

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
NASA CONTRACT NO. NASW-4598  
TASK ORDER NO. 27**

**ENVIRONMENTAL ASSESSMENT FOR  
EARTH OBSERVING SYSTEM DATA AND INFORMATION SYSTEM  
DISTRIBUTED ACTIVE ARCHIVE CENTER**

**LANGLEY RESEARCH CENTER  
HAMPTON, VIRGINIA**

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ENVIRONMENTAL ASSESSMENT  
EARTH OBSERVING SYSTEM DATA AND INFORMATION SYSTEM  
DISTRIBUTED ACTIVE ARCHIVE CENTER  
LANGLEY RESEARCH CENTER  
HAMPTON, VIRGINIA

DECEMBER 1993

Prepared By:

Ebasco Services Incorporated

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Based on the evaluations presented in this EA, the potential environmental impacts associated with the proposed construction and operation of a new DAAC building at LaRC, the new/expanded parking lots, the new sidewalk, and the widening of Langley Boulevard at LaRC do not appear to individually or cumulatively have a significant effect on the quality of the environment. A Finding of No Significant Impact (FONSI) is recommended.

## 2.0 PURPOSE AND NEED

### 2.1 PROJECT BACKGROUND

The Earth Observing System (EOS) is the centerpiece of NASA's Mission to Planet Earth, a pivotal part of the U.S. Global Change Research Program. Key features of the EOS include a space-based observing system which will collect data on global conditions, and the Earth Observing System Data and Information System (EOSDIS) which will process, manage, archive, and distribute to the scientific community, the EOS global data.

The EOSDIS consists of a distributed network of eight planned data centers known as Distributed Active Archive Centers (DAACs) (Table 1). The EOSDIS capabilities will be evolutionary, starting with the Earth science applications data systems presently in existence at the eight DAACs. An initial prototype version of the EOSDIS will be available in 1994. The capacity of the initial prototype version will be increased as the EOSDIS capabilities are expanded over the 15-year EOS mission life.

The EOS mission will be headquartered at NASA's Goddard Space Flight Center in Maryland, while the DAACs will be distributed at eight locations nationwide. Each of the DAACs is planned to be co-located with an existing data center which was selected because of its demonstrated capabilities in Earth science research. The proposed DAAC at LaRC will be co-located with the existing Langley Central Scientific Computing Complex (Buildings 1268, 1268A, and 1268B) to take advantage of the existing capabilities in managing atmospheric data. The LaRC DAAC will be the designated facility for data on global radiation budget, aerosols, and tropospheric chemistry.

### 2.2 PROJECT OBJECTIVE

The objective of the proposed action is to construct new facilities to support the proposed DAAC at LaRC. While sufficient space exists at the Langley Central Scientific Computing Complex to support the initial EOSDIS prototype version, additional space is needed to support the programmed increases in capacity as the EOSDIS capabilities are expanded. The proposed DAAC facilities include secure space for the computational and support facilities, and office, work, and parking space for the research staff. Additionally, improvement of the Langley Boulevard/South Wright Street intersection is being considered.

