4. THE EXISTING ENVIRONMENT AND POTENTIAL ENVIRONMENTAL IMPACTS

4.1 INTRODUCTION

This chapter describes the community and human elements that partly make up the local environment that could be affected by the proposed action. These elements include regional setting and climate, general area land use, available community resources, natural resources, worker and public health and safety and impacts from operation of the Helios.

The proposed action is expected to have moderate impacts due to land disturbance during construction (temporary); moderate to minor impacts due to long-term land use and building and Helios operation; and minor safety and health impacts from all identified activities. Note that only potential negligible impacts due to noise, non-radiological air quality, radiological air quality, surface water quality, ecology, floodplain and wetlands, and threatened and endangered species are expected. There should also be no substantial adverse impacts on groundwater, geology and soils, cultural resources, socioeconomic, and environmental justice concerns. Thus, the impact analyses that follow, that include items of regional and community concern, focuses on temporary land disturbance concerns, Helios as a radiation source, and related potential impacts to stormwater management, ecological resources, and human health.

The sites proposed for construction, all within the developed sections of the site are in the proximate vicinity of existing structures and support areas such as parking lots and utility corridors. The proposed substantial additions to floor space and parking for each of the new construction projects should provide long range building and travel usage efficiencies and some aesthetic benefits that may not be fully addressed in this EA.

All comments received from reviewers of the draft EA have been satisfactorily addressed in this final NEPA document. Reviewer satisfaction was confirmed and is documented by the correspondence included in Appendix B.

4.2 REGIONAL SETTING AND CHARACTERISTICS

4.2.1 Site Location

Jefferson Lab is located in Newport News, Virginia. Newport News is bounded on the east by York County and the City of Hampton; on the north by James City County and the City of Williamsburg; on the west by the James River; and on the south by the Hampton Roads waterway. Jefferson Lab is located just east of Jefferson Avenue, a main area thoroughfare, and is less than one mile to the west of Interstate 64. The site is just south of Oyster Point Road and just north of Middle Ground Boulevard. The general vicinity layout of Jefferson Lab is included as Figure 1. Two schools and railroad tracks serving the local rail system are located within one mile of the site. Newport News-Williamsburg International Airport is located two miles to the north. Figure 2 shows the Jefferson Lab site property and the proposed building sites identified in this EA.

Jefferson Lab is sited in the northern section of Newport News at an average elevation of 34 feet above mean sea level (MSL). The site elevation ranges from approximately 29 to 35 feet above MSL, which is above the 100-year floodplain level of 13 feet above MSL. The Jefferson Lab site is located in the coastal plain of the lower York-James Peninsula. The site is a part of the Brick Kiln Creek watershed, which discharges into the Big Bethel Reservoir. Big Bethel Reservoir is operated by the U.S. Army and

provides drinking water to Fort Monroe, Langley Air Force Base, and the National Aeronautics and Space Administration (NASA)-Langley Research Center.

4.2.2 Local Climate

The meteorology of the Jefferson Lab site is strongly affected by the nearby marine environment. The Chesapeake Bay moderates the climate and weather of the site, with land-sea breezes dominating the wind patterns during much of the year. The mean monthly temperature for the Newport News area ranges from 4°C (40°F) in January to 26°C (79°F) in July. The record low temperature is -19°C (-3°F) and the record high is 40°C (105°F). Note that temperature values are based on information from the International Station Meteorological Climate Summary, Version 4.0 (Washington Post 2001). Data is compiled using a 57-year history.

Normal annual precipitation is 112 cm (44 in.) spread evenly throughout the year. Extreme precipitation events, caused by hurricanes or tropical cyclones, have deposited as much as 29 cm (11.5 in.) of rain in a 24-hour period. Average snowfall is 23.1 cm (9.1 in.), but up to 35 cm (14 in.) has fallen in a month. Because of the proximity of the Bay, fog is a common occurrence in the area. Heavy fog, reducing visibility to less than 0.4 km (0.25 miles), occurs an average of 23 days/year. Severe weather, in the form of thunderstorms, averages 37 days/year. Tornadoes are rare in coastal Virginia but may be spawned by severe thunderstorms or when associated with hurricane or tropical cyclone activity. Hurricanes average less than one per year in Virginia, but have caused both wind and flooding damage to the area since colonial times (Gale 1978).

4.2.3 Air Quality

The Jefferson Lab site is located in the Hampton Roads Intrastate Air Quality Control Region (AQCR) 223. The AQCR is in attainment with all criteria pollutants: sulfur dioxide, nitrogen dioxide, total suspended particulates, carbon monoxide, ozone, and lead, but remains a Clean Air Act maintenance area for ozone.

4.2.4 Site Conditions

The proposed construction areas, all located on DOE property, do not have any known chemical, radiological, or other contamination in area soils, surface waters, or groundwater. The 1987 EA noted that the facility would be located on previously disturbed land, referring only to the areas around the existing buildings (DOE 1987). One of the buildings, now called the Test Lab, did have radiological contamination but was successfully cleaned up prior to occupancy by Jefferson Lab. Although a new site specific environmental investigation was not performed specifically for this proposed action, the DOE has determined that, as there has been no reported spills or known contamination found on the DOE owned property to date, except as noted for the Test Lab, and that groundwater monitoring across the site has been performed since 1989 and has identified no water quality concerns, that no site investigation is necessary at this time. The determination that no new investigation was necessary is based on these sources of information: the 1987 EA (DOE 1987); on-site groundwater monitoring records from permitted wells (VPA 1989, VPDES 2001); results from sampling effluent at a permitted groundwater withdrawal point (DEQ 1994); a search of databases in January 2002 for local area information that included reported spills and waste facilities; environmental reports provided annually to the DOE and the public; and Jefferson Lab staff knowledge. It is understood that conditions at each of the construction areas will be evaluated during the course of the excavation work, and if concerns are identified, appropriate mitigating actions will be taken as noted in Section 4.4.

4.3 COMMUNITY RESOURCES

4.3.1 Demography and Settlement Patterns

The Jefferson Lab site is now part of the Jefferson Center for Research and Technology, and is situated just north of Oyster Point Industrial Park.

The population of Newport News has steadily grown over the last 20 years, since documented in the 1987 EA. The 2000 census showed that 180,150 people lived inside Newport News (U.S. Census Bureau, 2001) vs. 144,903 in the 1980 census. The growth rate since 1980 is 24%. The Metropolitan Statistical Area, that includes Norfolk, Virginia Beach, and Newport News was estimated to have a population of 1,562,635 in 1999, up 30% from the 1,201,400 documented in the 1987 EA.

4.3.2 Area Land Use

The local Oyster Point area was developed to serve industrial and business needs, and both City and industrial development continue throughout the area. The proposed project will take place on land already occupied by Jefferson Lab. The sites for each of the proposed construction actions are directly adjacent to existing facilities that are used in support of the Lab's mission.

4.3.3 Public Services

The city of Newport News has an adequate quality and quantity of public utilities and services to support Jefferson Lab and the continued area development. The proposed action would have a negligible impact on current public services.

Natural gas is supplied by Virginia Natural Gas Company. The electrical service is provided by Dominion Virginia Power and is brought onto the site by 3 feeder lines, including through a 40 MVA master substation on the accelerator site. Water to serve site usage is provided by the City of Newport News Waterworks via two water mains. The Hampton Roads Sanitation District (HRSD) handles sanitary waste and local area landfills accept generated trash. Fire and Emergency Services are provided by the City of Newport News, with the closest station within one-half mile from the site.

4.3.4 Transportation

All vehicles traveling to the site gain access by way of Jefferson Avenue (Route 143) with a limited access entrance via Canon Boulevard. Both roads are capable of supporting current traffic loads. This proposed action is expected to have little to no effect on local traffic.

4.3.5 Economic Structure

The 1987 EA identified that there were over 150,000 people participating in the Virginia Peninsula labor market. The City of Newport News Department of Planning and Development has updated that figure so that it is estimated that there are 760,000 people currently participating in the highly diverse Peninsula labor market. Note that the Peninsula refers to all cities and counties south of Williamsburg. Newport News firms draw employees from across the Peninsula, the Norfolk-Portsmouth areas, and other areas within driving distance. Service, manufacturing, technical, sales, and administrative support positions make up a majority of the work force.

Labor for proposed construction projects would be drawn, project by project, from the area labor pool by the respective subcontractor. Minimal new staffing is expected, as practically all the labor to staff the new structures and to operate the Helios would be drawn from the pool of SURA staff and visiting researchers that already are present at Jefferson Lab. Therefore, only minor impacts to the local population, services, and economy would be expected during the larger construction projects, otherwise no impacts would be expected.

With regard to environmental justice, there would be no disproportionate adverse impacts on minority and economically disadvantaged populations in the Newport News area because no major adverse impacts are expected from any aspects of the proposed action. This is because any identified adverse impacts would be limited to the Jefferson Lab site.

4.3.6 Historic, Aesthetic, and Cultural Resources

No previous investigations have been performed to determine the presence of subsurface historic or archeological features. This was based on a Virginia Historic Landmarks Commission determination that one was not needed, as cited in the 1987 EA. The Project Review Supervisor at the Commonwealth of Virginia Department of Historic Resources (VADHR) advised DOE in 1992 that no adverse impacts to archaeological and historic resources would be expected from activities at Jefferson Lab. It was also documented that no survey was required when the 1997 EA was prepared. Major construction has occurred since 1987 and no trace or sign of historic or archeological value has been noted. For this action, the DOE requested reaffirmation that no survey was required through a letter to the VADHR. The VADHR responded with a request for information on the age of existing site structures, which were provided to the VADHR by letter, dated August 29, 2001. The VADHR responded, in a letter dated September 6, 2001, reaffirming that the proposed actions in the EA will not affect historic properties. Based on the correspondence regarding this action (see Appendix B), it is apparent that no archeological surveys need to be performed.

The local peninsula area has a vast array of cultural and historic resources, with none in the immediate vicinity of Jefferson Lab. The current facility has preserved some visually pleasing original vegetation buffers along the periphery of the site. Landscaping around buildings and along the main site entranceways was performed for aesthetic reasons.

