trees were constructed describing the necessary events and the frequency or probability of each step occurring to lead to a loss of containment (LOC) and ultimately a fire and/or explosion. Representative accident/failure frequency and probability values were developed from industry-available databases and FRA rail accident statistics. Several conservative assumptions were applied during the analysis to estimate failure probabilities for the LNG ISOs since no specific historical data exists for this operation. The assumptions may be evaluated and changed based upon new information, and this may lead to different and likely lower (i.e., less conservative) failure probabilities (e.g., lower risk). It was assumed that each train includes (b) (4) LNG ISO containers single-stacked in well cars, and (b) (4) cars were shipped every day of the year. Further, each of the three routes was evaluated independently to bound the maximum potential risk by assuming shipment via only one route. If the (b) (4) LNG ISOs are split among multiple routes, then the risk calculated for each route would decrease.

U.S. Census population data and Port passenger statistics were used to represent the populations surrounding the mainline rail routes, rail yards, and intermodal facilities. The populations along the proposed mainline routes were evaluated as aggregated population groupings within 1.6 miles from the rail yards and either side of the rail mainline. Along the mainline, the population was evaluated within approximately one-mile increments along the route. The maximum one-mile population density was 11,800 people per square mile, which occurred in the Miami area. This population value was used to conservatively bound the risk for mainline movement of LNG ISOs.

E.1.1 Evaluating the Risk

A commercially available software tool (PHAST Risk v6.7) was used to model the consequences of potential releases resulting in pool fires, flash fires, pressurized jet fires, and explosions, and to calculate the resulting Individual Risk (IR) and Societal Risk (SR) for the mainline and yard/intermodal facilities. Typically, stakeholders (e.g., government agencies, investors, communities) set a threshold risk level that is deemed acceptable. This is called quantitative risk criteria and may vary from region to region and depends upon the type of facility or transportation activity. Currently, the U.S. Department of Transportation (DOT) Federal Railroad Administration (FRA) has not codified quantitative risk criteria for LNG hazardous materials transportation scenarios. Additionally, QRA analyses are not common regulatory requirements in the U.S. and no broadly-accepted risk criteria are employed by domestic communities or industries.

In this report, the calculated risk was benchmarked against a similar hazardous commodity—liquefied petroleum gas (i.e., propane or LPG). The quantitative risk criteria for evaluating the IR and SR used in this report were developed from those presented for stationary LNG plants in NFPA 59A *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG), 2016 edition*. The stationary LNG plant risk criteria are not directly applicable to rail