# 1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

## 1.1 Introduction

NASA proposes to construct a Bioastronautics Facility (BAF) at the Lyndon B. Johnson Space Center (JSC) in Houston, Texas beginning in 2002.

The functional requirements of the BAF would be to house the following general areas:

1. Advanced Systems Development
2. Astronauts Isolation Area
3. Astronauts Training and Rehabilitation
4. Baseline Data Collections
5. Biomedical Research Laboratories
6. Flight Medicine Clinic
7. National Space Biomedical Research Institute (NSBRI)

The following components would be necessary for monitoring biomedical health of crewmembers and implementing research programs relating to extended - duration human space flight at the proposed facility.

Astronaut Training and Rehabilitation
Biomedical Research Laboratories
Flight Projects Management
National Space Biomedical Research Institute
Medical Operations Clinic
Flight Crew Isolation Facility

New initiatives set forth to support and monitor longer manned space flights are described below.

1. Extended Duration Crew Operations (EDCO): Includes ground-based and Shuttle-based investigations, monitoring, and evaluation of biomedical issues associated with long-duration stays in orbit. This initiative would also allow NASA to ensure biomedical issues are understood and countermeasures developed.

2. Remote Health Care / Health Maintenance Facility (HMF) Development: Results in the creation of flight hardware designed to deliver on-board health care including prevention, diagnosis, and treatment. In addition, the ground-based HMF hardware

would provide for training, pre-flight hardware development and evaluation, near real-time medical surveillance, and troubleshooting support.

3. Space Station Environment Health Subsystem (EHS): To develop a Space Station EHS that ensures station habitability in areas such as microbiology, toxicology, water quality, and radiation.

4. Space Station Biology (SBP): To understand the effects of microgravity and space travel on humans and other living organisms ability to adjust in space and re-adapt to Earth. In addition, science payloads and life science research facilities are to be developed.

5. Preflight Adaptation Trainers (PAT): Consists of trainers designed to pre-adapt crews to altered sensory conditions which in turn, should prevent or mitigate space motion sickness and neurosensory disturbance.

Growth needs dictate additional operating space for the following on-going programs, which would be incorporated into the BAF.

1. National Space Biomedical Research Institute: Would require augmentation of existing facilities as well as creation of new facilities that would support the new initiatives in the areas of cardiovascular, musculoskeletal, barothermal and exercise physiology, and neurophysiology.

2. Flight Medicine (FMC), Dental and Occupational Medicine Clinics (OMC): Would provide equipment, laboratories, supplies, and pharmaceutical needs for use by both clinics in a single locale. This would avoid duplication of personnel and space and provide a growing FMC with needed staff and facilities.

3. Anthropometric and Biomechanics Laboratory: Additional space would be required for new equipment that would enhance testing activities relating to Shuttle Transport System (STS) and Space Station Extra Vehicular Activity (EVA) suit and glove design.

4. Baseline Data Collection Facility (BDCF): Allows for collection and processing of data pertaining to pre-flight and post-flight medical tests, and Shuttle/Spacelab and Space Station crewmembers.

5. Discipline Operations Center (DOC): Would be a control room for personnel to provide real-time life sciences mission support. Payload verification tests, mission simulations, and training would also be supported activities.

6. Science and Technology Center (S&TC): Would provide integration of Spacelab and Space Station flight racks with life sciences experiment hardware.

7. Space Station Computer Facility: Would support all administrative, office automation, database development and engineering analysis tasks related to Space Station life sciences applications.

## 1.2 Need for the Bioastronautics Facility

Certified tours of Astronaut duty on an operational basis of 180 days, and support for exploration initiatives for the Space Station and future moon or Mars endeavors are formally accepted responsibilities of the JSC Director of Space and Life Sciences and the Directors of Life Sciences at NASA Headquarters. JSC is the lead NASA Center for STS Orbiter and medical operations support. JSC is responsible for determining consequences of extended duration STS missions. Monitoring physiological functions and development of countermeasures for potential physiological problems incurred during re-entry, landing, and post-landing egress are additional responsibilities of JSC. With the disciplines of space biology and medicine in development, these initiatives require expanded life sciences research and the resources necessary for facilitation. Currently, the life sciences program and its associated projects are housed in 10 separate buildings, which are occupied to capacity and scattered throughout JSC. Overcrowding, and a lack of space and unification dictate the need for a central facility that would accommodate the new programs and initiatives. The manned space flight-oriented biomedical research and operational support capabilities for the planned life sciences research can only be met at JSC. Existing non-life science facilities at JSC could not meet the needs of the program. The new facility would be a key element in meeting NASA's long range manned space flight goals.

The proposed construction site is centrally located to existing facilities currently occupied by the affected organizations (Medical Sciences Division, Life Sciences Projects Division, and Man Systems Division).

## 1.3 Decisions That Must Be Made

JSC management must decide:

- Whether to construct the Bioastronautics Facility on the proposed site or choose the no-action alternative.

- Determine whether the proposed action would or would not be a major Federal action significantly affecting the quality of the human environment. If JSC management determines that it would be, then an EIS (Environmental Impact Statement) must be prepared and a ROD (Record of Decision) signed for the Bioastronautics Facility project to proceed.

## 1.4 Applicable Regulatory Requirements and Required Coordination

Compliance with the following environmental laws, regulations, and coordination activities are required for the proposed Bioastronautics Facility project to proceed.

- Clean Water Act

  Compliance with Section 404 of the act is required in the form of notification.

- Clean Air Act

  This act establishes standards for particulate matter in the air. This project meets these standards as described in 4.3.1.

- Migratory Bird Treaty Act

  This act provides for the protection of migratory birds. Under this act it is unlawful "by any means or manner, to pursue, hunt, take, capture, [or} kill" any migratory birds except permitted by regulation. Unintentional take constitutes a violation. While modifications of habitat possibly used my migratory species may occur at the site, habitat modification is not considered a "take".

- National Historic Preservation Act

  This act establishes a requirement for consideration of potential impacts to historic properties. The Texas Historical Commission (THC) determined that

there would be no adverse effects to historic properties if the proposed action were implemented.

- Endangered Species Act

  This act was established to protect Federally listed threatened and endangered species. The U. S. Fish and Wildlife Service determined that no federally listed threatened or endangered species are known to occur at the proposed site. In addition, there was no officially designated critical habitat at this site. The proposed action would be constructed in accordance with the law.

- Farmland Protection Policy Act

  This act was implement to assist in protection of prime farmland throughout the United States. The proposed site is designated as "farmland already in urban development" and is exempt from further review under the policy.

Additional guidelines to be followed:

- Federal Emergency Management Agency guidelines concerning floodplains.
- National Pollution Discharge Elimination System general permit conditions as outlined in the NASA Storm Water Pollution Prevention Plan.