There are no impacts to any historic or cultural resources, so no mitigations are addressed. If an item or evidence of an area of historic significance were found during this project, no action would be taken until an appropriate mitigation strategy was worked out. As for aesthetics, various trees at CEBAF Center and the FEL Addition and a portion of the vegetation buffer at CEBAF Center and the new Storage Building will be removed under this proposed action. These actions will be mitigated by incorporating native plant species that are low maintenance and resource-friendly into the landscaping at each of the disturbed areas.

4.3.7 Not Applicable Considerations

The Commonwealth of Virginia Department of Conservation and Recreation, Division of Natural Heritage (VADCRDNH) confirmed, in correspondence to the Commonwealth's Department of Environmental Quality (DEQ) dated November 20, 2001, that this action would not affect federal or state listed rivers or have an impact on existing or planned recreational facilities. As well, the Virginia Department of Transportation said there would not be an impact on existing or planned transportation facilities. The Commonwealth's Department of Forestry said there would be no significant impact to Virginia forestlands, however, precautions to protect trees in the vicinity of the construction projects will be taken as identified in Section 4.4.9.2.2. Other actions that did not have to be considered in this EA involve prime farmland, Native Americans, aesthetically important areas, scenic rivers, and special natural resources such as aquifers.

4.4 RESOURCES AND ENVIRONMENTAL IMPACTS

This section presents the expected level of environmental impacts for each factor that is taken into account for this proposed action. The three main focus areas, construction impacts, long-term land use and building operations, and impacts due to Helios, are noted below. Areas with minimal or no impact are noted in Section 4.3.7. Impact information on specific species is discussed in Section 4.4.9. The DOE

advocates P2 principles that include source reduction, energy efficiency, waste minimization, and EPP. Therefore, the DOE intends to integrate these principles into all phases of the proposed action.

This assessment takes into account that, by implementing the general performance criteria provisions of the Chesapeake Bay Preservation Area Designation and Management Regulations (CBPADMR), the impacts to the environment will be minimized to the extent possible. These provisions include minimizing erosion potential, reducing the land application of nutrients and toxics, maximizing rainwater infiltration, and ensuring that these performance criteria are incorporated in a long term site strategy.

Construction Effects:
The proposed construction areas are all located on DOE property. There is no known chemical or radiologically contaminated soil or groundwater within the limits of the proposed construction sites or anywhere on the DOE property. If any unusual materials are encountered at any of the construction sites, sampling will be performed to identify possible contaminants. If any are identified, all appropriate means will be taken to remove contaminated materials and provide for proper disposal. Also, soil conditions within the proximity of an accelerator enclosure or building will be checked by radiation control staff in the course of any excavation to verify that no special soil handling precautions are necessary. If a problem is identified, the soil will be collected as directed by radiation control staff and disposed of as a low level radioactive waste. Refer to Section 4.2.4 for more information on existing site conditions.

Construction activities and the resultant disturbance will be separated by both location and phasing and would be spread over a number of years. Each specific construction activity would range in duration from one to three years. All new structures and their associated parking will have a moderate impact on local drainage patterns, so surface water and stormwater are addressed in Section 4.4.2. Air and noise quality impacts, potential transportation effects, and waste management implications resulting from construction activities are also presented starting at Section 4.4.4. As each of these concerns can be mitigated with proper planning and controls, no large impacts should result.

In order to integrate environmental stewardship and P2 principles into the construction phase, the DOE intends to perform the following: include related guidance and directives in the building design scopes and encourage and support opportunities to conserve natural resources during design and construction that could aid in minimizing impacts.

Long-term Land Use and Building Operations: The multiple construction projects will involve the disturbance of about 8 acres of vegetated land, with the permanent removal of almost all of it from serving its natural drainage function. Some of the disturbed land will end up reducing local wind and noise buffer zones. The impacts due to the change in local land use and utilizing the new buildings are considered here. The proposed changes are needed to support Jefferson Lab operations and the land disturbance is typical of that occurring throughout the local area. The entire Oyster Point area, including the Jefferson Lab site, is zoned for industrial use. This means that continuous industrial-related development by Jefferson Lab, the City, and by neighboring businesses is a normal process. Jefferson Lab, through long range planning, attempts to minimize land disturbance. Jefferson Lab will use best management practices to optimize building and parking layouts to minimize negative effects to the environment.

The architect/engineering firm tasked for each building will be required to design the buildings to incorporate healthful and environmentally beneficial features into the structures. The Jefferson Lab Environmental Protection Program elements that encourage reducing waste at the source,

promoting the reuse of items, and recycling to the maximum extent will be emphasized by line management and integrated into the building designs to the extent possible.

Also in place is the Spill Prevention, Control, and Countermeasure (SPCC) Plan that is the site program to minimize spills from any oil-containing items and the contractor's Environment, Health, and Safety (EH&S) Manual procedures that document the procedures for the proper handling and storage, including secondary containment for chemicals and/or waste materials stored outside.

Proposed construction and use activities at the projects within the accelerator site would not change the accelerator site's industrial nature. Only a small part of the forested buffer to the south will be disrupted. The actions at CEBAF Center, which is located closest to Jefferson Avenue, will result in some forest buffer removal and this will have at least a moderate impact on the environment. The installation and operation of Helios in the proposed FEL Addition will simply augment the research activities already in progress, so no change in land use is associated with Helios operation.

Note that all potential impacts regarding land use, building and site layouts, and building operations will be mitigated and addressed during planning and incorporated into the individual project scopes. Factors that could have long-term effects are considered in the discussions below.

Helios Installation and Operation: Helios installation and operation will occur within the proposed FEL Addition. The effects of the construction of the FEL Addition are addressed above. Thus, this portion of the impact analyses addresses (1) installation of Helios in the FEL Addition, (2) operation of Helios as an independent device, (3) new experimental apparatus within the proposed FEL Addition, (4) operation of Helios to support experimental apparatus, and (5) operation in conjunction with the existing FEL machine.

This analysis is being prepared to assess the potential for radiological and non-radiological impacts to the public and workers and the potential for activation in the surrounding environment. The factors to be considered, indoor and external radiological air quality, the potential for water activation both within and outside the building, worker safety, and worker and public health concerns are primarily addressed in Section 4.5. Very minimal to minor impacts are expected, as the radiation and power levels involved with Helios operation are very small and is thus a very low hazard machine. Helios operations will use the same type of controls and support equipment that is currently in use for the existing CEBAF and FEL accelerators.

4.4.1 Coastal Zone Management Act Considerations

4.4.1.1 Coastal Zone Management Act (CZMA) as implemented in Virginia as the CBPADMR

All of the relevant regulations under the CZMA that could apply to the activities described in this proposed action have been taken into consideration in this EA. According to City of Newport News Department of Planning and Development correspondence dated April 25, 2001 included in Appendix B, there are no areas on the Jefferson Lab site that are designated as either a Resource Protection Area (RPA) or a Resource Management Area (RMA) under the CBPADMR. As further documentation of the site status under the CBPADMR as requested by the DEQ, an area review to determine the presence of RPA features was performed in early 2002. This review clarified that there is at least a 500 foot separation between the DOE site and any designated RMA so that the site does not encroach on any RMA or RMA buffer zone. The local RMAs are located as show on Figure 4. Area soil maps indicate that there are no City of Newport News defined "highly erodible soil" types on the Jefferson Lab site. As this was the only

potential RPA or RMA feature on the site, it is concluded that there are no RPA or RMA features that need attention under the CBPADMR.

As the site is situated on a coastal plain where it could potentially have a small impact on downstream CZMA designated areas, the DOE has provided a Certification of Consistency in Section 4.4.1.2. The resources described in the relevant CZMA regulations, and how DOE is addressing them and any necessary mitigation measures in regards to the proposed action, are discussed below. Based on this EA review, it appears that there should be no adverse impacts to any of the resources described under the CZMA, which includes resources in any designated Chesapeake Bay Preservation Area (CBPA).

~~4.4.1.2~~4.4.1.2 CZMA Consistency Certification

Although the Jefferson Lab property does not fall under the purview of the applicable Virginia law, the Chesapeake Bay Protection Act, the requirements of the CZMA have been reviewed. To be consistent with the CZMA programs, the DOE intends to obtain all applicable permits and approvals listed in the Virginia program prior to commencing this action. Upon granting of a permit or other approval, the DOE affirms that it will comply with any identified terms and conditions, as well as with the goals and objectives of the CBPADMR and other relevant regulations, to the maximum extent practicable. How the requirements of the CZMA are being addressed regarding this proposed action are discussed here.
The applicable Regulatory Programs that require addressing under the CBPA and Virginia's Coastal Resources Management Program (VCP) follow:

- Coastal Lands Management: The Jefferson Lab site in Newport News has not been designated by the local government as a Chesapeake Bay RPA or RMA, as defined in §10.1-2107 of the CBPA. This was documented in correspondence dated April 25, 2001, which is included in Appendix B. The average site elevation, of roughly 32 feet above MSL, places Jefferson Lab outside of the nearest RMA. Refer to Figure 4 for the locations of local RMAs.

  By taking due care to avoid, or minimize as possible, the discharges of any sediments from any of the construction areas, no impacts beyond the immediate construction areas are expected, so there should be no chance of any effect beyond the site boundary. There will be only minimal discharges, such as from cooling towers, expected from the use of the new buildings and Helios. Therefore, there is effectively no chance of any impact to any downstream coastal areas of concern.