### 2.3 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

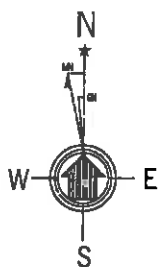
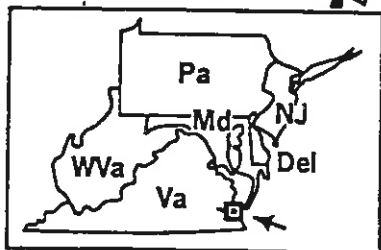
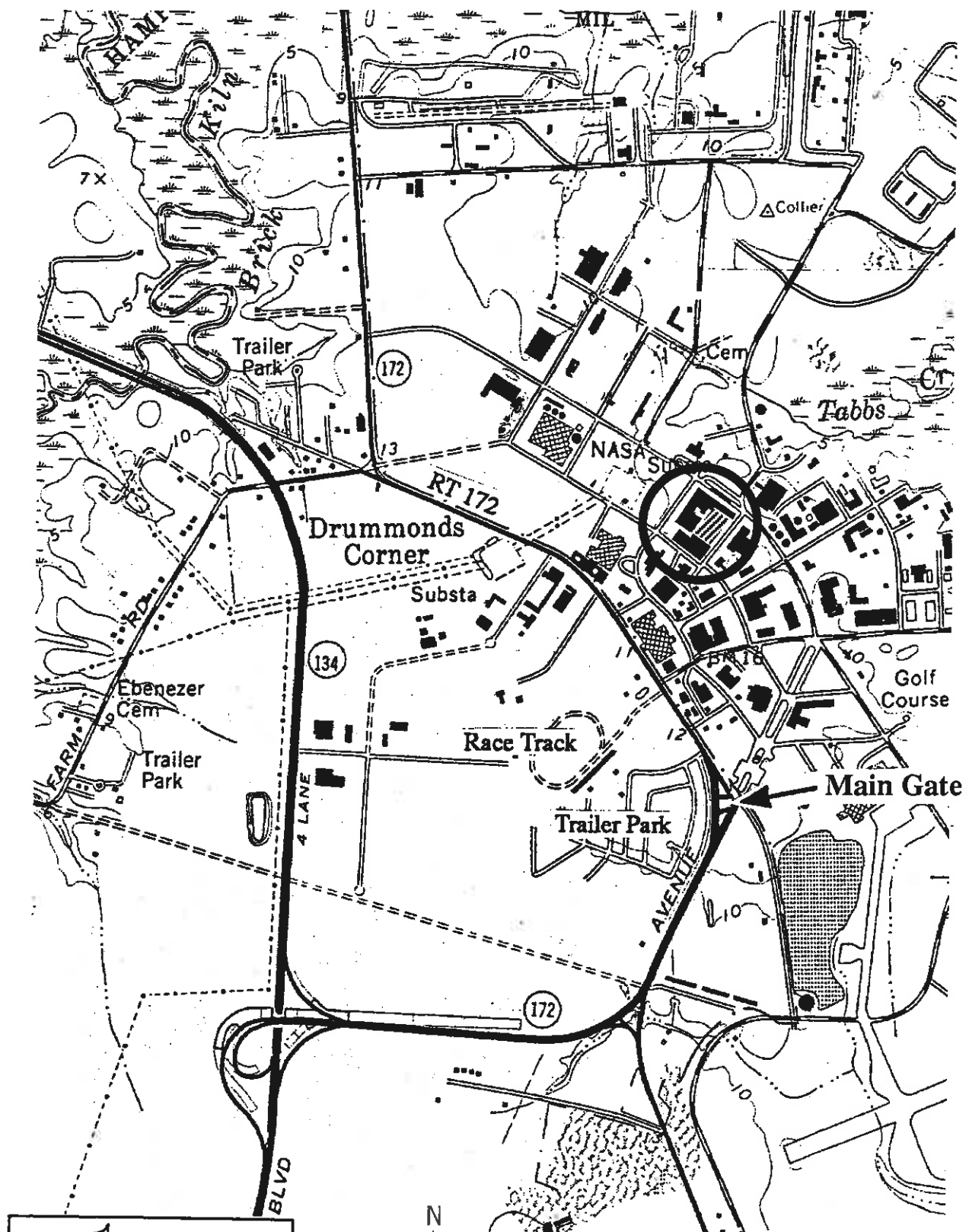
This Environmental Assessment (EA) addresses environmental issues related to construction and operation of the proposed DAAC at LaRC. This EA was prepared in accordance with the Council on Environmental Quality Regulations for Implementing the Procedural

**Table 1 Location of EOSDIS DAACs**

<b>DAAC</b>	<b>Data</b>
Earth Resources Observation System, Data Center, Sioux Falls, SD	Land Processes
Goddard Space Flight Center, MD	Upper Atmosphere, Atmospheric Dynamics, Global Biosphere Geophysics
Jet Propulsion Laboratory, CA	Ocean Cir- culation, Air- Sea Interactions
Langley Research Center, VA	Radiation Budget, Clouds, Aerosols, Tropospheric Chemistry
Marshall Space Flight Center, AL	Hydrology
National Snow and Ice Data Center, CO.	Cryosphere Polar Processes
Oak Ridge National Laboratory, TN	Atmospheric Trace Gases
University of Alaska, AK	Sea Ice, Polar Processes



Provisions of the National Environmental Policy Act (NEPA) (40 CFR Parts 1500 - 1508) and NASA's regulations implementing the provisions of NEPA (14 CFR Subpart 1216.3, as addressed in NHB 8800.11 and LHB 8800.1).