# 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

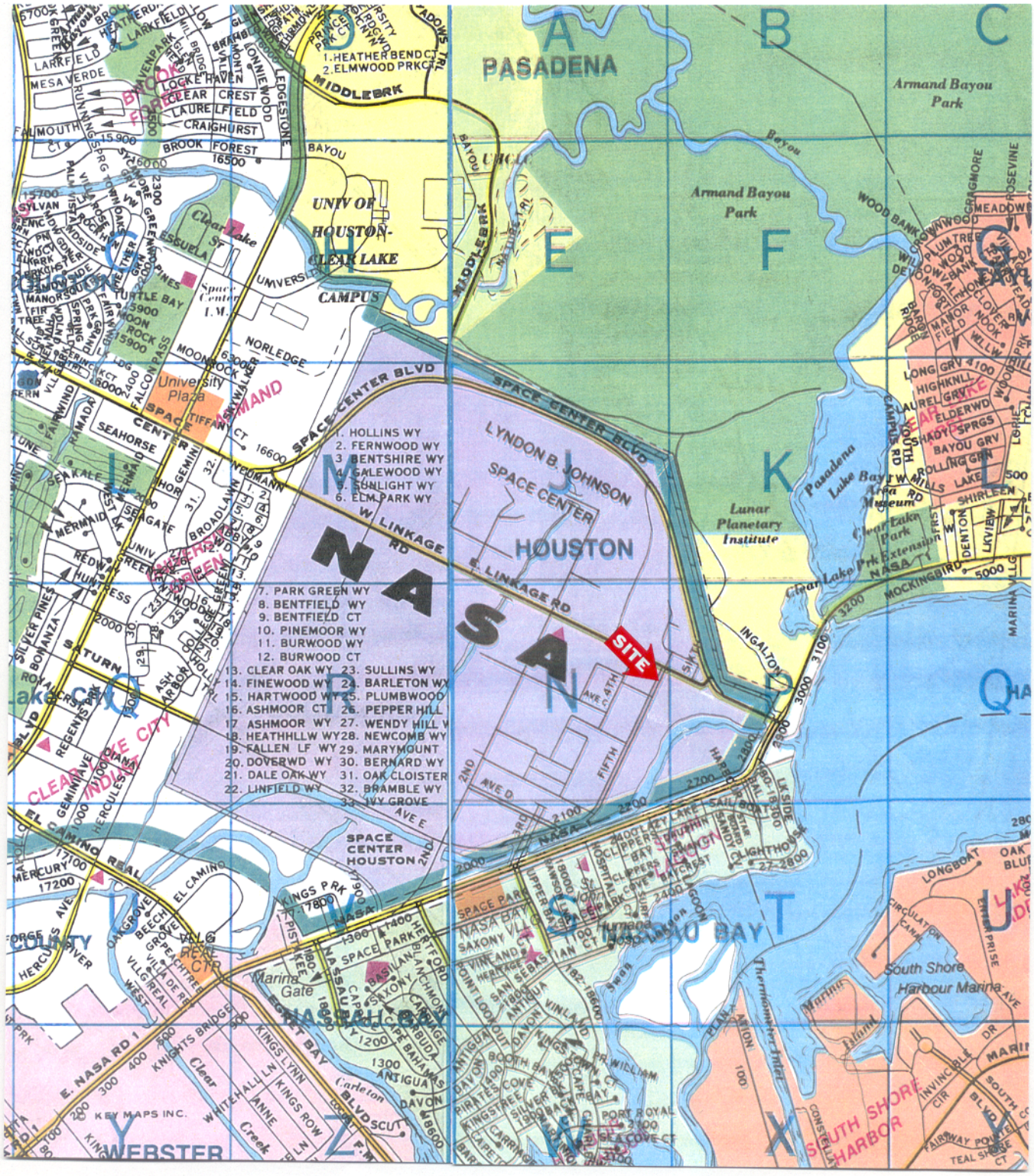
## 2.1 Construction of the Bioastronautics Facility

The BAF would be located at JSC in Harris County, Texas. JSC is located 35.40 kilometers (22 miles) southeast of downtown Houston, near Clear Lake (Figure 2-1). The proposed site is located in the northeast portion of JSC, north of Building 28 and east of Building 37 at the southeast corner of the intersection of Avenue B and Fifth Street. The site is approximately 9.30 hectares (23 acres) of an undeveloped fallow field, dominated by grasses.

A precast tilt-up and composite steel frame building, approximately 26,384.46 square meters (284,000 square feet) in size, comprised of 3-stories is proposed for construction. The building would house laboratories, offices, a medical clinic, library and archive areas, classrooms/conference space, an auditorium, and a presentation room. A 0.4 kilometer (¼ mile) running track, parking lots to accommodate approximately 380 vehicles, and landscaped outdoor areas are also proposed for construction (Figure 2-2). The entire site will be impacted by the proposed facilities.

## 2.2 No-Action Alternative: Maintenance of site in the undeveloped condition

The no-action alternative would have several consequences for JSC. JSC has responsibilities to certify tours of Astronaut duty, to support Space Station missions and other exploration ventures, to determine physiological consequences of extended - duration missions, and to develop measures to safeguard the crewmembers health throughout their duty. Lack of space and a centralized location for medical operations and research facilities are critically limiting the implementation of JSC initiatives and no-action would result in JSC's inability to execute programs.