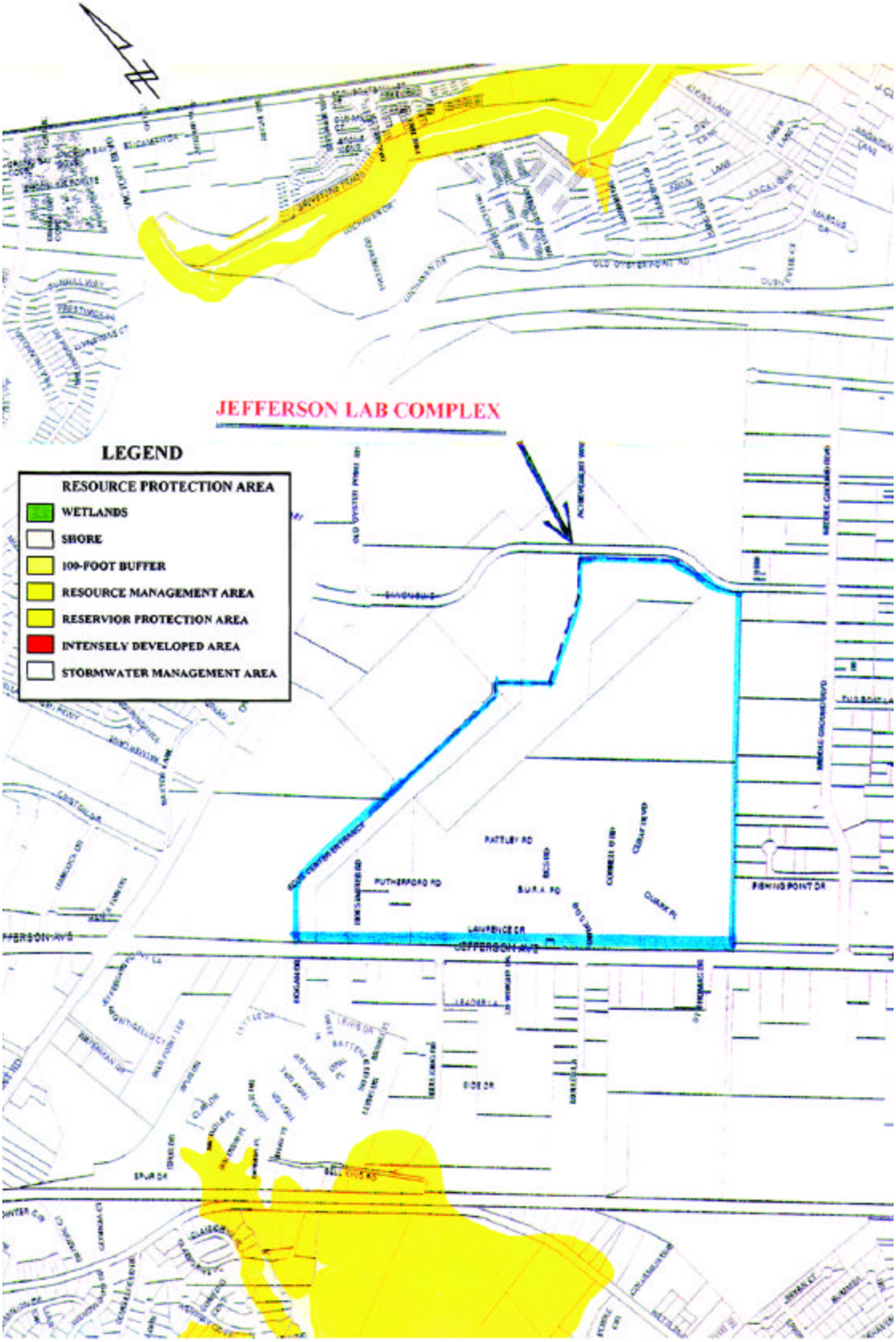

Figure 4 Jefferson Lab Area RMA Map

- Wetlands Management: No wetlands were identified at any of the proposed construction sites as identified in the Wetland Delineation and Threatened and Endangered Species Survey (REMSA, Inc. 2001). The Corps of Engineers, as documented in Appendix B, verified that none of the proposed construction areas had any wetlands. As land disturbance will be strictly limited within the defined construction sites, there will be no impact on adjoining on-site areas and, therefore, no impact that would disturb or otherwise affect any other wetlands that could be in the general vicinity of the laboratory. Any discharges from building operations, such as cooling towers, if directed to existing storm channels, should have no adverse affect on any downstream wetlands. As no offsite impacts are expected from construction or operations, no coastal or other wetlands should be affected by this proposed action.

- Non-point Source Pollution Control: All construction projects will be managed for erosion and sediment control, following at a minimum the Virginia Erosion and Sediment Control Law. This proposed action would have a temporary moderate impact at each construction location. To mitigate this disturbance, Erosion and Sediment Control (E&SC) plans will be required for each individual activity, and one or more permits will be obtained as identified applicable. Proper E&SC practices, to be overseen by a robust inspection program, will ensure that impacts are restricted to within the limits of construction for each activity. No other disturbance to the Jefferson Lab site beyond the construction limits is expected. There should be no non-point sources affecting surface water from building use or Helios operations. So, no offsite effects at any downstream locations are anticipated.

- Stormwater Management: Stormwater retention BMPs will be implemented with the new projects in order to address runoff concerns, such as from construction-related sediment. The practices to be implemented will be identified in a pending stormwater management study. Refer to Section 4.4.2.2. The DOE will implement control measures consistent with the performance standards in the CBPADMR so this proposed action should not have a negative affect on offsite stormwater quality.

- Point Source Pollution Control: The only potential point source discharges are from: construction dewatering, which is expected to be none to minimal; cooling towers for equipment, with expected minimal to moderate amounts of discharge; and accidents, with a low to minimum likelihood of occurrence. No more than minor impacts would be expected from these possible point sources, as the discharges would be no different from those already addressed under existing programs. These programs include E&SC Plans, permits, and other site programs that address spill control and accident prevention. Any identified dewatering or cooling tower discharges would likely be incorporated into an existing site permit, with new permits obtained if identified necessary (VPDES 1998; HRSD 1999). No offsite impacts are expected.

- Air Pollution Control: No local or regional impact on National Ambient Air Quality Standards (NAAQS) parameters is expected from the construction activity, building use, or from Helios operation. Refer to Non-radiological Air Quality in Section 4.4.4.

The Jefferson Lab site is not directly adjacent to beaches or tidal areas so a number of enforceable regulatory programs comprising the VCP do not apply so are not addressed here. These programs are: the Fisheries, Subaqueous Land, Dunes Management programs, and Shoreline Sanitation.

No potential downstream effects on Coastal Natural Resource Areas and other shorefront property identified in VCP Advisory Policies are expected. Refer to the sections above on how non-point and point source pollution control shall be addressed.

4.4.2 Water Resources

The facility site is located on the York-James peninsula, situated between the York and James Rivers, part of the eastern Coastal Plain of Virginia. Groundwater is located at shallow depths and drainage is provided to alleviate seasonal flooding due to heavy precipitation. Even with proper drainage controls, the site is susceptible to flooding from major precipitation events.

As land disturbance will be phased by project, the DOE intends to use controls to maintain water quality and flow quantities during significant rainfall events during construction and long term operation so as not to have a major impact on or off the site. The next two subsections address the situations involving surface water quality and stormwater flow.

4.4.2.1 Surface Water

On site surface flow is made up of rainfall, of which a small fraction is from City property, ongoing structural dewatering effluent, and some cooling tower discharges. The DOE facility is located in the watershed of Brick Kiln Creek, which discharges to the Big Bethel Reservoir. An area topographic map is provided as Figure 5 at the end of this Chapter. There are no perennial streams on the site, though there are some small, ephemeral streams and storm channels just beyond the DOE site boundary. Localized ponds that form during storm events are drained through surface channels and groundwater recharge. Stormwater flow management is discussed in Section 4.4.2.2.

The Big Bethel Reservoir, located roughly 2.7 km (1.7 miles) east of the property, is owned by the U.S. Army at Fort Monroe, and is the water supply for 20,000 personnel at Fort Monroe, Langley Air Force Base, and the NASA Langley Research Center. The U.S. Army surveys the water quality of the Reservoir. The DOE Site Office informs the Fort Monroe U.S. Army Corps of Engineers annually regarding groundwater withdrawal quantities and other information that could affect the flow to the Big Bethel Reservoir.

In the course of implementing this proposed action, the DOE shall comply with the terms of applicable federal, state, and local regulations and directives with regards to surface waters, including Virginia's Erosion and Sediment Control, see below, and stormwater management programs, see Section 4.4.2.2. The DOE will cooperate with state, regional, and city agencies and departments to ensure that surface water quality concerns are given appropriate consideration through all activities described in this EA. DOE will ensure that SURA flows down applicable provisions of federal and state agency policies and mandates to its subcontractors as required in the DOE/SURA Contract.

> Construction: Expected impacts could result from erosion and sedimentation to on-site stormwater channels and from increased storm flows with the loss of vegetated ground from land disturbances during on-site construction. Up to 5 acres would be affected at any one time, for a total of about 8 acres overall. Impacts due to the potential for increased storm flow runoff are discussed in Section 4.4.2.2.
>
> Standard erosion control measures would be implemented prior to and during disturbance of soils to minimize runoff and the potential deposit of sediments in surface waters and include the protection of stockpiled earthen materials. These measures would be identified in the form of one or more either site-approved or agency-approved E&SC Plans. The plan or plans would be prepared and provided to the DEQ in support of a General VPDES Permit for Discharges of

Stormwater Associated with Construction Activity that will be obtained prior to the initiation of any construction activity. As E&SC plans will be utilized to minimize any disturbance outside of the immediate construction area, there should be no impacts due to erosion or sediment on adjacent on-site or offsite areas or regions further downstream that may have CBPA designations. No mitigation of impacts from sedimentation is expected to be necessary after construction and area stabilization is complete.

It is anticipated that there will be no herbicides or pesticides, beyond termite controls, used during construction. If identified necessary for a specific problem, the product will be selected so as to minimize toxicity and used only in accordance with manufacturer's instructions.

Operations and Use: The actions identified in this EA are not expected to influence the quantity or quality of the dewatering effluent that is discharged from the experimental halls to the surface. Cooling towers that discharge to the surface are discussed under 4.4.1.2. At least one new cooling tower has been identified under this proposed action. There would be only minor changes to surface flow and minimal impact to site surface water quality as a result of this action. Incorporating the tower effluent into an existing site permit (VPDES 1998; HRSD 1999), after coordination with either the DEQ or the HRSD, would address the mitigation of this discharge. Impacts involving stormwater flow during long term building operation and use are discussed in 4.4.2.2.

Long-term operations should not result in an increase in the use of vehicles on the site and the implementation of existing site practices and procedures will ensure that potential contaminants are properly transported and stored. There are no plans for outside storage of liquids included in this proposed action.