**LOCATION OF THE CENTRAL SCIENTIFIC COMPUTING COMPLEX AND THE PROPOSED EOSDIS DAAC AT NASA LANGLEY RESEARCH CENTER**  
Hampton, Virginia

FIGURE 1

Chilled water for cooling the proposed DAAC building will be provided by a water chiller. The DAAC building's chilled water piping system will be connected to the existing chilled water system for the Langley Central Scientific Computing Complex which will serve as a back-up cooling system. Two cooling towers, one active and one backup, will be provided. The cooling systems will be powered by both electricity and steam for redundancy. The proposed DAAC building will be heated by steam, provided by a connection with the existing steam lines beneath South Wright Street.

Water for domestic and fire flows will be piped via a new 20-centimeter (cm) (8-inch (in)) service lateral connected to an existing 20-cm (8-in) water main on the east side of South Wright Street. Wastewater flows will be through a new 15-cm (6-in) diameter pipe connecting to an existing 25-cm (10-in) sanitary sewer gravity main on the west side of South Wright Street. The existing 38-cm (15-in) storm drain located on the west side of South Wright Street will be relocated into the street to clear the new building. New storm structures and piping will be installed as needed to collect stormwater runoff from paved areas and the roof area. The intent is to preserve as much of the existing 107-cm (42-in) storm drain as possible on the west side of the new building.

Construction of the proposed DAAC building will require demolition of the existing Langley Central Scientific Computing Complex's parking lot and removal of the foundation of an old tow tank located beneath the parking lot. The proposed DAAC building, together with another project (the Cockpit Motion Facility, which is a minor Construction of Facilities project and categorically excluded from preparation of an EA), will displace 144 parking spaces at the Complex. Parking will be retained along South Wright Street, and four designated handicapped parking spaces will be located along the south end of the proposed DAAC building.

A total of 181 new parking spaces will be provided in a proposed parking lot located to the north of the Langley Central Scientific Computing Complex off of North Wright Street (indicated as Area D on Figure 2). The proposed parking lot will encompass 2.4 hectares (5.8 acres) at the former site of the relocated water tank, and will be contiguous with an existing parking lot at the trailer site. The distance from the proposed off-site parking lot in Area D to the proposed DAAC building is 247 to 457 m (900 to 1,500 ft). Pedestrian access from the proposed parking lot will be provided by a new sidewalk which begins across from the proposed parking lot, passes beside the tennis court, crosses through the picnic area, and ties into the parking lot at the existing crosswalk directly in front of the Building 1268 main entrance (see Figure 2). The proposed parking lot and connecting sidewalk will be illuminated for the second and third shifts. The paved area remaining at the Langley Central Scientific Computing Complex will be dedicated to

existing space which would meet the project requirements. Consequently, it was determined that new construction would be required for a DAAC located outside LaRC. A financial review of this alternative determined that the cost for a 20-year lease period, at 4 % inflation (\$28 million) will be significantly higher than the construction cost of an on-site DAAC facility (\$8 million).

#### 4.0 ENVIRONMENTAL IMPACTS

##### 4.1 PROPOSED ACTION

###### 4.1.1 Water Quality

Construction of the proposed action will not impact water quality. The construction contractor will be required to implement a sediment and erosion control plan for the project which will ensure no impact to surface water systems. The sediment and erosion control plan will be approved by the Contracting Officer prior to construction. Additionally, because it is larger than 5 acres, construction of the proposed parking lot in Area D will be accomplished under a National Pollutant Discharge Elimination System (NPDES) stormwater construction permit from the Virginia Department of Environmental Quality (DEQ), Division of Water. This requires NASA LaRC to submit a Notice of Intent (NOI) to the Virginia DEQ. The three potential parking lot expansions at Areas A, B, and C, and the Langley Boulevard widening are each smaller than the 5-acre threshold for NPDES stormwater permitting.

Domestic wastewater from the proposed DAAC building will be discharged to the Hampton Roads Sanitation District (HRSD) under the existing LaRC permit for treatment and disposal. DAAC operations will not generate any process wastewater. The minor increase in sanitary wastewater associated with the 65 to 100 DAAC employees will not provide a capacity impact to the HRSD.

During semi-annual maintenance of the proposed DAAC building cooling system, cooling water will be discharged into the storm drain. Discharge of non-contact cooling water into the stormwater system is allowed under the NPDES regulations, however the LaRC NPDES permit will require a modification to address the additional discharge.

Stormwater from the proposed DAAC building will be handled by the addition of new storm structures and piping to the existing storm drain at the Langley Central Scientific Computing Complex. The proposed parking lot in Area D, which is at the former site of the relocated water tower, will be located in an area of LaRC not served by the existing stormwater system. Stormwater from the proposed parking lot will gravity drain to the marsh along Tabbs Creek. Stormwater drainage from the three potential parking lot expansions (Areas A, B, and C) and from the potentially widened section of Langley Boulevard, if constructed, will be accommodated by the existing LaRC stormwater management system. The stormwater discharges from the proposed DAAC facilities will not affect the LaRC's application for NPDES permit for stormwater.

