activities. A Record of Decision (ROD) on management of LLW and MLLW was issued on February 25, 2000 (65 FR 10061). DOE decided, among other things, to continue onsite disposal of LLW at four DOE sites and to make Hanford and the Nevada Test Site (NTS) available to all DOE sites for disposal of LLW and MLLW. The HSW EIS and WM PEIS analyzed similar configurations for treatment and disposal of LLW and MLLW and used similar methods for calculating transportation impacts. The main difference between the purposes of the HSW EIS and the WM PEIS is that the former seeks a site-specific decision on management of LLW, MLLW, and TRU waste, whereas the latter sought decisions on broader, nationwide configurations of sites for management of these and other radioactive wastes.

Given the similarities in scope and analytical methodologies between the HSW EIS and WM PEIS, it could be asked if the impacts calculated in both documents are comparable. A comparison was made between the transportation impacts calculated in the WM PEIS and HSW EIS in an effort to understand what the differences are, if any. The WM PEIS information was taken from the *Information Package on Pending Low-Level Waste and Mixed Low-Level Waste Disposal Decisions to be made under the Final Waste Management Programmatic Environmental Impact Statement* (DOE 1998) that was developed to support the LLW/MLLW Record of Decision.

This exercise led to the following observations. First, the WM PEIS scope was limited to 20 years whereas the HSW EIS covers the lifecycle of the Hanford Site Solid (Radioactive and Hazardous) Waste Management Program (through 2046). Consequently, the LLW and MLLW volume projections are significantly different, leading to differences in the transportation impacts. In addition, the WM PEIS was published in 1997, so the waste-volume projections are several years older than the waste-volume projections used in the HSW EIS. The HSW EIS volumes from offsite generators have been verified with the generator sites and are thought to be more realistic than waste volumes analyzed in the WM PEIS. Finally, some of the data was used in the transportation-impact calculations, for example, transportation-accident statistics, have been updated from previous studies. This has led to small differences in impacts relative to the differences that arise from the waste-volume projections.

H.9 Effects of Transporting Solid Waste by Rail

The analyses in this appendix assumed that all of the onsite and offsite shipments of solid waste would be conducted using trucks over existing roads. It is possible that some of the shipments of solid waste and construction/capping materials could be transported by rail. Rail shipments generally result in lower impacts than truck shipments. These lower impacts for rail relative to truck shipping are documented in numerous EISs (DOE 2002a, 1997a, 1997b). Generally, rail shipments result in lower impacts than truck shipments for a variety of reasons:

- Rail payload capacity is substantially greater than truck. This results in fewer shipments which, in turn, results in lower transportation impacts.

- There are fewer people sharing a rail line than would be sharing the highway with truck shipments. This is somewhat offset by the lower average speeds for rail shipments, which increases the exposure time relative to truck shipments.

- When a rail shipment stops at a railyard, there are many other railcars that provide shielding between the shipping container and any people. This shielding results in lower radiation dose rates, and thus lower radiation exposures, to bystanders and people living in the vicinity of rail stops relative to truck stops.

- According to recent data in Saricks and Tompkins (1999), fatality rates for truck and rail transport are comparable. For example, the nationwide accident and fatality rates for truck shipments are about 3.2E-7 accidents per truck-km and 1.4E-8 fatalities per truck-km, respectively (see Table 4 of Saricks and Tompkins [1999]). For rail shipments, the comparable nationwide accident rate is about 5.4E-8 accidents per railcar-km and the fatality rate is about 2.1E-8 fatalities per railcar-km (see Table 6 of Saricks and Tompkins [1999]). Although the fatality rate on a per-km basis is higher for rail than for truck shipments, the rail shipments travel fewer miles than truck shipments due to the higher payload capacity of the rail shipments. The higher payloads for rail shipments more than offset the difference in fatality rates, resulting in lower non-radiological accident impacts for rail shipments.

While rail shipments generally result in lower radiological incident-free and non-radiological accident impacts than truck shipments, the impacts of radiological accidents are likely to be higher for rail shipments than truck shipments. Recall that radiological accident impacts are calculated as the product of the frequency of an accident times its consequences. While the probability of a severe accident is comparable between the two modes as discussed above, the consequences of a severe rail accident would be greater due to the higher payload of rail shipments relative to truck shipments; i.e., larger quantities of radioactive materials would be released from a rail shipment than a truck shipment. This leads to generally higher