If any herbicides, pesticides, or fertilizers are to be used during normal operations and landscape maintenance, an integrated approach will be used. The herbicide, pesticide, or fertilizer will be selected so to minimize toxicity and would only be used according to manufacturer's instructions. Any usage of toxic materials within the proximity of any storm channel would be prohibited. As a result, very limited impacts from the use of chemicals for pest control and landscape maintenance are expected, as use will be carefully managed, with no such materials being stored on the Jefferson Lab site. There should be no impact from unintentional applications, spills, or runoff to surface waters.

With no changes in dewatering quantities, using properly implemented E&SC measures, incorporating cooling water discharges into an existing permit, using stormwater controls noted in Section 4.4.2.2, and by strictly minimizing the use of any toxic substances, only minor impacts on the site and no impacts on offsite surface waters are predicted from construction or from building and Helios operations as described in this proposed action.

4.4.2.2 Stormwater Control

The removal of wooded and other vegetated areas from serving their natural functions continues in the Oyster Point area, as the City and other Oyster Point area developers continue to restructure the local landscape. This area development, as performed throughout the business and industrial zoned Oyster Point area, has added more challenges to the City management of area stormwater, and the DOE will cooperate as practicable. The City, in a letter dated December 20, 2001 in response to the draft of this EA, questioned the Jefferson Lab site's current and future stormwater retention capability.

The site's current retention is structured so that almost all non-developed site areas and all storm channels are vegetated to the extent possible and the change in elevation across the site is minimal so surface

waters generally permeate into the ground or move slowly across the site. The vegetated open grounds and storm channels collect storm runoff, from the Jefferson Lab site and a fraction of the City property, and Jefferson Lab dewatering and cooling tower effluents. Note that there are two sluice gates, one at each of the two site water outflows that were installed as control measures to contain chemical or oil spills on the DOE site and were not intended to control stormwater.

The DOE will address runoff as provided in applicable Federal, State, and local regulations and agreements, including the general performance criteria identified in the CBPADMR, and the terms and commitments for a planned VPDES general permit for Stormwater Discharges During Construction Activities. The effects on surface waters and site retention capabilities from additional loading due to stormwater runoff, both during construction and with long-term operations, will be minimized to the extent practical. These criteria include minimizing overall disturbance, preserving existing vegetation, and minimizing impervious cover to the extent practicable.

To address the City concerns regarding the site's stormwater control status, and to assist in the determination of effects on stormwater flow quantities due to this proposed action, a site wide stormwater drainage study is to be performed in FY 2002. This stormwater management study is being contracted to provide a comprehensive evaluation of current and future stormwater flow and control requirements. This study will consider all existing site drainage channels and features, including the possible use of the sluice gates for stormwater control. The study objectives also include determining measures to improve current site stormwater management practices if identified necessary, and to document a plan to address the effects of this proposed action and possible future on and offsite actions that could affect the DOE property. Adjacent undeveloped SURA and City land, that could be made available to the DOE, will also be considered in the study if an opportunity for additional open space or a stormwater retention area is identified necessary.

The DOE will discuss the results of the stormwater management study with the City and the Hampton Roads Planning District Commission (HRPDC). The study results will be used to develop a stormwater pollution prevention (SWP2) plan, that will cover all EA construction activities, to be used in support of the VPDES general permit noted above for the actions described in this EA. The DOE will work with the City and the HRPDC to ensure their concerns involving the new construction actions are addressed.

This additional stormwater runoff will utilize at least one water quality BMP to be identified in the pending site drainage study. The DOE will use available resources and BMPs to ensure that stormwater flow leaving the Jefferson Lab site, including the proposed 8 acres of newly impermeable land, is managed to minimize downstream impacts in the event of a major storm event.

DOE commits to perform BMPs and other measures to assure that no stormwater, beyond present site levels, leaves the site in the event of a major rainfall event. Critical measures provided in the stormwater study to address existing runoff concerns will be implemented as soon as practicable but certainly prior to the start of the first construction project. Other identified measures that are more practical to install along with the new construction projects will be implemented with the respective project. Other future control measures, such as retention ponds, that may be noted in permit-related documents, such as an SWP2 Plan, will be implemented either prior to or in the course of the construction for each activity.

As a result of implementing measures in this manner, there should not be a major impact on the site or offsite drainage system. Also, by having all strategies and mitigations dealing with stormwater and sediment control issues (which seem to be the primary CZMA concerns) addressed in one SWP2 Plan will help demonstrate that we intend to consistently use BMPs in all construction activities.

By implementing measures as needed as identified in the stormwater study, long-term impacts regarding stormwater retention, including that from localized flooding during significant rainfalls, should have the potential to be minimized. Due to planned improvements in the stormwater control function of the DOE site, no increased flows or flow rates as waters leave the site are expected as a result of this action so there should be no impacts, CZMA or otherwise, on downstream areas. This is in compliance with the stormwater criteria identified in the CBPADMR.

Water quality related impacts, such as due to the application of pesticides, are to be mitigated as discussed in the previous section.

4.4.2.3 Groundwater

The 1987 EA described regional and local hydrogeologic conditions and characteristics at Newport News, Virginia. Updated and new information on both geology and local hydrologic patterns, such as groundwater flow, were provided in a more recent Hydrogeologic Review (Malcolm Pirnie, Inc. 1995). The 1997 EA included this updated information. The monitoring of dewatering effluent and water quality at the monitoring wells is performed under a current VPDES permit (VPDES 2001).

There should be no need of any permanent dewatering for any of the construction projects, as there will be no below grade construction. Also, Helios will be installed with ample shielding in an above ground structure. Consequently, Helios operation will not result in activation of the groundwater in excess of any permit requirements. Therefore, there should be no effects on any of the site groundwater characteristics of dewatering quantity, water table elevation, or water quality, as a result of the proposed construction activities or new building or Helios operation.

The existing monitoring well network is positioned around the accelerator site to allow water quality to be monitored. Refer to Figure 6 at the end of this Chapter for the locations of the monitoring wells. Note that any groundwater activation due to ongoing CEBAF and FEL activity, at current operational levels, has been addressed in the 1987 and 1997 EAs with minimal to no impacts expected. No impacts to groundwater are expected due to Helios operation. From past history, it is recognized that there may be some follow-up minor variations in non-radiological parameters at the wells that are positioned downstream of construction activity. No mitigation actions are necessary, but the DOE will notify the DEQ, who holds the relevant VPDES permit, regarding planned activity within the accelerator vicinity prior to the start of any such activity (VPDES 2001).

4.4.2.4 Radioactivated Wastewater

Sources of radioactivated wastewater at Jefferson Lab include the air conditioning systems (dehumidification condensate) for the linear accelerator and experimental halls, the low-conductivity cooling water system for accelerator equipment, and the cooling water system for the high-power beam dumps, that serve as beam energy dissipaters for CEBAF. Disposal of this radioactivated wastewater is managed in accordance with an industrial wastewater discharge permit through the HRSD (HRSD 1999).

Very small quantities of cooling water may be affected at the Helios facility. Any activated water resulting from this proposed action would be addressed under existing site procedures and disposed of through the HRSD permit mentioned above. A negligible impact on the present program is predicted.

4.4.2.5 Accidents

Jefferson Lab's SPCC Plan is designed to mitigate releases of oil and petroleum products (SURA 1995). The site's general spill prevention program is documented in the contractor's EH&S Manual (SURA 2001). The program ensures that activated water and chemicals are properly stored and contained. If an inadvertent release reaches the ground surface, it would be contained locally by spill control equipment or retained on-site by the closing of sluice gates positioned near the property boundary.

The subcontractors involved in the construction projects will be obligated to utilize similar practices to reduce the event of a spill or release to the surface, to be documented in their own Safety Plan. The proposed operation of Helios and the other buildings would not involve the use of chemicals that aren't already addressed under existing site procedures. Therefore, even if an accident did occur, the impacts and mitigations would be the same as those that exist for current site operations.

4.4.3 Geology and Soils

The Jefferson Lab site is located in the Coastal Plain of the lower York-James Peninsula in an area of low seismic risk as noted in the 1987 EA. The site geology and hydrogeology were thoroughly reviewed in 1995 to support a new Commonwealth of Virginia permit (Malcolm Pirnie, Inc. 1995; VPDES 2001). Discussion is limited, as activities will only involve surface construction.

As provided in the 1987 EA, the site is located on the Huntington Flat, which is very flat and poorly drained (DOE 1987). Since 1987, overall site and area drainage has changed, in that there is less open ground to absorb flow, as nearby offsite commercial and industrial development has progressed. Site elevations range from roughly 29 to 35 feet above MSL. The surface soil is underlain by the clayey-sand and sand facies of the Norfolk Formation.

The soil types in the areas to be disturbed are: Chickahominy silt loam, Slagle fine sandy loam, and Udorthents-Dumps Complex. (REMSA, Inc. 2001) The soil types across the site seemed fairly similar, with most meeting the criteria for hydric soils. The new buildings will be designed as best suits the local soil types. As minimal activity below the surface will occur under this proposed action, there should be only minor construction related impacts and no impacts from operations. BMPs will be implemented and no geology or soil related mitigations are necessary.

4.4.4 Non-Radiological Air Quality

During construction, the operation of construction equipment and subcontractor vehicles on-site would produce non-radiological emissions common to similar activities elsewhere (hydrocarbons, sulfur dioxide, carbon monoxide, etc.). Emissions would occur throughout the course of each construction activity and would be localized near each construction site. Because the project site is within an ozone maintenance area, precautionary measures will be employed during construction to reduce ground level ozone concentrations, especially during ozone alert days. In the event an ozone alert is issued during vehicle-intensive construction activities, vehicles that are not being actively used will be removed from service and turned off. Extra support will be provided to keep construction traffic moving and to verify fuel containers are tightly sealed to help minimize ozone generation. Measures to accomplish this would include the design of access roads and intersections to avoid or minimize traffic congestion. Other measures during construction would include the use of low volatile organic compound (VOC) coatings where practical. There is minimal to no anticipated use of pesticides or herbicides during construction, so there should be no impact to air quality from that type of activity.