#### 4.1.2 Air Quality

Construction of the proposed action will result in minor and temporary fugitive dust emissions during earthwork operations. The use of standard construction dust control practices, such as spraying disturbed areas with water, will minimize any dust emissions.

The proposed DAAC building will be powered by electricity from Virginia Power, and heated by steam from the existing LaRC steam plant. The UPS for the DAAC will be powered by batteries and will not generate air emissions.

#### 4.1.3 Biological Resources

The Langley Central Scientific Computing Complex is located within the densely developed western area of LaRC. No natural habitats occur in the vicinity of this facility. Construction of the proposed DAAC building will occur within an area presently containing a paved parking lot (1.5 acres). Construction of the proposed parking lot at Area D will result in paving 5.8 acres of a previously disturbed grassy area. Expansion of the existing parking lot at Area A will result in paving a grass median within the existing parking lot (1.5 acres). Expansion of the existing parking lot at Area B will result in paving a grass area adjacent to the existing parking lot (1.3 acres). Expansion of the existing parking lot at Area C will result in paving a grass area adjacent to the existing parking lot (4.2 acres). Widening of Langley Boulevard between Doolittle Road and South Wright Street will result in paving less than 0.25 acre of a grass area along Langley Boulevard. The consequences of the proposed action will not affect any biological resources.

#### 4.1.4 Endangered and Threatened Species

No Federal or state-listed endangered or threatened species are known to occur at LaRC (Letter from the Virginia Department of Conservation and Recreation's Division of Natural Heritage dated 21 January 1993). However, no comprehensive field survey has been performed at LaRC. The proposed action will occur in an industrial area of LaRC devoid of suitable natural habitat. The consequences of the proposed action will not affect any listed or proposed endangered or threatened species, or their critical habitat.

#### 4.1.5 Waste Generation, Treatment, Storage, and Disposal

Non-hazardous solid waste generated at LaRC is disposed of by burning in the existing LaRC on-site refuse-to-steam plant, or by disposal in an off-site permitted landfill. Construction debris from the proposed action will be disposed in an off-site permitted landfill. The construction contractor will be required to identify any hazardous wastes resulting from construction of the proposed

action, and to submit a hazardous waste disposal plan to the Contracting Officer for approval prior to the planned disposal.

Operations within the proposed DAAC building will result in an increase in the amount of non-hazardous solid waste generated by the additional employees. The proposed DAAC facilities will not generate hazardous waste.

#### 4.1.6 Noise

Construction of the proposed action will produce minor increases in noise levels in the immediate vicinity. Construction will involve removal of the existing paved parking lot, excavation and removal of the old tow tank foundation from under the parking lot, and driving piles for the foundation of the proposed DAAC building. These activities will require some diesel-powered equipment, such as front-end loaders, dump trucks, concrete ready-mix trucks, mobile cranes, and pile drivers. The equipment will operate intermittently during daytime hours and produce noise levels in the range of 95 dBA locally. The noise will attenuate rapidly with distance. As part of the LaRC Noise Control and Hearing Conservation Program, NASA monitors noise levels within its property and facilities and takes appropriate actions when necessary, such as providing hearing protection or evacuation of personnel from high noise areas in compliance with the Federal Noise Control Act (40 CFR Parts 201-211). The nearest noise-sensitive receptor outside LaRC property is the trailer park located about 1,300 m (4,260 ft) to the southwest. No off-site noise-sensitive receptors will be impacted by construction noise.

#### 4.1.7 Toxic Substances

A survey of Building 1268B indicated that there are no asbestos containing materials in the areas which will be disturbed by construction of the proposed DAAC building. Any toxic substances, such as lead paint, encountered during project construction will be managed in accordance with appropriate Federal, state, and local regulations, and with the Langley "Facility Safety Requirements" (LHB 1740.2), the "Langley Safety Requirements" for contractors, Section 01060 (SPECSINTACT), and the "Environmental Program Manual" (LHB 8800.1). (11)

The existing Cray supercomputers in the Langley Central Scientific Computing Complex use a non-conducting fluor-inert material for cooling. This material is completely enclosed within the computers. The computers for the new DAAC facility have not been determined at this time. It is anticipated that they will be cluster computers with air cooling.