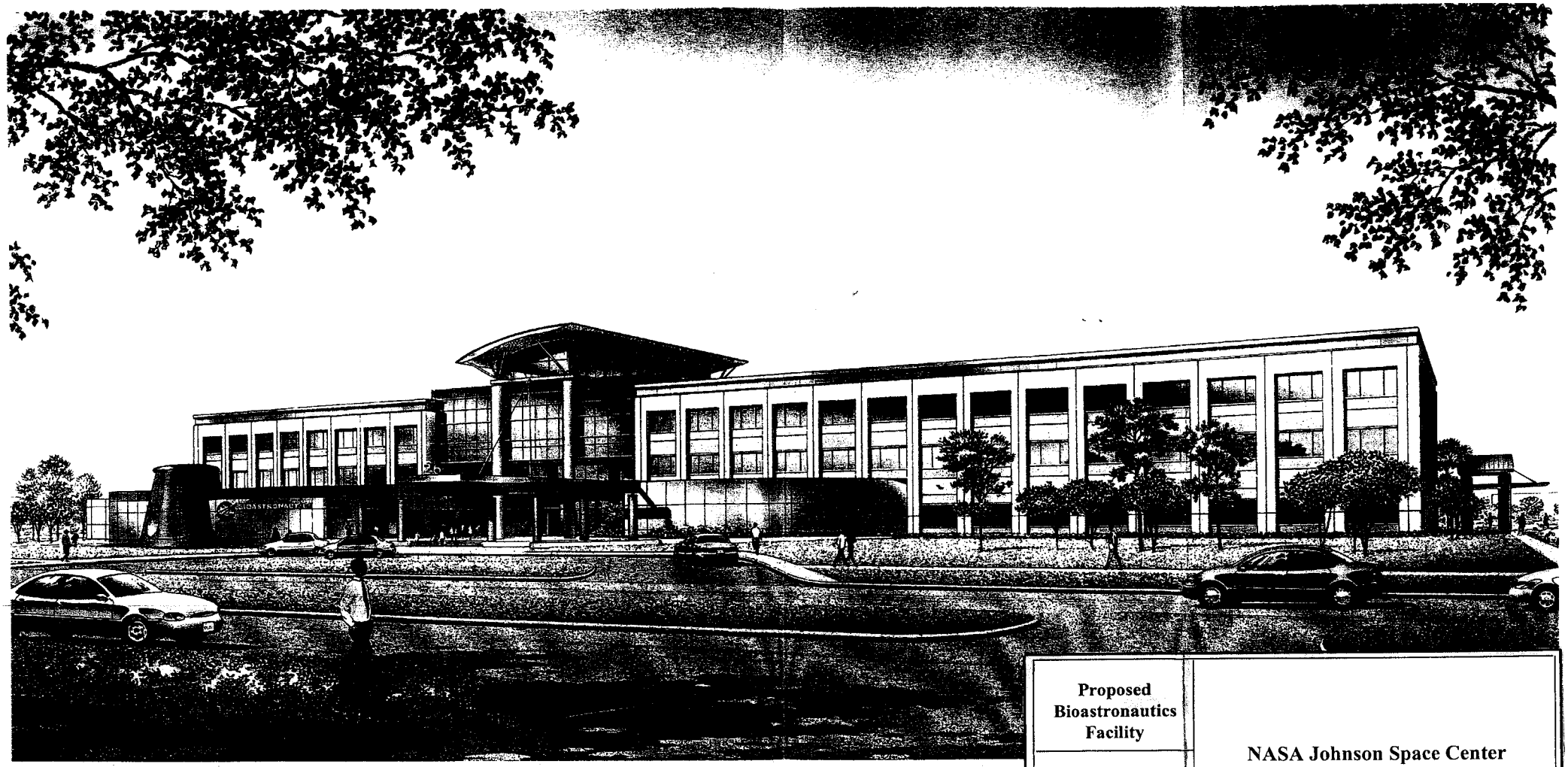



Scale: 1 inch = 0.5 miles

Source: Key Maps, Inc.
Houston, Texas

N

| Vicinity Map | NASA Johnson Space Center<br>BioAstronautics Facility<br>Houston, Texas |
|---|---|
| Date: 10/00 | |
| Figure 2-1 | |



| Proposed Bioastronautics Facility | NASA Johnson Space Center<br>BioAstronautics Facility<br>Houston, Texas |
|---|---|
| Date: 10/00 | |
| Figure 2-2 | |

# 3.0 AFFECTED ENVIRONMENT

## 3.1 Introduction

The affected environment succinctly describes the relevant resources of the areas that would affect or that would be affected by the alternatives if they were implemented. In conjunction with the description of the no action alternative in Chapter 2 and with the predicted effects of the no action alternative in Chapter 4, this chapter establishes the scientific baselines against which the decisionmaker and the public can compare the effects of the action alternative.

## 3.2 Climate and Earth Movements

### 3.2.1 Hurricanes and Tidal Surge

From June to November, the Gulf Coast may be struck by hurricanes and tropical storms with sustained heavy rain and strong winds. Flooding may occur in coastal areas due to storm surge (extremely high tides caused by wind) and receding waters. A review of the U.S. Geological Survey (USGS) Topographic Map (League City Quadrangle) indicates the proposed site located within JSC has an elevation of approximately 4.57 meters (15 feet) above mean sea level (USGS, 1995) (Figure 3-1). The proposed site and the land surrounding the site are generally flat, with a gentle slope to the southeast. The northeastern portion of the site is topographically lower than the rest of the site. Areas of the proposed site are in the floodplain of Clear Creek.

### 3.2.2 Rainfall

Rainfall is evenly distributed throughout the year, with an annual average of about 116.84 centimeters (46 inches) (WeatherPost 2000). Thunderstorms are common in summer months when the sun warms the air near the surface, causing it to rise and cool, resulting in clouds and rain. Showers and thunderstorms also occur when weather fronts pass through the area.

## 3.3 Construction Impacts

### 3.3.1 Air Resources

The U. S. Environmental Protection Agency established National Ambient Air Quality Standards (NAAQS) for ozone, lead, carbon monoxide, sulfur dioxide, nitrogen dioxide, and respirable particulate matter. The Texas Natural Resource Conservation Commission

(TNRCC) has adopted the NAAQS standards presented in Table 3.3.1 for each of the six pollutants.

The TNRCC classifies the air quality status of each county with respect to NAAQS as attainment, nonattainment, or unclassified. Attainment indicates that the air quality is within the NAAQS. Nonattainment indicates that the air quality exceeds NAAQS for a specified pollutant or pollutants. Unclassified indicates insufficient data to categorize a particular county. Harris County is classified as a "severe nonattainment" area for ozone. It is in attainment for all other NAAQS. Ozone is not emitted directly into the air. It is formed through chemical reactions between natural and man-made emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx) in the presence of sunlight. Ozone pollution is the periodic increase in the concentration of ozone in the ambient air. When temperatures are high, sunshine is strong, and winds are weak, ozone can accumulate at ground level to unhealthful levels (TNRCC 1995).

**Table 3.3.1 - National Ambient Air Quality Standards (NAAQS)**

| Pollutant | Averaging Perioc | Primary NAAQS | Secondary NAAQS |
|---|---|---|---|
| Ozone | 1 hour[a] | 125 ppb | 125 ppb |
| | 8 hour[b] | 85 ppb | 85 ppb |
| Carbon Monoxide | 1 hour[c] | 35.5 ppm | 35.5 ppm |
| | 8 hour[c] | 9.5 ppm | 9.5 ppm |
| Sulfur Dioxide | 3 hour[c] | - | 550 ppb |
| | 24 hour[c] | 145 ppb | - |
| | Annual[d] | 35 ppb | - |
| Nitrogen Dioxide | Annual[d] | 54 ppb | 54 ppb |
| Respirable Particulate Matter (10 microns or less) (PM10) | 24 hour[e] | 155 µg/m3 | 155 µg/m3 |
| | Annual[f] | 51 µg/m3 | 51 µg/m3 |
| Respirable Particulate Matter (2.5 microns or less) (PM2.5) | 24 hour[g] | 66 µg/m3 | 66 µg/m3 |
| | Annual[h] | 15.1 µg/m3 | 15.1 µg/m3 |
| Lead | Quarter[d] | 1.55 µg/m3 | 1.55 µg/m3 |

Source: TNRCC June 2000; www.tnrcc.state.tx.us/air.monops/naaqs.html
Primary NAAQS: The levels of air quality that the EPA judges necessary, with an adequate margin of safety, to protect the public health.
Secondary NAAQS: The levels of air quality that the EPA judges necessary to protect the public welfare from any known or anticipated adverse effects.
ppb = parts per billion, ppm = parts per million, µg/m3 = micrograms per cubic meter
[a] – Not to be at or above this level on more than three days over three years.
[b] – Not to be at or above the average of the annual fourth highest daily 8-hour maximum over a three year period.
[c] – Not to be at or above this level more than once per calendar year.
[d] – Not to be at or above this level.
[e] – Not to be at or above the three year average of the annual 99th percentile for each monitor within an area.
[f] – Not to be at or above the three year average of annual arithmetic mean concentrations at each monitor within an area.
[g] – Not to be at or above the three year average of the annual 98th percentile for each population-oriented monitor within an area.
[h]– Not to be at or above the three year average of annual arithmetic mean concentrations from single or multiple community-oriented monitors.