Control methods identified in applicable regulations would be implemented to minimize fugitive dust resulting from construction activities. The methods, that include the use of water for dust control and the covering of open equipment when conveying materials, will be included in the construction specifications for each project. There are no concerns involving open burning, as there will be no open burning of debris. All waste materials will be disposed of in the most resource efficient manner. BMPs, including optimizing vehicular use as practicable, would be implemented to minimize impacts.

There would be minimal non-radiological air quality impacts from the activities to be pursued in the new buildings, to include the operation of the Helios accelerator, refer to Section 4.5.1.7 for discussion, as

they will function as office space, tech workshops, storage, and research support areas. Except for minute effects from Helios, operations described in this proposed action do not have any known sources of pollutants as identified in the NAAQS. As the project site is within an ozone maintenance area, measures to minimize the generation of pollutants will be incorporated into the designs as practical. This includes using energy efficient natural gas boilers to heat the buildings. As all the boilers will operate well under any state permit limits, it has been determined that no air permits are needed. The facility will reevaluate permit requirements if unit sizing or regulatory conditions change. As well, no refrigeration equipment that uses ozone-depleting substances will be used in any of the new buildings. The parking lot and access road layouts to serve these structures would be designed to minimize idling vehicles to the extent practical. The application of herbicides, pesticides, and fertilizers will be managed under an integrated program that minimizes the use of toxic materials, including VOCs, so effects on air quality would be minimal.

In the event an extended ozone alert is issued during regular building operations, Lab management could choose to stagger working hours to minimize traffic congestion upon entering and leaving the site. Any chemicals kept outdoors should already be sealed so extra precautions would not be necessary. Also, no applications of herbicides, pesticides, or fertilizers would be authorized or performed in the event of an ozone alert.

Therefore, contribution from the proposed action to offsite concentrations of regulated non-radiological air pollutants would be kept to a minimum. No mitigations beyond using best management practices to both optimize operations and minimize equipment use are necessary.

4.4.5 Noise

Though no monitoring of area noise levels has been performed, noise levels in the site vicinity are typical of current land use practices. Noise is generated by the traffic flow along adjacent streets, by ongoing construction activities on and off the site, by the nearby Chesapeake and Ohio Railroad, and from activity at the Newport News/Williamsburg International Airport and Langley Air Force Base. Estimates at nearby residential areas provided in the 1987 EA were in the 50 to 55 decibel range.

Given the industrial nature of the site and its vicinity, noise from construction would not be unique. Construction activities, to be separated by structure and phase, would be spread over a number of years. The construction tasks would range from short to long-term, though all noise concerns would be localized at the Jefferson Lab site. While regular noise from construction equipment and traffic would be highly perceptible locally and less perceptible in nearby offsite areas, no adverse effects on human hearing would occur. No mitigations beyond the implementation of best management practices are identified.

Operating equipment in the proposed buildings would produce various levels of noise. Mechanical rooms and the entire new ESR Support Building would likely require designated areas where hearing protection would be required as identified in site programs. Equipment and soundproofing measures would be selected to minimize these impacts to the extent possible.

4.4.6 Transportation and Traffic

Jefferson Lab is situated in the middle of a busy industrial area. The effect on the local traffic on both public and site roads from the additional personal vehicles and trucks during the proposed construction activities will be noticeable. There will be minor offsite traffic impacts due to the proposed construction activity. To facilitate entries and exits to the site, and to take into consideration on-site staff, special construction routing and parking needs will be evaluated for each activity. The impacts to staff will be minimized through coordinated planning and by providing advance notification of alternate routing and parking arrangements. Only minimal impacts should result.

As there will be only small changes in staffing and only minimal changes in the present level of transporting goods and services at the site over the next ten years, no impacts involving site traffic and transportation during building operations and use are expected as a result of this proposed action.

4.4.7 Pollution Prevention

Pollution prevention, as accomplished through energy efficiency, waste minimization, and affirmative procurement principles and practices, will be emphasized at all stages of this proposed action. The DOE places considerable importance on integrated safety management principles, which include environmental protection considerations, into planning, construction, and regular facility operations. The facility is committed to continuously improving its performance with respect to environmental protection.

The proper application of P2 BMPs will result in major resource savings and will mitigate a moderate to high impact if compared to the cost to the environment if these measures and efficiencies are not incorporated.

4.4.7.1 Resource Use Reduction

Factors to reduce the use of natural resources will be considered. These factors include items such as incorporating drought tolerant plants and through other beneficial landscaping practices to minimize water usage, and improving the Lab's performance with regards to EPP. As well as procuring materials with recycled content, EPP refers to further reducing the Lab's need for toxic materials and to choosing products that take into account environmental sustainability.

4.4.7.2 Energy Efficiency

Building scopes will include applicable factors to make the buildings as energy and utilization efficient as practicable. New structures will have individual lighting and temperature controls and staff will be trained to make the best use of these features.

4.4.7.3 Waste Management

In addition, as construction subcontractors are familiar with the materials and techniques that will best accomplish the job, it is expected that they will use BMPs to utilize materials with recycled content and to minimize waste generation.

During construction, waste, including all recyclable materials, resulting from construction activities will be managed through each project construction subcontractor using existing site programs that are in adherence to applicable laws and regulations. Construction specifications will designate the applicable laws and regulations appropriate for the type of wastes involved. No special provisions for contaminated or activated soil are necessary.

Management shall continue to support and encourage efficient waste minimization and recycling practices as the new areas are put into use. Recycling centers will be established in each of the buildings where practical. These practices will help to minimize the low to moderate impacts that result from performing any waste management activities.

A discussion on the impacts from future Helios decommissioning is presented in Section 4.5.1.5.

4.4.8 Land Use

The overall Jefferson Lab site still remains a temporarily wet, upland area but only portions of the site retain the hardwood-pine forest that extended over the site in an earlier time. The site is within an area

that the City of Newport News has zoned for research and development. The surrounding Oyster Point area supports a mix of residential, commercial, and light to medium industrial developments.

The proposed construction areas are all within the site limits and are all adjacent or nearby to existing buildings that have been built since 1987 to support the facility.

Proposed construction and use activities at the four projects within the fenced accelerator site would not change the accelerator site's industrial nature. Storm drainage and other minor impacts will be mitigated as described or as otherwise appropriate. The environs of CEBAF Center, that includes elements that serve as natural areas that provide noise buffers and natural area drainage, will be considerably affected. All impacts, including those during construction, during long-term area functioning, and during Helios operation will be mitigated. All identified mitigations will be fully addressed in the construction project scopes. Prior to undertaking any action that could require mitigation, the DOE will validate that the mitigation actions described in the project scopes have been fully addressed.

4.4.9 Ecological Resources

4.4.9.1 Ecology

In accordance with Endangered Species Act requirements, DOE formally requested written comments regarding the proposed action from the U.S. Department of Interior Fish and Wildlife Service. Contact was also made with the Commonwealth of Virginia DEQ, the Virginia Department of Game and Inland Fisheries (VADGIF), the Virginia Department of Agriculture and Consumer Services' Office of Plant and Pest Services, the VADHR, the VADCRDNH, and the City of Newport News Department of Planning and Development for comment on the proposed actions. Additional telephone conversations were made to some of these agencies to clarify provided information. All agencies generally reported that no adverse impacts to protected species and/or habitat would be expected from the proposed action (see Appendix B). All listed species were reviewed during the preparation of this EA. Included was a review of the potential effects on three state-sensitive terrestrial species as requested by the VADGIF.

The VADGIF species of concern that were to be evaluated and coordinated with the Department are the state endangered canebrake rattlesnake, the striped bass, and a local water bird colony containing great egrets and great blue herons. The potential impacts involving them are evaluated in 4.4.9.3 and 4.4.9.4 below. The VADCRDNH had also requested that three rare plant species be included in this review. Refer to Sections 4.4.9.2 for a discussion that includes the results from the 2001 review.

4.4.9.2 Terrestrial Resources

4.4.9.2.1 Vegetation

The portions of the Jefferson Lab site that will be disturbed by this proposed action are located in, or are directly adjacent to, previously developed areas. All projects on the accelerator site will affect grassy areas, and two will affect wooded areas. One of the areas has a small loblolly pine wooded area adjacent to the proposed FEL Addition site and the other is a section of oak-loblolly pine forest to be cleared in order to maintain security at the site's perimeter fence. The area surrounding CEBAF Center that will be affected includes: primarily a large oak-loblolly pine forest; large grassy areas that contain sloping surface water drainage channels and scattered single trees (e.g. paperbark maples and crepe myrtles); landscaped planting areas; and an existing paved driveway and parking areas. Both the FEL Addition and CEBAF Center sites have vegetated storm channels that will be affected.

The VADCRDNH identified three rare plant species of concern for this review. The species are: Cuthbert turtlehead, hazel dodder, and a St. John's wort. The Wetland Delineation and Threatened and Endangered Species Survey (REMSA, Inc. 2001) addressed them in the report. Upon completion of the site-wide field investigations for species and habitat, which were performed in the spring and again when the plants would most likely be in flower, the report concluded that there were no sitings of either the plants or any preferred habitats for any of the three species. In the course of the review, the survey crew also checked the site for other special species. It was documented in the report that there were no resident threatened, endangered, or rare plant species identified on the subject property during any of the field surveys.

It is concluded that there will be no disturbance of any special concern species or habitat with the approval of this proposed action. Note that the Department of Agriculture and Consumer Services' Office of Plant and Pest Services has reviewed the activity and anticipates no adverse impacts from this project. No mitigations, beyond minimizing the areas of disturbance, are necessary.

4.4.9.2.2 Trees

Though this action will not have an important effect on Virginia forestlands, as identified in correspondence dated November 30, 2001, necessary measures will be taken to protect trees in the vicinity of the construction areas. Specific requirements will be incorporated into the construction specifications and coordinated in the field by the authorized facility representative.

Trees within the construction limits that are earmarked to remain and trees situated on the perimeter of the construction areas will be visibly marked and fenced. The fencing should extend to at least the tree drip line or to the end of the root system, whichever is farthest from the tree. These fenced areas will be maintained as off limits to all activities, including vehicular traffic, parking, equipment staging, or soil stockpiling in order to minimize soil compaction in the vicinity of the trees. If parking or stacking of equipment is deemed unavoidable, that is performing them elsewhere would have a greater adverse consequence, then the subcontractor would be required to use temporary crossing bridges or mats to minimize compaction and any resulting injury to plants. Refer to Section 4.4.2.1 for information on erosion control at stockpiles.