#### 4.1.8 Historic, Archeological, and Cultural Factors

Building 1268 was constructed in 1960; Building 1268A in 1967; and Building 1268B in 1970. These buildings are not considered to have historical significance. The portion of the foundation of the old tow tank which remains under the parking lot at the Langley Central Scientific Computing Complex, is not considered to have historical significance. The sites of the proposed DAAC building, new utility lines, new/expanded parking lots, and Langley Boulevard widening have been disturbed in the past by construction and utility line installation, and are considered to have no cultural resources potential.

The proposed sidewalk crosses through the picnic area which is the site of the Cloverdale Plantation, a 17-th century occupation. In 1993, NASA LaRC performed a Phase I archeological survey of a portion of the picnic area for the proposed expansion of the Activity Center (Building B1222). The survey did not identify any features, although artifacts were encountered in the test holes (Kosky Carrell Associates, 1993). NASA LaRC is proposing an expanded Phase I survey (which will include the area of the proposed sidewalk) prior to embarking upon the proposed Phase II survey. This approach currently is in consultation with the Virginia State Historic Preservation Officer (SHPO). The expanded Phase I survey is scheduled for January 1994; the Phase II survey is scheduled for March 1994. If the Phase II survey identifies potentially significant cultural resources, no construction will be permitted to begin in the affected area until completion of the National Historic Preservation Act process (36 CFR Part 800).

#### 4.1.9 Economic, Population, and Employment Factors

LaRC is located in the northern portion of the City of Hampton which is adjacent to York County and Poquoson City in the southern Peninsula Area of Virginia. The population study area addressed in this EA is within a one-hour commuting radius (80 kilometers or 50 miles) from LaRC. This area is in the central portion of the Hampton Roads Metropolitan Statistical Area (MSA). The Hampton Roads MSA includes the Peninsula Area, the City of Newport News across Hampton Roads to the south, and James City County and the City of Williamsburg to the north.

According to the 1990 Census, the population in the City of Hampton was 133,793; in the City of Newport News it was 170,045; while the entire Hampton Roads MSA had a population of 403,654. This indicates a 17.2 percent increase in population since 1980. The Hampton Roads MSA workforce consisted of 643,120 civilian and 141,000 active duty military in 1991.

NASA LaRC presently employs approximately 3,000 civil service and 2,200 contractors, with an annual payroll of \$ 153 million. LaRC contracts about \$ 409 million annually in goods and services both



locally and nationally, thus performing an important role in the local economy.

The proposed DAAC will have 65 to 100 new employees, assumed to be relocated from, or newly hired by, the Goddard Space Flight Center in Maryland. This represents less than 2 percent of the existing 5,200 personnel at LaRC, and an insignificant percentage of the Hampton Roads MSA workforce. Assuming the 1990 York County household population of 2.90, this would indicate a population increase of an estimated 189 to 290 persons in the Hampton Roads MSA. This represents a negligible increase in the MSA population which could be accommodated within the existing housing, public services, and infrastructure of the Hampton Roads MSA. This increase in population due to the new employment at LaRC will offer a slight beneficial impact to the economy of the area.

The 65 to 100 DAAC employees will work four shifts to provide the 24-hour per day, 7 days per week operation of the facility. The weekday daytime shift will have the largest staff with approximately 45 employees; there will be minimal staffing on the remaining shifts. Assuming a person-per-car ratio of between 1.1 and 1.25, this indicates that approximately 39 more vehicles will be traveling and/or parking within the LaRC complex during the weekday. As discussed in Section 3.2, 181 new parking spaces will be constructed in a proposed parking lot at the site of the relocated water tower along North Wright Street (see Area D on Figure 2) to accommodate the loss of the 142 spaces at the Langley Central Scientific Computing Complex.

The construction of the proposed parking lot at Area D cannot begin until the construction of the proposed DAAC building begins. During that time, there will be a deficit of 142 parking spaces from the Langley Central Scientific Computing Complex for approximately three months until the water tower is dismantled and Area D is available. Parking will be difficult and inconvenient, whereby carpooling should appear more reasonable and increase during this limited timeframe. The available parking facilities will exceed the need over the next year until the DAAC is completed and staffed. Only minimal disruption of traffic flow is expected during construction, with minor impact due to increased traffic during operation. The new parking lot in Area D will remain inconvenient to the Langley Central Scientific Computing Complex and the proposed DAAC due to its distance from these facilities.

Only minimal disruption during construction is projected for the present employees in Building 1268B while corridors and walls are renovated for access to the proposed DAAC building.