### 3.3.2 Sound Environment

Most of the land immediately surrounding the proposed site hosts buildings and parking lots. Adjacent to the southwest of the proposed site, there is the Auxiliary Chiller Facility. Adjacent to the northwest, there are the Planetary and Earth Sciences Laboratory, the Life Sciences Laboratory, and parking lots. Adjacent to the northeast, there are the Environmental Support Facility, a Gate House, and the Administrative Support Facility. Adjacent to the southeast, there are several drainage ditches, the drainage swale, the HL&P canal, a pecan grove, open field, a pipeline corridor, and eventually Clear Lake. A fence marks the perimeter of JSC, and there are public roadways to the north, east and southwest of JSC. There is also a residential development located to the northwest of JSC. Noise levels to not appear to exceeded normal background levels typically associated with such areas.

### 3.3.3 Spills and Hazardous Materials

The proposed site is undeveloped and has not been associated with any known activities or past uses, which involved the generation, storage, or disposal of hazardous materials. The application of herbicides and insecticides is presumed to have occurred as part of normal pest control procedures. Residual concentrations of these chemicals are not expected to be present on the proposed site. There are no records of spills having occurred at this site.

### 3.3.4 Transportation

The proposed site is located on the corner of Avenue B and Fifth Street. Vehicles currently travel on both roads when going to and from surrounding buildings. There is a side entrance from Space Center Boulevard into JSC located to the northeast of the proposed site. In general, there is little traffic in this area of JSC.

## 3.4 Water Resources

### 3.4.1 Surface Water and Drainage

A canal, maintained by the Houston Lighting and Power Company (HL&P), traverses the southeastern boundary of the BAF site. Based on historical aerial photographs, the canal was constructed between 1944 and 1957. A storm water drainage ditch (herein called the "drainage swale") parallels the HL&P canal along its northern boundary. Based on historical aerial photographs and USGS topographic maps, the drainage swale was created in the late 1960's. Both structures have outlets into Clear Lake.

There is a linear depression located on the southern portion of the site. This depression is depicted in the Preliminary Engineering Report (prepared by Shah Smith & Associates, Inc., in January 2000) as a swale (herein called the "diagonal swale"). There are drainage ditches in the northeastern portion of the site, which is the proposed location for a running track (Figure 3-1.2 and 3-1.3). The gentle slope of the land toward the southeast indicates runoff would flow into the drainage swale and eventually into Clear Lake.

The HL&P canal and the drainage swale typically hold water. Water was not observed in the ditches bordering the proposed running track area, but it can be assumed these areas do shunt surface water off the site at certain times.

### 3.4.2 Floodplains

Floodplains are low areas adjoining inland and coastal waters. Those that have a one percent chance or greater for flooding in any given year are considered to be in a 100-year floodplain. Activities in floodplains should be compatible with the natural propensity for flooding. Structures in the floodplain may further exacerbate flooding upstream or downstream.

The Federal Emergency Management Agency (FEMA) publishes flood maps for insurance ratings. A floodplain map of the site was obtained from FEMA and is included as Figure 3-2 (Map number 48201C1090 K, revised April 20, 2000). The proposed running track is the only portion of the proposed project that appears to be located within the 100-year floodplain.

### 3.4.3 Groundwater

The Beaumont Formation, along with the underlying Montgomery, Bentley, and Wouldis Sand Formations, comprise the Chicot Aquifer, which extends approximately 700 feet below surface in the area of the proposed BAF site. The Evangeline Aquifer is approximately 670.56 meters (2,200 feet) thick and extends from the base of the Chicot Aquifer to approximately 883.92 meters (2,900 feet) below surface (*Digital Models for Simulation of Groundwater Hydrology of the Chicot and Evangeline Aquifers Along the Gulf Coast of Texas,* 1985, Texas Department of Water Resources). Shallow groundwater can typically be encountered at a depth of 3.05 to 6.10 meters (10 to 20 feet) below the surface at JSC. The Chicot and Evangeline Aquifers are the principal sources of groundwater in the Houston area.

Harris County has restricted the pumping of groundwater due to the subsidence in the area. The main source of water supply for JSC and the surrounding vicinity is treated

surface water. According to the Joint Groundwater Monitoring and Contamination Report prepared by the Texas Groundwater Protection Committee in 1998, JSC is not located in a groundwater protection or recharge zone.

There are 3 monitoring wells on the proposed BAF site that should be sampled before construction would commence (Figure 3-1.2).

## 3.5 Biological Resources

### 3.5.1 Vegetation

The proposed site is in the Gulf Prairies and Marshes area of Texas, with nearly level coastal prairie, slowly drained by many slow-moving rivers, streams, and sloughs surrounded by low woodlands (Hatch et al. 1990). Fresh water marshes are located in low-lying remnant prairies, while salt marshes are located in areas adjacent to coastal waters.

Tall prairie grasses are the dominant vegetation in coastal prairies. Natural fires and grazing have prevented trees and shrubs from dominating the landscape. Development has affected plant communities at and surrounding the proposed site. The proposed site was used for agriculture prior to 1969. Many species of natural vegetation were removed during agricultural practices. In addition, the site was used for fill deposit for about 20 years. Dominant vegetation now includes Bermuda grass (*Cynodon dactylon*), Dallisgrass (*Paspalum dilatatum*), and Johnson grass (*Sorghum halapense*). Ten different species of native and non-native trees are planted along the perimeter of the property.

### 3.5.2 Wildlife

The Upper Texas Gulf Coast is home to many species of birds, mammals, reptiles, and amphibians. However, agriculture and urban development have fragmented and altered wildlife habitat. Open fields, a pecan grove, administrative and operation buildings, a gatehouse, roadways, and parking lots surround the proposed site.

The open land and pecan grove near the proposed site provide habitat for deer, small mammals, birds, reptiles, and amphibians that are adapted to suburban and rural environments. The HL&P canal and the drainage swale also provide habitat for a variety of species. During the field reconnaissance, species observed included green heron, (*Butorides striatus*), great egret (*Casmerodius albus*), grackle (*Quiscalus sp.*), barn swallow (*Hirundo rustica*), mottled duck (*Anus fulvigula*), red-winged blackbird

(*Agelaius phoeniceus*), Eastern meadowlark (*Sturnella magna*), loggerhead shrike (*Lanius ludovicianus*), purple martin (*Progne subis*), snowy egret (*Egretta thula*), double-crested cormorant (*Phalacrocorax auritus*), killdeer (*Charadrius vociferus*), American crow (*Corvus brachyrhynchos*), crawfish, and several snakes. Owl pellets consisting primarily of crawfish were found on site, indicating this may be a foraging area for some wildlife.

