

**ENVIRONMENTAL ASSESSMENT  
FOR THE E4 TEST STAND**

**JOHN C. STENNIS SPACE CENTER  
HANCOCK COUNTY, MISSISSIPPI**

Lead Agency: NASA, John C. Stennis Space Center

Proposed Action: To Build the E4 Test Stand

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Abstract: NASA is planning to build a new test stand for testing of Rocket Based Combined Cycle (RBCC) engines. The new test stand would be called the E4 Test Stand. It would be capable of three different test regimes: sea level static tests, sea level free jet tests, and altitude tests. The primary benefit of this test stand and the associated engines is the development of propulsion systems for reusable launch vehicles with significant reduction in the cost of launching payloads to orbit.

## Executive Summary

NASA's John C. Stennis Space Center (SSC) is proposing to construct a new test stand to accommodate the testing of rocket engines using Rocket Based Combined Cycle (RBCC) technology. The environmental impacts of the proposed construction and testing include air emissions, cooling water discharge, storm water control, wetlands disturbance, dredging and filling, propellant storage tanks, and noise. These temporary or intermittent impacts will not affect the local community and will have minimal impact at the SSC facility. Alternatives considered are locating the test stand near the A Test Stands; near the H1 Test Stand; north of the E2 Test Stand; and the "No Action Alternative". Since SSC is NASA's lead center for propulsion testing it was selected over other NASA sites for proposed construction of the new test stand.

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## 1.0 Purpose and Need

The National Aeronautics and Space Administration (NASA) at the John C. Stennis Space Center (SSC) is the Lead Center for Propulsion Testing. As such NASA plans to construct a new test stand to be called the E4 Test Stand at SSC. The E4 Test Stand would be used for testing of the Rocket Based Combined Cycle (RBCC) technology. It would be capable of three different test regimes: sea level static tests, sea level free jet tests, and altitude tests. The primary benefit of this test stand and the associated engines is the development of propulsion systems for reusable launch vehicles with significant reduction in the cost of launching payloads to orbit.

An environmental assessment of the proposed project has been conducted to comply with the requirement of the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations for implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508) and NASA policy and procedures (14 CFR 1216.7).

## 2.0 Description of Proposed Action and Alternatives

The proposed action is to construct a new rocket test stand for testing RBCC technology. This test stand would be used for tests involving hydrocarbon-based fuels, liquid oxygen and hydrogen peroxide. A containment pond of approximately 0.8 hectares (2 acres) would be built for managing non-hazardous liquid waste. An office building of approximately 1,700 square meters (18,000 square feet) and a computer signal conditioning building would also be constructed for directing tests and collecting data from the rocket tests. Safety fencing would surround the test facility and all volatile or pressurized peripheral system components. Roads and drainage ditches would be improved and area lighting would be provided.

Since SSC is NASA's lead center for propulsion testing it was selected over other NASA sites for construction of the new test stand. The location at SSC selected for the test stand should be as close as is feasible to support infrastructure such as facility high pressure gas, high pressure water, electrical support and transportation accessibility. Additionally, the facility should have a location and orientation that keeps noise at a tolerable level for the surrounding buildings and facilities. The facility also needs to be outside of the blast over-pressure perimeters of other test stands and in a location where there is access to the site when other test stands are in operation.

Alternatives considered are locating the test stand near the A Test Stands; near the H1 Test Stand; north of the E2 Test Stand; and the "No Action Alternative". The "No Action Alternative" would not allow NASA to advance technology for RBCC in a timely manner. Inclusion of the "No Action Alternative" is prescribed by the Council on Environmental Quality regulations. The "No Action Alternative" provides the benchmark against which the proposed actions are evaluated.

The location near the A Test Stands is near electric power utilities, high pressure gas and high pressure water. Roads would need to be improved and a drainage ditch would need to be dug from the facility to the SSC canal for removal of cooling water. This location may be inaccessible when other testing operations are occurring at the A Test Stands.

