IX. CONCLUSIONS

The purpose of this study was threefold. NIH conducted additional reviews to: 1) determine if a quantitative assessment of potential risks of the release of various exotic infectious agents into the community could be made under realistic conditions; 2) compare potential risks of infectious disease posed by the release of various exotic infectious agents into the community using fictitious scenarios; and 3) conduct alternative site analyses for three communities -- Boston-BUMC, Albany Street; Tyngsborough, MA; and Peterborough, NH.

Initially, NIH determined that, it would not be possible to attempt a quantitative assessment of risk resulting from an accident involving an infectious disease agent studied at the NEIDL, because any modeling based on realistic -- even if conservative -- assumptions would lead to a conclusion of essentially negligible risk. Therefore, scenarios that exaggerated risks were used in order to "force" an infection beyond the laboratory, allowing a comparison of the effects on the three communities. Risk assessments were performed using fictitious scenarios that "forced" four disease agents -- Ebola virus, Sabia virus, monkeypox virus, and Rift Valley fever (RVF) virus -- into the community.

Specifically, the reviews were designed to answer two questions related to comparative risk:

1) Does location of the NEIDL in an urban, suburban, or rural setting represented by Boston-BUMC, Tyngsborough, and Peterborough, respectively, affect the incidence of disease or transmission of disease as a result of the introduction of an infectious agent through each scenario?
2) Are Environmental Justice communities, if present, subjected to disproportionate health impacts as a result of siting the NEIDL near these communities in the unlikely event that an infectious agent was released?

A-BEST Modeling provided answers to all these questions. First, there was no difference in disease transmission among the urban, suburban, or rural environments of Boston-BUMC, Tyngsborough, MA, or Petersborough, NH, respectively, with respect to Ebola virus, monkeypox, or Sabia virus. Because RVF is a mosquito-borne disease that can affect livestock as well as human, RVF transmission was actually ***greater*** in Tyngsborough and Peterborough than in the Boston-BUMC location. In addition, the population size in each community did not affect the simulated rate of transmission of Ebola, Sabia, monkeypox, or RVF in the three communities. Finally, the Environmental Justice communities near Boston-BUMC were not disproportionately adversely impacted by the presence of the NEIDL on Albany Street. Indeed, because RVF transmission increased in the Tyngsborough and Peterborough locations, the modeling predicts that the Environmental Justice communities would be at a lower risk from an accident at the NEIDL than would communities in Tyngsborough or Peterborough.

Results of A-BEST simulation modeling of exotic disease transmission in the three communities being considered as sites of the NEIDL (Boston-BUMC, Tyngsborough, MA, and Peterborough, NH) demonstrated that for Ebola virus, monkeypox virus, and Sabia virus, there was no difference among the three communities in the rate or occurrence of disease after introducing the virus into each community through an infected laboratory worker or other event. A-BEST simulations also demonstrated that for RVF, the Tyngsborough and Peterborough communities were at higher risk for human disease, animal disease, and adverse economic impacts than the Boston-BUMC community. The increased number of infections and associated deaths in Tyngsborough and Peterborough is because cattle, goats, and other livestock present in those communities can become infected with RVF virus, resulting in much higher levels of virus in the environment. The species of mosquito responsible for transmitting RVF virus in the A-BEST simulation was present in all three communities at the same density (10,000 infected female mosquitoes/acre of appropriate water habitat).

The A-BEST modeling approach was not as robust in simulating a mosquito-borne disease as it was in modeling diseases transmitted person-to-person. That is because the A-BEST model can not take into account increases in the mosquito population and the movement of the mosquitoes across the affected communities. A-BEST simulation relies on available census, geographical, transportation, social, and epidemiologic data interacting within complex time and space networks that are built on traditional SEIR (susceptible, exposed, infected, removed) epidemiologic models. These data are not available for mosquito populations. Therefore, a second modeling approach (MLAB-ST) was used to simulate time and space networks that allow mosquitoes to freely move about a community and accounted for the biology of the mosquito (breeding, blood meals, infectivity, aggressive biting, etc.) and the biological interactions of mosquitoes, humans, and disease carriers.

Using MLAB-ST modeling, the introduction of disease into a community could be simulated from the time the first infected mosquito appears in the community. Results from the MLAB-ST simulation confirm the A-BEST results and indicate that RVF would not be sustained in the Boston population; whereas in Tyngsborough and Peterborough, once introduced, the spread and persistence of RVF virus was helped along by infected livestock, resulting in significant human disease and even death. These simulations also grossly overstate the disease probability, because no commonly used public health or medical interventions were introduced into the model (e.g., vaccination of livestock for RVF, use of insect repellents, medical interventions, or supportive therapy). However, they are accurate in their estimates of the ***relative*** probability of infection among the three communities

Considering the impact of all four diseases across the three affected communities, it is clear that the identified Environmental Justice populations surrounding the Boston-BUMC Albany Street site would not be subjected to disproportionate adverse health effects should Ebola virus, Sabia virus, monkeypox virus, or RVF virus be introduced into the general population through an infected worker, infected pet, transportation accident or other mishap. In fact, the nature of the communities surrounding Boston-

BUMC (e.g., urban environment, lack of animal carriers of the virus, etc.) places citizens of these communities at much less risk of acquiring a RVF infection than persons living in Tyngsborough or Peterborough.

Results of the additional site analyses for the three potential NEIDL locations reveal that the Boston-BUMC Albany Street site was superior and more appropriate than either Tyngsborough or Peterborough for construction and operation of the NEIDL. Although an Environmental Justice community is present near Boston-BUMC, because the Environmental Justice community actually faces either the same or ***lower*** risk than the suburban or rural locations, the mere presence of Environmental Justice community is not reason to avoid the Boston-BUMC location.

Figure VIII-8 compares the overall suitability of the Tyngsborough, Peterborough and Boston-BUMC sites as locations for construction and operation of the NEIDL.

Based on the results of the additional risk assessments and site analyses of the three potential NEIDL sites, the Boston-BUMC Albany Street site was determined to be the best site for construction and operation of the NBL.