Birds such as mourning doves *(Zenaida macroura),* European starling *(Sturnus vulgaris),* house sparrows *(Passer domesticus)*, Northern mockingbird *(Mimus polyglottos),* Northern cardinal *(Cardinalis cardinalis),* and blue jay *(Cyanocitta cristata)* may also be found at and surrounding the proposed site. Small mammals such as raccoon *(Procyon lotor),* opossum *(Didelphis virginiana),* and rodents are found in undeveloped areas on and adjacent to the proposed site. Whitetail deer (*Odocoileus virginianus*) are frequently observed on JSC property. Deer signs were observed at the proposed site. The fence surrounding JSC typically would prevent large animals from entering the property, however, deer on the property may be able to penetrate the boundary.

### 3.5.3 Wetlands

The U.S. Army Corps of Engineers (USACE) is responsible for administering and enforcing Section 404 of the Clean Water Act. Wetlands are defined in Title 33, Code of Federal Regulations (CFR) Part 328, Section 3(b), as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. A jurisdictional wetland, as defined by the *1987 Corps of Engineers Wetland Delineation Manual*, must meet three mandatory criteria: hydric soils, wetland hydrology, and hydrophytic vegetation.

Soils at the proposed site are mapped as Midland-Urban and Lake Charles-Urban land complexes (Figure 3-3). The Midland-Urban soils consist primarily of open prairie, but occasionally are covered with hardwood trees, sloping an average of 0.5%. Midland soils are firm, dark grayish brown, silty clay loam, and strongly acidic within the top 7 inches. As depth progresses, soils become firmer, less acidic, and more clayey. Urban land includes soils that have been altered or covered by buildings and structure, and include remnants of Midland soils. Fill material often covers natural soils (Soil Conservation Service, Harris County Soil Survey, 1976).

Lake Charles soils are very firm, mildly alkaline at depths below 55.8 centimeters (22 inches), and consist of clay ranging in color from black (top 55.8 cm (22 inches)) to gray with mottles (187.96 cm (74 inches)). Soils are nearly level, sloping between 0 - 3% (usually 0 – 1%). These soils are somewhat poorly drained, and very slowly permeable. Unless modified, these soils are poor building foundations due to their potential to shrink when dry and swell when wet. The Urban land component of this complex has the same characteristics as that of the Midland-Urban complex, except remnants of Lake Charles soils replace the Midland soils (Soil Conservation Service, Harris County Soil Survey, 1976).

The U.S. Department of the Interior, Fish and Wildlife Service has published National Wetland Inventory maps that identify wetland areas. No wetlands were shown on or directly adjacent to the proposed site, although wetlands are mapped on other portions of the JSC property (Figures 3-4). During site reconnaissance, a depressed area with several inches of standing water, hydrophytic vegetation, and hydric soils was observed. The dominant vegetation included spikerush (*Eleocharis spp.*) and Torpedo grass (*Panicum repens*), which typically occur in wetlands. A formal wetland delineation was conducted on August 31, 2000. The depressional wetland was surveyed at 0.038 hectares (0.095 acres) and is located on the northeastern side of the site, approximately 76.2 meters (250 feet) from Avenue B (Figures 3-1.2 and 3-5). This wetland may be a result of previous modification of the area during fill deposit or it may be a natural depression. The USACE has received these data, but has not verified the delineation to date. The drainage swale on the proposed site does support hydrophytic vegetation, but it is a man-made structure created from uplands and is not considered a water of the United States.

## 3.6 Socioeconomic and Cultural Resources

### 3.6.1 Demographics and Economic Activity

The proposed site is located in the Clear Lake area. The Clear Lake area includes the cities of Friendswood, Kemah, League City, Nassau Bay, Seabrook, Webster, Clear Lake Shores, El Lago, Taylor Lake Village, and parts of Houston and Pasadena. The 2000 population estimate for the Clear Lake area is about 200,000 persons (Clear Lake Economic Development Foundation 2000).

The proposed site is located within one census tract composed of five block groups, mapped and designated by the U.S. Department of Commerce, Bureau of the Census. The proposed site is located in the 1990 census tract, 373.03, surrounding NASA Johnson Space Center, in Houston, Harris County, Texas. Table 3.6.1 lists the race, ethnicity, the

number of persons of voting age, the number of persons in the workforce, the average household income, and the number of housing units and their occupancy status for all block groups in tract 373.03.

The aerospace industry, specialty chemical industry, tourism, and boating and recreation dominate the Clear Lake area economy. Additional area businesses include the service, wholesale, and retail sectors (Clear Lake Economic Development Foundation 2000).

**Table 3.6.1 Demographics of Census Tract 373.03 (including all blocks)**

| Census Tract 373.03 | | |
|---|---|---|
| Persons: | White | 4,506 |
| | Black | 328 |
| | Native American | 14 |
| | Asian | 338 |
| | Hispanic | 801 |
| | Other | 13 |
| Total Persons: | | 6,000 |
| Persons of Voting Age: | White | 4,218 |
| | Black | 247 |
| | Native American | 8 |
| | Asian | 251 |
| | Hispanic | 560 |
| | Other | 184 |
| Total Persons of Voting Age: | | 5,468 * |
| Persons in Work Force: | | 4,268 |
| Average Household Income: | | 34,272 |
| Housing Units: | Occupied | 3,182 |
| | Vacant | 462 |
| Total Housing Units: | | 3,644 |