The location near the H1 Test Stand was evaluated but there are no substantial utilities on the site and the gravel access road to the test stand would require improvements.

The site north of the E2 Test Stand is near an improved road, electric power lines, and high pressure gas lines. A pumping station would be necessary to pump water from the SSC canal to provide cooling water and fire protection to the RBCC facility. Cooling water discharge would be returned to the canal via a containment pond and an existing drainage ditch to the north. At this site rocket testing operations would be able to occur independent of testing at other test stands unlike the alternative near the A Test Stands. This site is the preferred site and will be evaluated in this environmental assessment as well as the alternatives. Since this site is located near the E Test Stand Complex, the name "E4 Test Stand" has been selected. Figure 1 shows the location alternatives at the SSC facility.

### 3.0 Existing Environment and Environmental Consequences of Alternatives

There will be some minor impacts on the existing environment at SSC. The following sections describe the possible impacts that may occur.

#### 3.1 Air Quality

Short term fugitive air emissions may result from construction activities. Air emissions from RBCC engine testing are included in SSC's State of Mississippi Air Pollution Control Title V Permit to Operate # 1000-00005 issued February 5 1998 and have been reviewed in the NASA/MSFC/SSC Environmental Impact Statement of Engine Technology Support for NASA's Advanced Space Transportation Program. Emissions from the RBCC engines are primarily carbon dioxide, carbon monoxide, nitrogen oxides and water. Some carbonaceous soot would be formed as a result of incomplete combustion of the fuel. The test stand itself and the tanks used to store hydrocarbon fuel or hydrogen peroxide would need to be included in SSC's Title V Air Emissions Permit to Operate by submitting a modification to the Title V permit application.

Air Quality impacts will be the same for all alternative locations. The "No Action Alternative" will result in no air emissions.





Figure 1—Stennis Space Center - Logtown Quadrangle

### 3.2 Noise

Noise from construction will have a short term intermittent impact. SSC is surrounded by a large uninhabited Buffer Zone that covers a total of 50,587 hectares (125,001 acres), extending in an eight kilometer (five mile) radius around the perimeter of the central, fenced, "Fee Area". It consists of mostly forests and pasture lands. The E4 Test Stand would be located near the center of SSC within the "Fee Area" and would be oriented to the east in a manner that will direct sound to the east during engine testing. Noise issues have been reviewed in the NASA/MSFC/SSC Environmental Impact Statement of Engine Technology Support for NASA's Advanced Space Transportation Program. The noise produced will be within the scope of noise levels produced by existing testing activities. Hearing protection would be required for personnel in the area of the E4 Test Stand during testing.

There will be no off-site impact to local communities. Noise impacts will be the same for all alternative locations, however the orientations may differ directing noise in different directions. The "No Action Alternative" will result in no additional noise.

### 3.3 Water Quality

A storm water general permit for construction will be obtained from the Mississippi Department of Environmental Quality prior to construction. This permit will require SSC to abide by a pollution prevention plan that insures the reduction of possible impacts on the environment from erosion.

The E4 Test Stand would be equipped with a pump system to remove surface water from the canal for fire protection and for non-contact cooling water. The non-contact cooling waste water would be fed into a containment pond where it will remain until it reaches ambient temperature before it is released back into the canal. The containment pond would also be a safeguard in the event of a spill or unanticipated release of hydrocarbon based fuel or oxidizer. A modification to SSC's National Pollutant Elimination System (NPDES) permit # MS0021610 will need to be submitted to add the discharge of this water back into the canal. No deflector would be installed at this test stand so there is no need for deluge water for deflector cooling at this time.

The test stand would be built such that any spills that occur during engine testing will be contained within the test stand curbed foundation. Piping, storage tanks and surge tanks for hydrocarbon fuels will be double walled and sloped concrete will direct any fuel transfer spills to a holding area for removal.

Water quality impacts would be the same for all alternatives except the "No Action Alternative" which would result in no possibility of additional wastewater or spill contamination.