#### 4.1.10 Radioactive Materials and Non-ionizing Radiation

Construction and operation of the proposed action will not require the use of radioactive materials or non-ionizing radiation.

#### 4.1.11 Wetlands and Floodplains

LaRC has large areas of tidal marsh wetlands associated with Brick Kiln Creek and Tabbs Creek, and small, scattered areas of forested wetlands. The 100-year floodplain elevation at LaRC is at 2.6 m (8.5 ft) above mean sea level (MSL). No wetlands occur in the vicinity of the Langley Central Scientific Computing Complex, and this facility is above the 100-year floodplain elevation. The proposed project is not a "critical action" facility. The proposed parking lot at Area D will be within the 100-year floodplain, and will be adjacent to the marsh wetland area along Tabbs Creek. There is no practicable alternative which avoids locating the parking lot in the floodplain. The potentially expanded parking lots at Areas A, B, and C, and the potentially widened section of Langley Boulevard do not contain wetlands and are not within the 100-year floodplain. No wetlands will be affected by the proposed action. Construction of the proposed parking lot in Area D will not adversely affect the floodplain, and will not pose a risk to safety or property.

#### 4.1.12 Coastal Resources Management

LaRC is located within Tidewater Virginia, but by law is excluded from the boundaries of the Virginia Coastal Management Area. The proposed action is a Federal development within the coastal zone. Consistency with the enforceable policies of Virginia's Coastal Program will be accomplished through compliance with Virginia's Erosion and Sediment Control Law and with the NPDES permit program by implementing a sediment and erosion control plan for the proposed construction, obtaining a NPDES stormwater permit for construction of the proposed parking lot at Area D, and by modifying the LaRC NPDES to include the discharge of cooling water during semi-annual maintenance of the proposed DAAC building's cooling system.

#### 4.1.13 Energy

The Langley Central Scientific Computing Complex is a major electricity user, and is covered by the LaRC-wide energy management program for energy conservation and efficient usage. The Langley Central Scientific Computing Complex uses approximately 3,680 kVA of electricity annually. The proposed action will result in an annual increase of 733 kVA, which is available from Virginia Power. The additional steam for the proposed DAAC building is available from the LaRC steam plant.

#### 4.2 NO-ACTION ALTERNATIVE

The No-Action alternative will result in no impacts to the environment from either construction or operation, however this alternative will not provide the needed capability for DAAC facilities to handle global atmospheric data over the 15-year

EOSDIS mission life.

#### 4.3 EXISTING FACILITIES ALTERNATIVE

The Existing Facilities alternative also will result in no construction-related impacts to the environment. Existing facilities at LaRC can be used to provide space for the initial prototype version of the EOSDIS, but space will not be available to support the programmed expansions of the EOSDIS capabilities over the entire EOS mission life. Consequently, the Existing Facilities alternative will not satisfy the EOS program objective.

#### 4.4 OFF-SITE LEASING ALTERNATIVE

An evaluation of available space in the Hampton Roads area determined that the Off-Site Leasing alternative will require construction of new facilities to accommodate the proposed DAAC. The environmental effects of constructing a new facility outside LaRC will be generally the same as those associated with the proposed action. Locating the DAAC outside LaRC will preclude the benefits of co-location with the existing Langley Central Scientific Computing Complex. Co-location would provide for redundancy in back-up and support systems, such as utilities, and in the availability of technical staff from the existing computing complex.

## 5.0 REFERENCES

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- NASA. April, 1980. Implementing the Provisions of the National Environmental Policy Act. NHB 8800.11.

**6.0 AGENCIES RECEIVING A COPY OF THE ENVIRONMENTAL ASSESSMENT**

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**ENDANGERED SPECIES REVIEW**



ADMINISTRATION  
NATURAL HERITAGE  
PLANNING AND RECREATION RESOURCES  
SOIL AND WATER CONSERVATION  
STATE PARKS

**COMMONWEALTH of VIRGINIA**  
**DEPARTMENT OF CONSERVATION AND RECREATION**  
**DIVISION OF NATURAL HERITAGE**

Main Street Station, 1500 East Main Street — Suite 312

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21 January 1993

Dottie Keough  
Ebasco  
2111 Wilson Blvd. Suite 435  
Arlington, Virginia 22201

Re: Resources Management Document for NASA Langley Research  
Center

Dear Ms. Keough:

In response to your request for information, the Department of Conservation and Recreation's Division of Natural Heritage (DNH) has searched its Biological and Conservation Datasystem (BCD) for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources (NHR's) are defined by the Virginia Natural Area Preserves Act as "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest" (sec. 10.1-209 et seq. of the Code of Virginia).