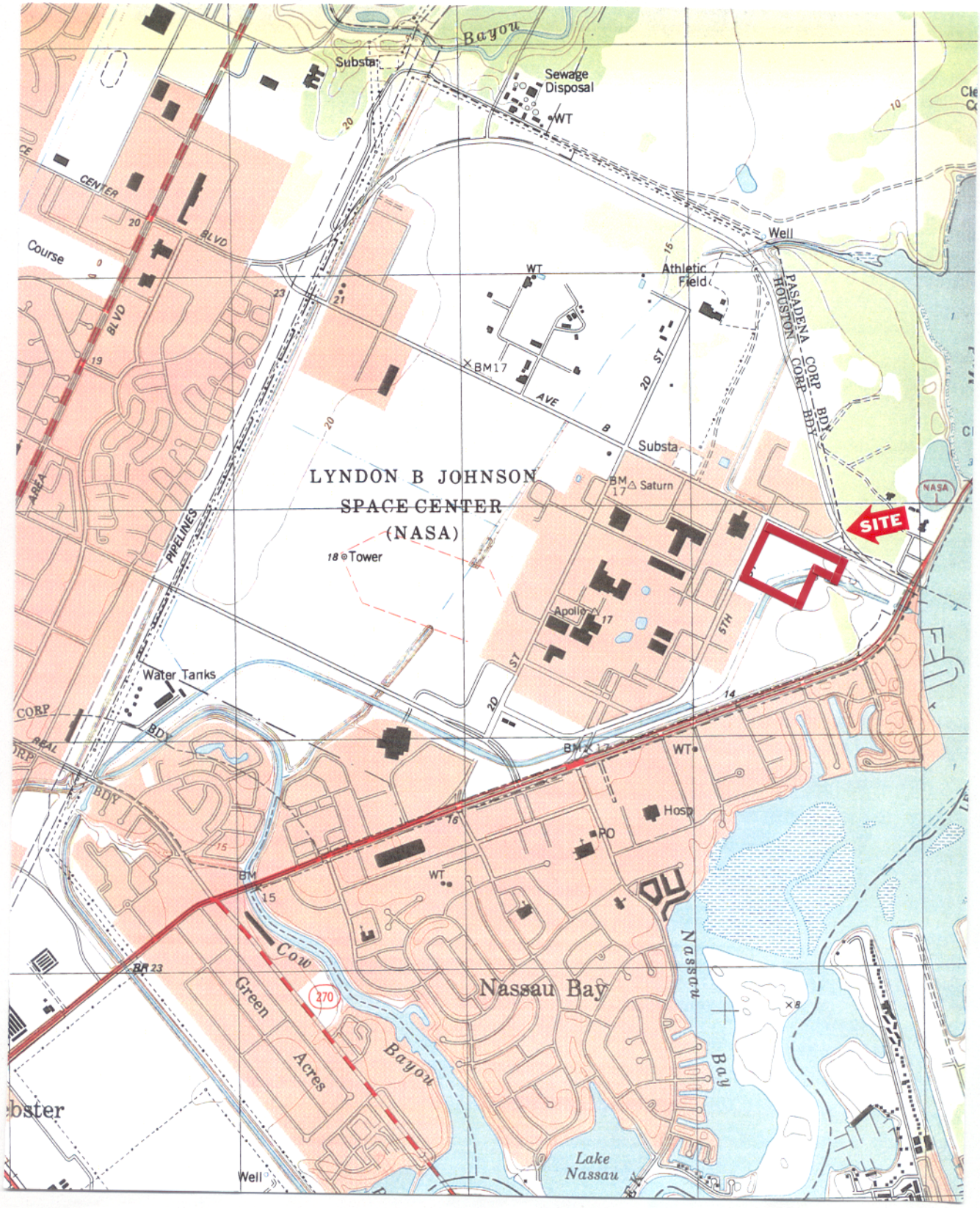
Source: U.S. Department of Commerce, 1990
*The actual number of persons of voting age is 4,908. Due to data collection methods, age categories for Hispanic origin by race were not provided. Consequently, Hispanic voters were tallied among the other races.

### 3.6.2 Cultural Resources

Archeological site records on file with the Texas Archeological Research Laboratory (TARL) at the University of Texas at Austin were reviewed to determine the presence of recorded sites within or immediately adjacent to the project area. Based on a review of these records, no archeological sites have been recorded within the project limits. However, numerous sites in the immediate vicinity of Clear Lake are on record with the

state files at TARL suggesting a favored location for habitation during the prehistoric period.

According to a letter from the State Historical Preservation Officer dated April 27, 2000, a determination of effect was required for the above referenced project. This requirement was based on the proximity of the proposed facility to the National Historic Landmark (NHL) listed Apollo Mission Center Building #30 and the NHL submitted Space Environmental Simulation Lab Building #32. A determination of effect was submitted in writing to the THC on June 6, 2000. A response indicating no adverse effect was received on July 10, 2000.