Under the guidance in the Lab's Environmental Protection Program, trees removed under this activity will be replaced with new trees or shrubs at suitable locations to the extent possible.

4.4.9.2.3 Fauna

The 1987 EA cited that 257 species of terrestrial vertebrate fauna had geographic ranges that encompassed the site, though only a fraction would be expected to actually exist on the site. The continuing expansion of development, both on the Jefferson Lab site and in all adjacent areas and beyond have further reduced wildlife habitat and wildlife populations, so the chances of having an on-site existence of many species has grown even smaller. Information on the fauna of concern to the VADGIF is provided in the next section.

4.4.9.3 Threatened and Endangered Species

No Threatened or Endangered species or suitable habitats for any of the species were identified on-site in the most recent Wetland Delineation and Threatened and Endangered Species Survey performed by REMSA, Inc. (REMSA, Inc. 2001). Several surveys of the complete Jefferson Lab site have been conducted over the history of the facility, including the one performed for the 1987 EA and the recent Wetland Delineation and Threatened and Endangered Species Survey (REMSA, Inc. 2001). Most of the new information noted is from this most recent survey. The survey states that there were also no state-sensitive species or the listed rare plants observed and that there were no suitable habitats or conditions

for them anywhere on the Jefferson Lab site property. The specific VADGIF and VADCRDNH species of concern are addressed below.

In this recent agency correspondence, the federal and state listed threatened bald eagle was identified as the only federally protected species possible at this site. State listed species present in the project area could include the threatened peregrine falcon and the endangered canebrake rattlesnake. Other rare animals that could be in the Jefferson Lab vicinity, as indicated by the VADGIF, are the special concern species: yellow-crowned night heron, least tern, great egret, great blue heron, and the striped bass. All species were considered in the 2001 survey noted above. The striped bass is discussed in Section 4.4.8.5. All other state identified species, including rare plants, are addressed below.

The most recent investigation identified no resident threatened or endangered species on the Jefferson Lab site. No other state or federal agencies contacted at the time of this investigation had indicated the possible presence of any threatened, endangered, or otherwise protected species on the DOE site (REMSA, Inc. 2001). Area development has minimized or eliminated any possible local habitats. As well, the recent survey found no rare or special concern species on the site. They, as well as the threatened and endangered species, may appear only as transients as there are no suitable foraging or nesting habitats in existence on the site. The discussion of VADGIF-identified species follows.

The canebrake rattlesnake, a state-endangered species, could be present in the general area. The most recent survey (REMSA, Inc. 2001) noted that there have been no area canebrake rattlesnake sightings in recent years. This survey included checking for the presence and or likely habitats for the rattlesnake. None were noted during the review, which paid special attention to this species. It was noted that it is a secretive species that could be overlooked, but the review cited that it is usually present in unfragmented areas, and any likely habitat on Jefferson Lab property and in the surrounding area is very fragmented, so the likelihood of finding one anywhere in the local area is very low. As the construction projects will be limited to areas that are already developed or just adjacent to developed areas, it is unlikely that any canebrake rattlesnake habitat will be disturbed. All staff and subcontractors involved in construction will be informed about the potential presence of the canebrake rattlesnake or other endangered species, not to disturb or interfere if encountered, to stop all work in the vicinity (at a minimum of 50' from the sighting), and to promptly report it to their Jefferson Lab contact. If a canebrake rattlesnake is observed anywhere on site, Jefferson Lab will promptly notify the VADGIF's designated contact.

The VADGIF is interested in the effect of disturbance on one local water bird colony that includes great egrets and great blue herons. The only one known to Jefferson Lab is located at or near the Big Bethel Reservoir, roughly located just over one mile from the site boundary. The recent REMSA, Inc. report identified no suitable habitat for these species on the Jefferson Lab site. The report also noted that there was no evidence of the use of any site area by great egrets or great blue herons. As the disturbance for this proposed action will be limited to the local construction areas on the DOE property and proper controls will be included to prevent any disturbance outside of the construction limits, no impacts on any downstream water bird colonies are expected. No yellow crowned night herons or least terns nor any appropriate habitats were observed on the Jefferson Lab site during the course of the survey. No impacts to any individual birds or breeding colonies would occur under this proposed action.

There are no federally protected plants in the project area, however, the VADCRDNH identified Cuthbert turtlehead, hazel dodder, and St. John's wort as rare plant species that could be present in the City of Newport News. These plants were taken into consideration in the 2001 survey that included at least one field trip during the predicted blooming time in August. None of these plants were identified in the proposed areas to be disturbed. Therefore, no on-site or offsite impacts to any of these identified plants are expected under this action.

This EA finds that there should be little to no potential for adverse impact to any of the listed species from either construction disturbance or long-term facility operation. As construction disturbance will be limited to within very local construction areas and be properly managed so that no downstream areas containing these species should be affected. As there are no expected impacts on any of these species, no mitigation actions beyond minimizing disturbed areas are believed necessary. As well, there should be no CZMA impacts on any coastal wildlife, plants, or habitats.

4.4.9.4 Aquatic Resources

There are no permanent aquatic habitats on the site. There are small drainage channels that move water across and off the site, with a few channels just beyond the DOE site limits. The few channels that almost always contain water pass under Canon Boulevard to eventually flow into Brick Kiln Creek. Brick Kiln Creek flows to the closest important body of water, Big Bethel Reservoir, located approximately 2.7 km (1.7 miles) east-southeast from the site.

The VADGIF has identified striped bass as a species of concern in our general area. The most recent survey (REMSA, Inc., 2001) identified that no habitat for striped bass exists on the Jefferson Lab property. Striped bass exist in tributaries well downstream of the site. The only known location for striped bass is at Lake Maury, which is located roughly 2.4 km (1.5 miles) south-southwest of the site. As the property does not drain in that direction, and as our impacts for this proposed action would be limited to, at most, the property limits, there should be no effect on that particular habitat or on any downstream population of striped bass.

There should be no impact to any downstream aquatic resources from the proposed action, as only minimal pollutants, such as dust, should penetrate past the local construction areas.

4.4.9.5 Floodplain and Wetlands

The Jefferson Lab property, at an average elevation of about 32 feet above MSL and with no permanent streams, is in a Zone C area on the local flood maps, so is not considered a floodplain. Most of the Oyster Point area is in this class. As localized flooding due to large rainfall events is possible, the DOE is addressing storm flow management to minimize any local area impacts. Short and long-term stormwater management concerns and solutions will be worked out with local and regional agencies as discussed in Section 4.4.2.2. Hence no higher risk floodplains should be directly or indirectly affected by the proposed action.

The site was originally primarily forested temporary wetlands (1987 EA). The Corps of Engineers approved the site development for the original project. Since then, the site was resurveyed for wetlands (REMSA, Inc., 2001) according to the U.S. Army Corps of Engineers criteria for wetlands. Except for one small area found to meet the Corps of Engineers technical criteria, which is not located in any of the areas to be disturbed under this EA, none of the sites to be disturbed under this proposed action met all three criteria that define a jurisdictional wetland. The Corps of Engineers performed a site visit on September 25, 2001 and reviewed the conditions at the proposed construction sites. It appeared that none of the proposed construction sites met defined wetland conditions. This was confirmed in a letter from the Corps of Engineers dated September 25, 2001. Refer to Appendix B for a copy of the correspondence. Therefore, this proposed action should not affect any on-site wetlands. As construction disturbance will be limited to the immediate construction area vicinities, no downstream wetlands, that could include any CBPAs, should be affected.

4.5 HEALTH AND SAFETY IMPACTS

The expected level of impact regarding health and safety concerns for each of the identified activities has been evaluated for this proposed action. The safety and health impacts to workers and the public due to

radiological activity resulting from Helios operation are very low and are discussed in Section 4.5.1. The impacts on subcontractor staff, lab workers, and the public due to construction do not exceed normal levels and are discussed in Section 4.5.2. Other impacts during normal use of the new buildings are evaluated in Section 4.5.3.

4.5.1 Radiological Effects

4.5.1.1 Radiological Background

Humans are exposed to natural background radiological sources in the form of radionuclides present since the formation of the earth (e.g. uranium, thorium, and their decay products) and radionuclides created by solar and cosmic rays (e.g., ^{3}H, ^{7}Be, ^{14}C, ^{22}Na). Humans are also exposed to the same solar and cosmic rays. The estimated total effective dose equivalent for a typical resident in the United States from natural background radiation is about 300 mrem/year (millirem/year) (NCRP 1987). For comparison, the average annual contributions from cosmic and solar rays and the natural background radiological sources mentioned above are 30 mrem and 230 mrem, respectively. These added to the internal dose of 40 mrem from foodstuffs containing background radionuclide sources, yields a dose of 300 mrem for the average resident of the United States.

4.5.1.2 Radiation Associated with Accelerator Operation

Particle beams created by an accelerator produce (1) prompt radiation and (2) induced radioactivity in matter caused by prompt radiation. Prompt radiation is an intentional, routine consequence of accelerator operation. It is localized near the accelerator itself and can be shielded and controlled. Induced radioactivity (also called "activation") results when prompt radiation from an accelerator beam strikes matter (e.g., experimental targets, beam pipes, concrete shielding, soils, water, etc.). Radiation and the changes it causes in matter enable scientists to use accelerators to study the properties of materials or the structure of the nucleus of the atom.

Accelerator operators routinely engage in practices designed to minimize the extraneous production of radiation in undesirable locations. The quantity of induced radioactivity depends on several factors: (1) the type of accelerated particle (e.g., electron, ion, proton); (2) the beam energy; (3) the intensity (beam current); and, (4) the matter or object that it strikes (e.g., experimental targets or shielding). CEBAF, the FEL, and the proposed Helios machine each accelerates an electron particle beam, which induces radioactivity primarily in the beam-dissipating devices (beam dumps), although the amount of induced radioactivity from any of the Jefferson Lab machines is substantially less than that produced by other particle (e.g., proton) accelerators with comparable power. In addition, some activation occurs in the structural material enclosing the accelerators and their experimental halls or other target areas (Stapleton, G. et al. 1997). Less than 0.1% of induced radioactivity may be produced outside the accelerator enclosure, primarily in adjacent groundwater and soils.