### 3.4 Groundwater Resources

Water for potable and industrial use at SSC is supplied through six large capacity wells on site. No additional groundwater wells or deep subsurface disturbance is planned for this project. No impact to groundwater resources is expected.

### 3.5 Wetlands and Flood Plains

The SSC facility lies within the watersheds of two rivers: the East Pearl River on the western Fee Area boundary and the Jourdan River on the eastern Fee Area boundary. Some tributaries at the facility flow west to Harper Bayou and eventually drain into the East Pearl River. Other tributaries flow east into Catahoula Creek, with some intermittent streams flowing south into Devil's Swamp. Catahoula Creek and Devil's Swamp both eventually drain into the Jourdan River. The Pearl River empties into Lake Borgne, while the Jourdan River drains into the Bay of St. Louis. Both Lake Borgne and the Bay of St. Louis discharge into the Mississippi Sound.

As a result of the wetlands hydrology found at and around SSC and the presence of hydric soils and hydrophytic vegetation, a large portion of both the Fee Area and Buffer Zone are considered jurisdictional wetlands by the U.S. Army Corps of Engineers (COE). The E4 Test Stand would be located on land that is considered jurisdictional wetlands. The disturbance of wetlands at SSC is covered under an existing General Permit #CELMK-OD-FE 14-GPD (Vicksburg District)-53 issued by the U.S. Army Corps of Engineers. As required by the permit, a Final Mitigation Plan was developed by NASA and the COE. This mitigation plan provides an approach for the establishment of a 115-acre Pearlington mitigation site and a 15-acre hardwood enhancement wetland mitigation area. These areas will provide compensation for up to 50 acres of unavoidable wetland impact over a ten year period at SSC.

Location alternatives would also necessarily have similar wetland impact due to the pervasiveness of wetlands throughout the SSC facility. It is anticipated that 10 hectares (25 acres) of wetlands may be impacted by this project. There is no practicable alternative that avoids location of the project in a wetlands area.

The floodplain at SSC, according to the Flood Insurance rate Map for Hancock County, Mississippi, includes a 100-year floodplain along the East Pearl River at the western edge of the Fee Area, and a 100-year floodplain along the Wolf Branch and along the Lion Branch of Catahoula Creek in the northeast portion of the Fee Area. The line for the 500-year floodplain extends a little further into the site along the same boundaries. The majority of SSC is classified as Zone "C"

meaning an area of minimal flooding. None of the alternatives is located in the 100-year or 500-year floodplain.

### 3.6 Biotic Resources

Pine forest communities account for the majority of the vegetation in the uncleared portions of SSC and the surrounding Buffer Zone. Bottomland hardwood communities occur in low, poorly drained soils, which may have standing water. Vegetation and wildlife species that occur at SSC are identified in the SSC Environmental Resources Document.

The proposed construction site is a wooded area and may cause displacement of wildlife from the construction area to other nearby woodlands. Impacts on biotic resources would be the same for all alternatives except the "No Action Alternative", which would result in no impact.

### 3.7 Threatened and Endangered Species

There are several threatened, endangered, and ranked species with ranges overlapping the SSC Fee Area and Buffer Zone. Federally listed and State-ranked species that may potentially occur in the project area are described in the SSC Environmental Resources Document. The ranked and listed species that have ranges that include SSC are Gulf sturgeon, eastern indigo snake, Florida panther, gopher tortoise, bald eagle, and paddlefish. The proposed construction activities will not affect any threatened and endangered species or critical habitat that may exist in the SSC Fee Area. If a listed or ranked species is seen during construction, the appropriate agencies will be consulted.

### 3.8 Archaeological Resources

Historically, the land at SSC has been severely disturbed by timber harvesting and the associated naval stores industry during the late nineteenth and early twentieth centuries. More recently, the land was disturbed by the construction of the SSC facility during the 1960's, making it unlikely that undisturbed archaeological sites would be found. In the Fee Area, only the townsite of Gainesville may require future archaeological considerations if land disturbing activities are proposed for the Fee Area. This project is not located near the Gainesville townsite and is on previously disturbed land. There are no anticipated archaeological impacts resulting from this project. If items of potential archeological interest are uncovered during construction, further construction in the immediate area will cease until the requirements of Section 106 of the National Historic Preservation Act have been satisfied.