According to the information currently in our files, there are no natural heritage resources documented at the Langley Air Force Base and Langley Research Center. The absence of data does not necessarily mean that natural heritage resources do not exist on or adjacent to the study site, but rather that our files do not currently contain information to document their presence.

To most accurately identify those species with a good potential to occur at the Langley Research Center, I have enclosed lists of natural heritage resources that have been documented on the Poquoson West, Newport News North, and Hampton USGS Quadrangles. All of these resources could occur at Langley in appropriate habitat, however, their presence can only be verified through field surveys. There are no NHR's documented on the Poquoson East Quadrangle.

Due to the delay in responding to your request, I am providing this information to you at no charge. Please note that DNH has recently revised the Information Services provided through



Dottie Keough  
21 January 1993  
Page Two

environmental review. An updated fact sheet and order form are included for your reference.

DNH's Biological and Conservation Datasystem is constantly growing and revised. Please contact DNH for an update on this natural heritage information if a significant amount of time passes before it is utilized.

An explanation of species rarity ranks and legal status abbreviations is enclosed for your reference. Thank you for the opportunity to comment on this project.

Sincerely,

  
Timothy D. O'Connell  
Environmental Review Coordinator

DEPARTMENT OF CONSERVATION & RECREATION  
DIVISION OF NATURAL HERITAGE

NATURAL HERITAGE RESOURCES OF POQUOSON WEST QUAD

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<b>** AMPHIBIANS</b>					
AMBYSTOMA MABEEI	MABEE'S SALAMANDER	G4	S1		LT
AMBYSTOMA TIGRINUM	TIGER SALAMANDER	G5	S1		LE
HYLA GRATIOSA	BARKING TREEFROG	G5	S1		LT
<b>** BIRDS</b>					
ARDEA HERODIAS	GREAT BLUE HERON	G5	S3		
IXOBRYCHUS EXILIS	LEAST BITTERN	G5	S2		
<b>** COMMUNITIES</b>					
COASTAL PLAIN SINKHOLE POND			S1		
ESTUARINE HERBACEOUS VEGETATION					
ESTUARINE SCRUB					
LOW HERBACEOUS WETLAND					
OLIGOTROPHIC SEASONALLY FLOODED WOODLAND					
OLIGOTROPHIC SEMIPERMANENTLY FLOODED WOODLAND					
SUBMESOTROPHIC FOREST					
<b>** MAMMALS</b>					
CONDYLURA CRISTATA PARVA	STAR-NOSED MOLE	G5T4	S2	3C	
<b>** NON-VASCULAR PLANTS</b>					
SPHAGNUM MACROPHYLLUM VAR MACROPHYLLUM	LARGE-LEAF PEATHOSS	G3G4T3	S2		
<b>** VASCULAR PLANTS</b>					
BOLTONIA CAROLINIANA	CAROLINA BOLTONIA	G2G	S2		
CAREX COLLINSII	COLLINS' SEDGE	G4	S3		
CUSCUTA INDECORA	PRETTY DODDER	G5	S2?		
ELEOCHARIS TENUIS VAR VERRUCOSA	SLENDER SPIKERUSH	G5T3T5	S1		
FIMBRISTYLIS PERPUSILLA	HARPER'S FIMBRISTYLIS	G2	S1	C2	LE
LYTHRUM ALATUM VAR ALATUM	WINGED LOOSESTRIPE	G5T5	S2		
SABATIA CAMPANULATA	SLENDER MARSH PINK	G5	S2		
TILLANDSIA USNEOIDES	SPANISH MOSS	G5	S2		

22 Records Processed

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DEPARTMENT OF CONSERVATION & RECREATION  
DIVISION OF NATURAL HERITAGE  
NATURAL HERITAGE RESOURCES OF NEWPORT NEWS NORTH QUAD

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<b>** AMPHIBIANS</b>					
AMBYSTOMA MABEEI	MABEE'S SALAMANDER	G4	S1		LT
<b>** VASCULAR PLANTS</b>					
CAREX LUPULIFORMIS	FALSE HOP SEDGE	G3G4	S1		
CYPERUS DIANDRUS	UMBRELLA FLATSEDE	G5	SH		
QUERCUS SHUMARDII	SHUMARD'S OAK	G5	S2		
TRILLIUM PUSILLUM VAR VIRGINIANUM	VIRGINIA LEAST TRILLIUM	G3T2	S2	C2	