Accelerators and experiment facilities are typically sited either underground or at grade with thick concrete walls and substantial earth berms to provide cost-effective shielding. By design, radiation reacts with the shielding materials. Induced radioactivity in the shielding materials—whether steel, lead, concrete or earth—is related to both the composition of the material and the type of radiation interacting in the shield. To be conservative, concrete, that is used as primary shielding for CEBAF and the FEL to minimize the production of radionuclides in the environment will be used for the same purpose for Helios. In general, the induced radioactivity remains fixed-in-place in the shield material and cannot be separated from the material.

There are also mechanisms for inducing radioactivity into groundwater, but as Helios will be located in an above ground structure, and there is virtually no potential effect on groundwater, the mechanisms are not presented here.

4.5.1.3 Radiation Protection at Jefferson Lab

DOE's Jefferson Lab is operated by SURA in accordance with applicable federal laws and regulations, including those specified in a Radiation Protection Program Plan (DOE 1995) approved by the DOE. All important aspects of radiation safety and protection, including DOE's ALARA goals, are regularly addressed in workshops and programmatic reviews. These reviews, that include peer reviews by other DOE laboratories in accordance with the DOE/SURA management and operations contract, will also apply to Helios.

4.5.1.4 Impacts to Radiation Workers

The level of prompt radiation is directly proportional to the amount of electron beam power lost in the accelerator components. Exposure to prompt radiation is managed by installing shielding and excluding personnel from areas where prompt radiation is above applicable limits. Most of the occupational radiation exposure at Jefferson Lab would continue to occur during maintenance activities on activated components involved with any of the site accelerators, including Helios.

Induced radioactivity in the components is directly proportional to the energy deposited in those accelerator components. This quantity, watts x seconds (or Joules), is the product of the electron beam power lost and the duration of that loss. Most of the activated components in the Helios accelerator are associated with the injector and transport line to the electron storage ring (SR). Continuous electron beam loss is typically associated only with operation of the Helios injector and transport line, which together are termed the Helios Linac. The injector is operated minutes per day. Helios operation will occur at beam energies between 700 and 1000 MeV. This would result in a normal beam power in the 500 to 1000 MW range. (Refer to Table 1 in Chapter 2.) The SR ring operates for hours per day but is not capable of sustaining a prolonged electron beam loss. Although the beam power is high, the energy stored in the ring is very low and activation of accelerator components in the ring is very minimal.

The DOE regulatory limit for occupational exposure of radiation workers is 5000 mrem/year (5 rem/year). Jefferson Lab uses 2000 mrem/year as an administrative limit and all facilities at the lab were designed to maintain radiation worker exposure at less than 250 mrem/year, in accordance with DOE's ALARA objectives. The 250 mrem/year administrative limit applies to all Jefferson Lab radiation workers and reflects the cumulative occupational exposure from operations and maintenance activities involving the FEL, CEBAF, and the proposed Helios. The exposure from operations reflects both normal and any accidental beam loss scenarios. The FEL and CEBAF operations are restricted by engineering and administrative controls such as shielding, the Personnel Safety System, interlocks, and beam absorbers. The proposed Helios will operate under the same constraints.

As Helios can produce beams of intense synchrotron light, which are a low energy x-ray hazard, these same controls will be implemented at the Helios accelerator. As well the administrative controls currently in use at Jefferson Lab will be supplemented with area monitors to ensure that robust exposure controls remain in place because of the x-ray hazard. As a result the typical annual exposures will be much less than the 250-mrem/year design goal. No changes to the administrative limits used by Jefferson Lab are necessary due to the operation of Helios. Jefferson Lab has a good record for occupational exposure management. Since 1996, only 0.2% of those occupationally exposed to radiation had doses in excess of 100 mrem in any one year. No workers are expected to exceed the 250-mrem/year design goal and no substantial addition to the collective exposure of workers at the lab is expected with the operation of Helios.

4.5.1.5 Impacts from Helios Decommissioning

For a full review of effects, the distant future consequences of decommissioning Helios are discussed. The Helios facility has two major components, the injector/linac, referred to as the Linac, which is the most likely place for the generation of detectable radiation, and the SR (electron storage ring). Helios is designed to produce synchrotron radiation. It is designed for negligible loss of electrons in the SR during operation. Poor quality electron storage in the SR is undesirable since it results in shorter operational periods and degraded quality for the synchrotron light. The synchrotron radiation produced by electrons in the SR is intense, but it is too low in energy to induce radioactivity in the Helios' Linac or in the SR components. Most of the electron losses come from the acceleration of electrons prior to storage in the SR, that is the losses come from the Linac. The Linac is somewhat inefficient during acceleration. In addition, poor quality electrons are intentionally removed (scraped) from the electron beam during transport, prior to injection into the SR. The electron losses during transport and injection can result in elevated levels of ionizing radiation and the production of radioactive material in the Helios components, in air and water systems, and in adjacent shielding. Most of the residual radioactive material will be collocated with the Helios components designed to produce, steer, focus, and select electrons for injection into the SR. The removal of accelerator components and testing of the remaining facility to verify the absence of appreciable residual radioactivity will accomplish facility decommissioning.

Upon decommissioning, some residual radioactivity may remain in the concrete shielding, and some radioactive material may be concentrated in air handling, solvent extraction, or related cooling water systems. The air handling, solvent extraction, or cooling water systems can be sampled by conventional means and evaluated for radioactivity content. Portions of these systems can be decontaminated or removed as radioactive waste if necessary. The concrete shielding may also be sampled for radioactivity content. Only Na-22, with its 2.62-year half-life, is of consequence to Helios decommissioning activities. If necessary, concrete may be removed to reduce external exposure rates to meet any decommissioning goals set for the facility. It should be noted that, after a successful ten year operating history, no residual activity was detected in any system, in shielding, or at the facility where Helios was previously located. Therefore, no more than a minimal impact on the environment or on worker safety would be expected. There would be negligible impact on public health from this action.

4.5.1.6 Effects of Prompt Radiation on the General Public

The annual DOE regulatory limit for prompt radiation dose to members of the general public is 100 mrem as cited in 10 CFR 835. Normal practice for implementing this limit is to identify a maximally exposed member of the general public near a facility, estimate their exposure and measure the follow-up radiation dose resulting from operation of that facility. DOE and Jefferson Lab, however, have adopted a "good neighbor" policy, which requires that radiation exposure of the affected population near CEBAF be maintained much below any pertinent regulatory limit. Consequently, a design goal of 10% of the regulatory limit at the site boundary was established for the Jefferson Lab site (DOE 1995) and was incorporated in Jefferson Lab policy as stated in the CEBAF FSAD (SURA 1994).

The chief source of prompt radiation exposure for members of the general public is "skyshine" radiation. Skyshine is due to radiation produced in fixed physics targets, transiting through the concrete shielding and soil on each end station roof and into the air. This shielding is effective but limited by structural considerations. This radiation scatters back to earth from the air above the end station roof. Currently, skyshine is unique to the operation of the CEBAF accelerator, but a minimal amount could be produced with Helios operation. The Helios accelerator produces no skyshine at the site boundary due to its position on the accelerator site and because it is not designed as a fixed target irradiation facility. Appropriate overhead shielding to minimize skyshine will be designed into the new FEL Addition, which will house Helios.

Reasonable methods of calculation for a wide range of operating conditions have been used to estimate a dose from prompt radiation to members of the general public at the site boundary and allow DOE to manage the annual site radiation dose effectively. These calculations and measurements substantiate the methodology used in the 1987 EA (Stapleton, G. et al. 1997) and confirm that, under present conditions, Jefferson Lab is meeting its administrative control level policy of 10% of the regulatory limit of 10 mrem per year for radiation exposure to the general public. Table 2 displays radiation doses taken from measurements at the site boundary monitor RBM-3 that verify our compliance. No changes in this dose rate from prompt radiation are expected as the Helios machine is not expected to contribute to radiation exposure to the general public. In a worst-case accident scenario, possibly where the building is damaged while the machine is operating, the machine would automatically turn off when the safety system noted a problem or would fail to operate due to damage to the machine or its support systems. Therefore, there would be no possibility of unshielded exposure at the site boundary and to the public.

Table 2 Radiation Boundary Monitor RBM-3 Results for 1998, 1999, and 2000

Period	Neutron (mrem)	Gamma (mrem)	Total (mrem)
1998	0.81 ± 0.03	0.20 ± 0.02	1.01 ± 0.04
1999	4.27 ± 0.03	1.06 ± 0.02	5.33 ± 0.05
2000	3.05 ± 0.04	0.76 ± 0.02	3.81 ± 0.04

4.5.1.7 Effects of Airborne Radionuclides, Ozone, and Nitrogen Oxides

The public may be exposed to small quantities of radioactivity induced in air in an accelerator enclosure as a result of nominal ventilation during routine operations. The Environmental Protection Agency (EPA) has established a dose limit to members of the general public from radioactive material in air of 10 mrem/year. Based on very conservative modeling (Stapleton, G. et al. 1997) and monitoring of CEBAF and FEL operations, the calculated dose to the general public is in the range of 0.05 mrem/year or 0.5% of the EPA annual dose limit. (The EPA requires an approved program of periodic confirmatory air measurements at 1.0% of the limit.) Negligible airborne emissions are expected from Helios operation. The airflow around the locations of highest beam loss, the Helios injector and linac, is provided by the FEL vault heating and ventilation system. The FEL produces a very small increment of the 0.5 mrem/year airborne emissions and no additional detectable contribution from Helios to this increment is expected. The radiological dose to workers or to the general public at the site boundary due to airborne emissions from Helios will be indistinguishable from the already small FEL contribution.