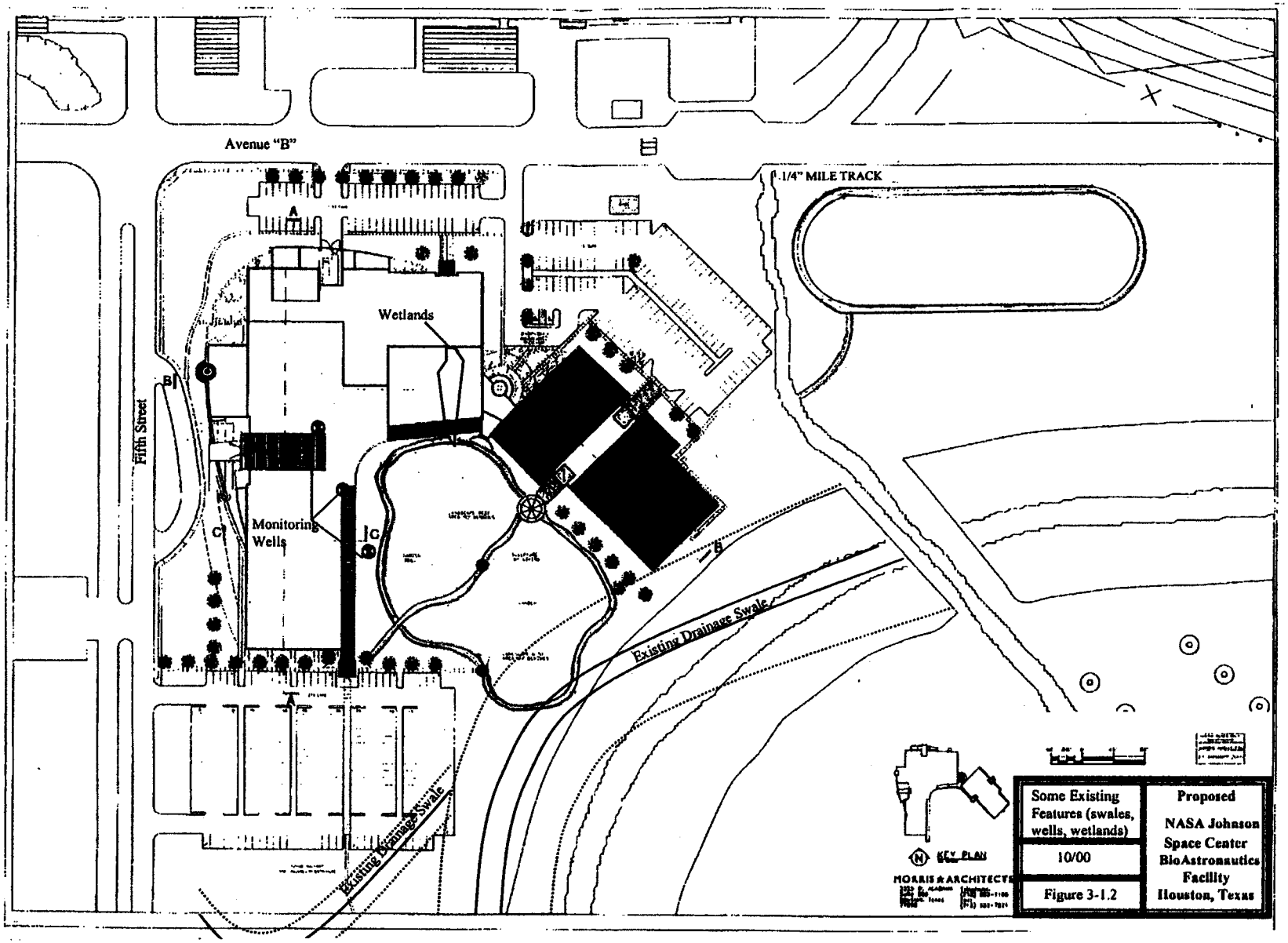

Scale: 1 inch = 2,000 feet

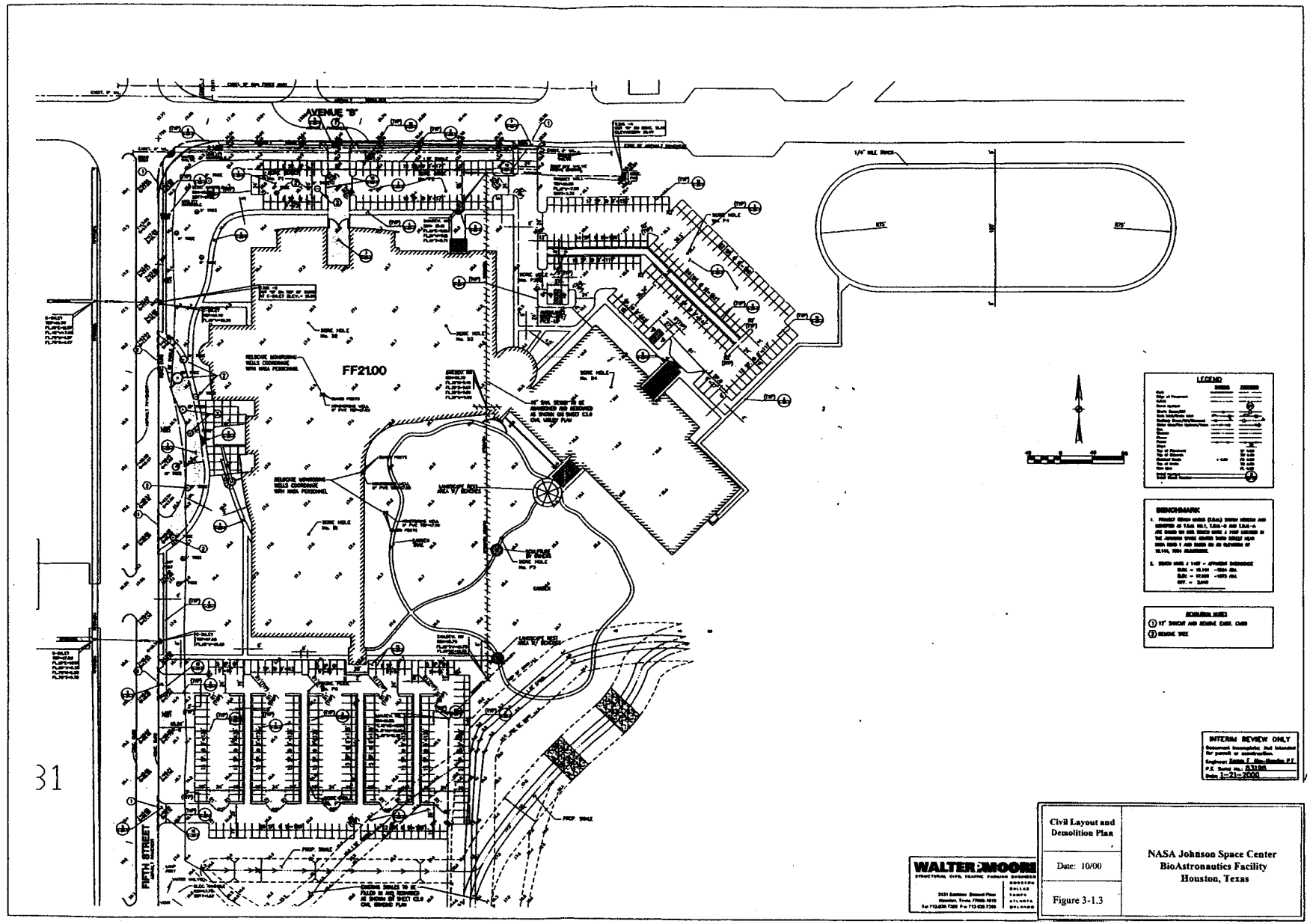
Source: United States Geological Survey
7.5 Minute League City, Texas, Quadrangle

Approximate Facility Boundaries

N

| Site Location Map | NASA Johnson Space Center<br>BioAstronautics Facility<br>Houston, Texas |
|---|---|
| Date: 10/00 | |
| Figure 3-1 | |


Avenue "B"
1/4" MILE TRACK
Wetlands
Fifth Street
Monitoring Wells
Existing Drainage Swale
Existing Drainage Swale
A
B
C
KEY PLAN
MORRIS ★ ARCHITECTS
Some Existing Features (swales, wells, wetlands)
10/00
Figure 3-1.2
Proposed
NASA Johnson Space Center BioAstronautics Facility Houston, Texas




| Civil Layout and Demolition Plan | NASA Johnson Space Center<br>BioAstronautics Facility<br>Houston, Texas |
|---|---|
| Date: 10/00 | |
| Figure 3-1.3 | |