5 Records Processed

DEPARTMENT OF CONSERVATION & RECREATION  
DIVISION OF NATURAL HERITAGE

NATURAL HERITAGE RESOURCES OF HAMPTON QUAD

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<b>** BIRDS</b>					
CASMERODIUS ALBUS	GREAT EGRET	G5	SB2SN4		
CHARADRIUS MELODUS	PIPING PLOVER	G3	S2	LT	LT
RYNCOPUS NIGER	BLACK SKIMMER	G5	S2		
STERNA ANTILLARUM	LEAST TERN	G4	S2		
STERNA HIRUNDO	COMMON TERN	G5	S3		
<b>** INVERTEBRATES</b>					
CICINDELA DORSALIS DORSALIS	NORTHEASTERN BEACH TIGER BEETLE	G4T2	S2	LT	C
<b>** OTHER</b>					
CHAMPION TREE					
<b>** VASCULAR PLANTS</b>					
CAREX PEDUNCULATA	LONGSTALK SEDGE	G5	S2		
CUSCUTA INDECORA	PRETTY DODDER	G5	S2?		
DESMODIUM STRICTUM	PINELAND TICK-TREFOIL	G3G4	S2		
DESMODIUM TENUIFOLIUM	SLIM-LEAF TICK-TREFOIL	G3G4	S2		
DROSER A BREVIFOLIA	DWARF SUNDEW	G5	S2		
IVA IMBRICATA	SEA-COAST MARSH-ELDER	G5?	S1S2		

13 Records Processed

Definition of Abbreviations Used on Natural Heritage Resource Lists  
of the  
Virginia Department of Conservation and Recreation

Natural Heritage Ranks

The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources, or "NHR's," are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The primary criterion for ranking NHR's is the number of populations or occurrences, i.e. the number of known distinct localities. Also of great importance is the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals. Other considerations may include the quality of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of populations or occurrences such that ranks will be an index of known biological rarity.

- S1 Extremely rare; usually 5 or fewer populations or occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.
- S2 Very rare; usually between 5 and 20 populations or occurrences; or with many individuals in fewer occurrences; often susceptible to becoming extirpated.
- S3 Rare to uncommon; usually between 20 and 100 populations or occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
- S4 Common; usually >100 populations or occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
- S5 Very common; demonstrably secure under present conditions.
- SA Accidental in the state.
- SB# Breeding status of an organism within the state.
- SH Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.
- SN# Non-breeding status within the state. Usually applied to winter resident species.
- SR Reported without persuasive documentation
- SU Status uncertain, often because of low search effort or cryptic nature of the element.
- SX Apparently extirpated from the state.
- SZ Long distance migrant whose occurrences during migration are too irregular, transitory and/or dispersed to be reliably identified, mapped and protected.

Global ranks are similar, but refer to a species' rarity throughout its total range. Global ranks are denoted with a "G" followed by a character. Note that GA and GN are not used and GX means apparently extinct. A "Q" in a rank indicates that a taxonomic question concerning that species exists. Ranks for subspecies are denoted with a "T". The global and state ranks combined (e.g. G2/S1) give an instant grasp of a species' known rarity.

These ranks should not be interpreted as legal designations.

Federal Legal Status

The Division of Natural Heritage uses the standard abbreviations for Federal endangerment developed by the U.S. Fish and Wildlife Service, Division of Endangered Species and Habitat Conservation.

- |                            |   |
|----------------------------|---|
| LE - Listed Endangered     | 3A - Former candidate - presumed extinct  |
| LT - Listed Threatened     | 3B - Former candidate - not a valid species under current taxonomic understanding |
| PE - Proposed Endangered   | 3C - Former candidate - common or well protected                                  |
| PT - Proposed Threatened   | NF - no federal legal status  |
| C1 - Candidate, category 1 |   |
| C2 - Candidate, category 2 |   |

State Legal Status

The Division of Natural Heritage uses similar abbreviations for State endangerment.

- |                        |                            |
|------------------------|----------------------------|
| LE - Listed Endangered | PE - Proposed Endangered   |
| LT - Listed Threatened | PT - Proposed Threatened   |
| C - Candidate          | NS - no state legal status |

For information on the laws pertaining to threatened or endangered species, contact:

U.S. Fish and Wildlife Service for all FEDERALLY listed species  
Virginia Department of Agriculture and Consumer Services Plant Protection Bureau for STATE listed plants and insects;  
Virginia Department of Game and Inland Fisheries for all other STATE listed animals.