Any activated air generated by Helios would also contain the pollutants ozone and oxides of nitrogen. Ozone concentrations have been calculated and measured at CEBAF, and the time-weighted average concentration of ozone has been below the Occupational Safety and Health Administration (OSHA) limit and the American Conference of Governmental Industrial Hygienists' Threshold Limit Values for occupational exposure (0.1 parts per million) (Stapleton, G. et al. 1997). Since the production of ozone and oxides of nitrogen stop when an accelerator (CEBAF, Helios, and FEL) is turned off, normal chemical dissociation and ventilation loss quickly reduce ozone and oxides of nitrogen to negligible values in the accelerator facility. As with the contribution of airborne radionuclides, only negligible levels, if any, of any of these pollutants would be generated upon operation of Helios. Therefore, there would be no impact from these pollutants to the public or to workers.

4.5.2 Construction Hazards

Normal construction-related hazards will be present during the building of each of the structures identified in this EA. These common industrial hazards include: transporting materials and equipment to and around each jobsite; noise in the immediate work area; electrical safety; lifting; and working on elevated areas. Each of these hazards will be mitigated using a combination of OSHA Construction Standards; best industry practices; and other special practices and procedures to be identified in the subcontractor's Safety Plan. The subcontractor's Safety Plan must be accepted and approved by Jefferson Lab prior to the issuance of any notice to proceed. Jefferson Lab provides a robust inspection program and incorporates financial safety incentives into the contract agreements to further encourage safe work practices.

4.5.3 Non-radiological Hazards

Non-radiological hazards associated with the proposed action include electrical hazards, chemical hazards, and non-ionizing radiation hazards (lasers), which could injure and in extreme cases, kill occupational workers. All such hazards were examined in the CEBAF FSAD (SURA 1994) and reexamined in the recently concluded Work Smart Standards effort at Jefferson Lab. Refer to the Jefferson Lab EH&S Manual for the list of Work Smart Standards hazards. The appropriate regulatory standards that are needed to control the hazards were also identified and are implemented through the EH&S Manual which can be accessed through the Internet at http://www.jlab.org/ehs/manual/EHSbook.html (SURA 2001).

Electrical hazards include the potential for electric shock and injury from accidental exposure to radio frequency (RF) power. Electric shock hazards are well understood and are readily prevented by standard industry practices. RF power can cause burns to those nearby if a wave-guide is damaged so that it allows RF power to leak. Administrative procedures in place at Jefferson Lab to minimize such accidents are specified in the Jefferson Lab EH&S Manual.

The principal chemical hazard at Jefferson Lab is buffered chemical polish, which is a mixture of nitric, phosphoric, and hydrofluoric acids. A spill could lead to burns from splashed liquid and lung damage from acid mists to those in the immediate vicinity. Procedures to minimize such accidents are specified in the Jefferson Lab EH&S Manual. Additional chemical hazards that may arise from the operation of Helios will be governed by administrative procedures specified in the EH&S Manual.

Non-ionizing radiation exists at Jefferson Lab principally in the form of laser beams and laser systems. Hazards associated with the use of lasers are direct exposure to the laser light and exposure to specular or diffuse reflections. Procedures for laser safety require that each potential experimenter be formally trained in pertinent local safety regulations and specific safety procedures for their test area. Safety operating procedures are developed and approved by qualified Jefferson Lab laser staff. Operation of Helios would present no additional laser impacts than those already identified.

4.6 CUMULATIVE IMPACTS

Cumulative environment, health, and safety impacts are those which result from the incremental contribution from each effect discussed above along with impacts expected from other past, ongoing, or planned actions within the same geographic area.

Both on and offsite major construction activities will have temporary and long term site related impacts. On-site construction actions would be managed to keep impacts to a minimum, but DOE has no control over offsite activities. However, it is assumed that both short and long term impacts from offsite construction activities, including any on the adjacent SURA property, would be limited to effects outside of the DOE property lines. In actuality, as wooded areas belonging to the City of Newport News and

other property owners are eliminated; their current denizens seek refuge wherever possible, many towards the partially wooded DOE and SURA land.

As for environment, health, and safety related operational impacts, the routine operation and use of the new DOE facilities would be managed to keep impacts to a minimum, as is done to the extent possible for existing site buildings. It is anticipated that any development on the adjacent SURA and City properties would also be managed to keep impacts to a minimum and to result in no impact to the DOE site. The long-term effects from the additional impervious cover on-site will be studied in a planned stormwater management analysis. Identified control measures, including BMPs, would be implemented to address long-term strategies to minimize on-site effects and to not affect offsite properties. DOE will work with the City of Newport News, SURA, and other area developers on this stormwater management issue. The DOE will promote the use of BMPs to minimize further stress on the area's stormwater retention and flow channeling systems.

The minimal impacts related to Helios operations will be long term, but will be managed to keep them to a minimum as noted in this EA. The radiological impact of the action proposed in this EA will be offset by factors such as radioactive decay and dilution. Radioactivity levels will remain well below permit limits and, therefore, any changes will be inconsequential. There will be cumulative impacts involving radioactivity from the combination of operating the existing CEBAF and FEL accelerators along with the new Helios machine. This is true even though there are no changes in CEBAF or FEL operations proposed under this action. The only other known source of radioactivity in the general site area is in the adjacent Applied Research Center. Helios, CEBAF, and the FEL will be operated within their proposed or specified operating limits and within identified site limits to minimize cumulative impacts to the environment, occupational health factors, and public health and safety concerns.

Thus, there would be cumulative impacts when taking into account the construction, operation, and use of the new buildings and Helios when combined with the other impacts from beyond the site boundaries, though none of these actions would have major impacts to occupational and public health and safety.

4.7 IMPACTS OF NO ACTION

If no action were taken on this proposal, DOE would continue operating the Jefferson Lab facility in a manner that is not optimal to support staff and researchers. This applies for both the identified construction projects, with each one serving at least one important purpose, and for the commissioning and operation of Helios.

With no action, the disturbance from construction activities would be avoided, but the benefits possible from having more efficient work areas and storage facilities would be lacking.

With no action, the minimal environmental effects due to Helios operation would not occur, but the materials research planned for the operation of Helios and the future synergistic operation of Helios with the FEL, which will provide a heretofore unavailable set of applied research capabilities, will also not take place. Other countries are pursuing such research into higher computer chip densities and if such research uncovers successful approaches to densification the U.S. may lose its lead as a primary developer of semiconductor processors. It is important for the future of the U.S. economy to maintain several independent research efforts into this important commercial arena. With no action, we would miss out on numerous research opportunities.

Figure 5 Topographic Map

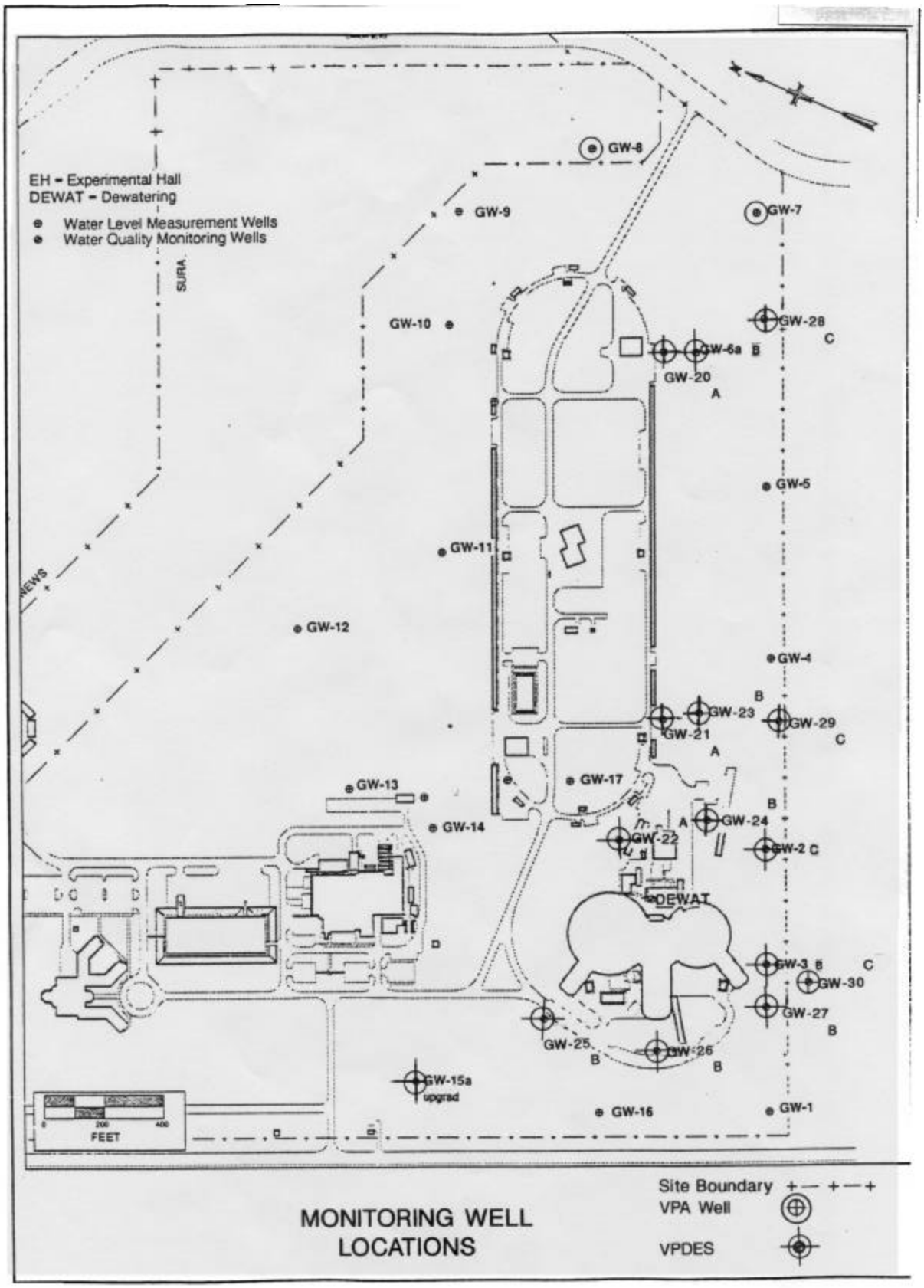

Figure 6 Monitoring Wells