### 3.9 Cultural and Historical Resources

The A-1, A-2 and B-1/B-2 Test Stands at SSC have been designated as National Historic Landmarks and appear on the National Register of Historic Places. These test stands and associated control centers have been so designated because of their importance in the testing of Saturn rockets, and the importance of the Saturn rocket in landing men on the moon. None of the alternatives will alter the historical attributes of the test stands or have an effect on their status as National Historic Landmarks.

### 3.10 Transportation

Interstates 10 and 59 (I-10 and I-59), U.S. Highway 90, and Mississippi 607 serve the SSC area. Direct access to and through SSC from I-10 and I-59 is provided by Mississippi Highway 607. Highway 607 also connects with U.S. Highway 90 approximately 9 miles (13.5 km) southeast of SSC. There will be no impact to transportation by this project.

### 3.11 Waste Generation and Treatment

The solid waste generated at SSC is recycled or placed in the site Class A landfill. Unacceptable wastes, such as hazardous waste, paint products, and fuels are excluded from disposal in the landfill and will be shipped off-site to pre-approved facilities for appropriate treatment or disposal. It is anticipated that there may be solvents, paints, and hydrocarbon fuel generated as waste during construction and operation of the test stand.

The "No Action Alternative" will produce no wastes.

### 3.12 Socioeconomics

The proposed test program for the E4 Test Stand may require approximately 30 employees. Only about a third of the employees are expected to be new hires. Construction will require temporary employment of personnel through construction contractors. There will be no socioeconomic impact.

### 3.13 Public and Employee Health and Safety

The SSC test areas are designed with consideration of the hazardous nature of the operations and provide for the protection of employees. The hazardous operations take place in areas safely isolated from the general public.

SSC adheres to Occupational, Health, and Safety Administration (OSHA) standards for protection

of employees on site. Procedures are in place to monitor and protect employees as necessary during operations. The SSC Integrated Contingency Plan (SPG 4130.3C) details specific emergency procedures to respond to natural and human-generated emergencies. There are on-going training programs to ensure emergency preparedness.

### 3.14 Pollution Prevention and Environmental Justice

In accordance with Executive Order (EO) 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements, SSC (NASA/SSC, 1995) has written a pollution prevention strategy into their Pollution Prevention Plan. This plan encourages elimination or reduction of the use and purchase of toxic chemicals, energy efficiency, solid waste reduction and recycling, water conservation, and hazardous waste and oil spill prevention. In order to meet the goals of the Pollution Prevention Plan, SSC has initiated projects affecting both the physical infrastructure and the program/project operations.

In accordance with EO 12898, SSC's Environmental Justice Implementation Plan reflects agency policy established in "Environmental Justice Strategy", March 1995. Any adverse effects of programs at SSC on low income or minority populations will be identified and, if necessary, remedies will be provided through implementation of these plans. Because of the size of the SSC Buffer Zone surrounding the Fee Area and the alternative test stand locations, there are no environmental justice concerns associated with this project.

#### 4.0 Agencies and Individuals Consulted

No agencies or individuals have been consulted for this environmental assessment. Information on environmental concerns from agencies and individuals on SSC activities has been addressed in previous environmental assessments and environmental impact statements.

#### 5.0 List of Preparers

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Carolyn Kennedy	Mississippi Space Services, SSC - Environmental Engineer	Environmental Impacts and Compliance
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7.0 Distribution List

Maury Oceanographic Library, Building 1003, Stennis Space Center, MS

Hancock County Library, Highway 90, Bay St. Louis, MS

Margaret Reed Crosby Library, Picayune, MS

St. Tammany Parish Library, Slidell, LA

U.S. Fish and Wildlife Service

Mississippi Department of Archives and History

Natioanl Aeronautics and Space Administration, Headquarters