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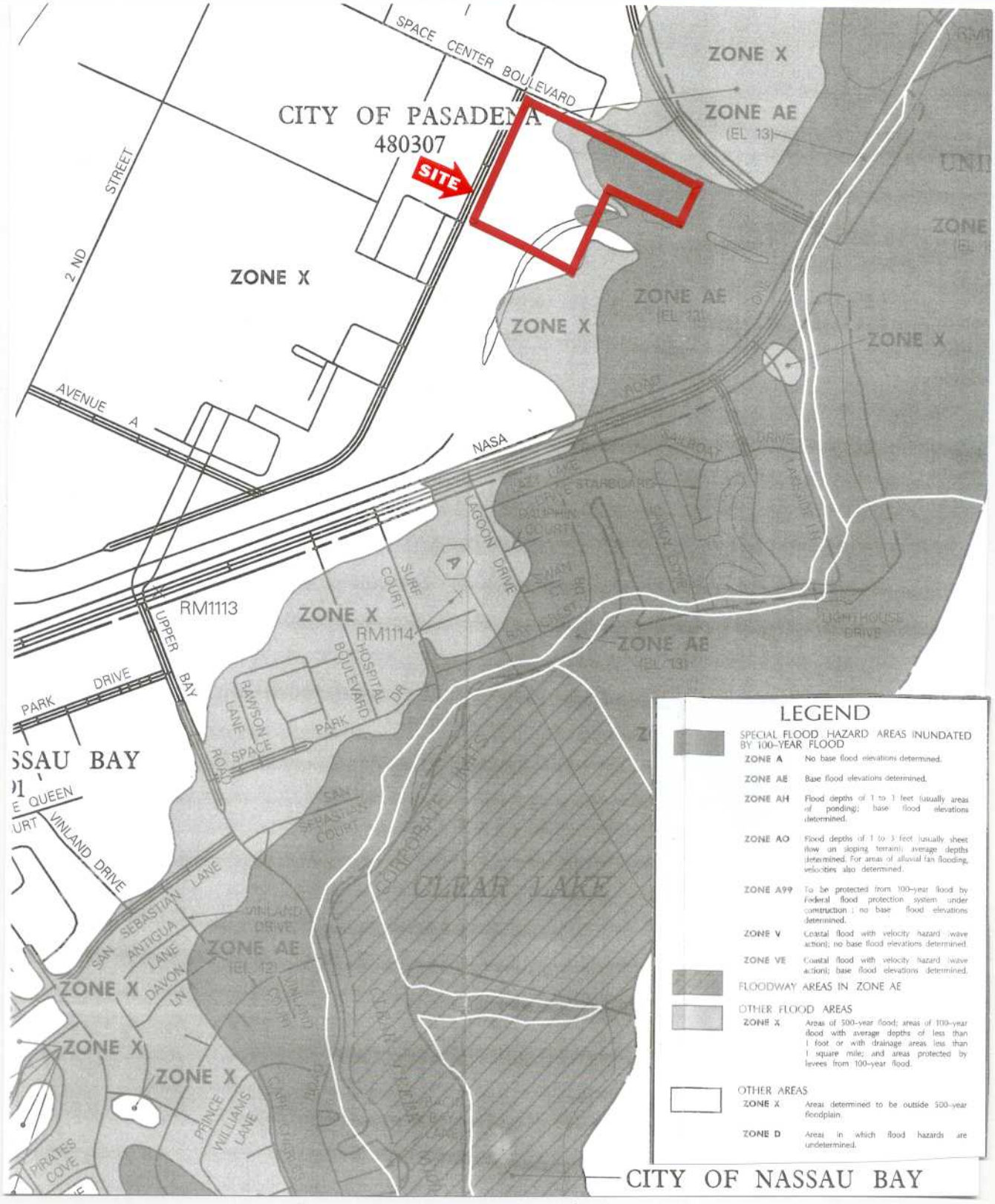



Scale: 1 inch = 1,000 feet

Source: Federal Emergency Management Agency, National Flood Insurance Program, Flood Insurance Rate Map, Harris County Texas and Incorporated Areas, Map Number 48201C1090K, April 20, 2000

Approximate Facility Boundaries

N

| Floodplain Map | NASA Johnson Space Center<br>BioAstronautics Facility<br>Houston, Texas |
|---|---|
| Date: 10/00 | |
| Figure 3-2 | |


Scale: 1 inch = 1,667 feet

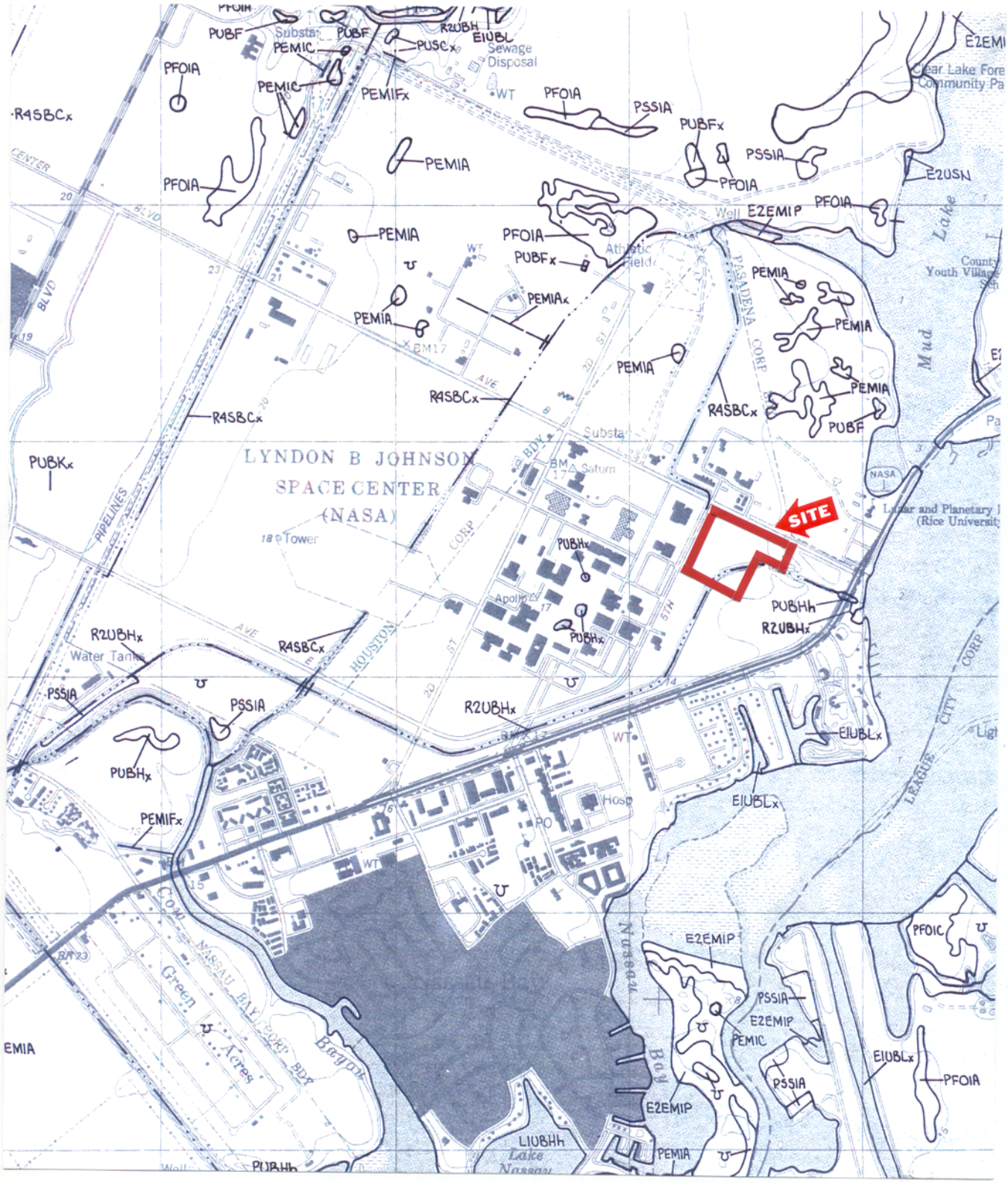
Mu: Midland-Urban land complex
Lu: Lake Charles- Urban land complex

Source: Soil Survey of Harris County, Texas
Map Plate 137

Approximate Facility Boundaries

N

| Soils Map | NASA Johnson Space Center<br>BioAstronautics Facility<br>Houston, Texas |
|---|---|
| Date: 10/00 | |
| Figure 3-3 | |



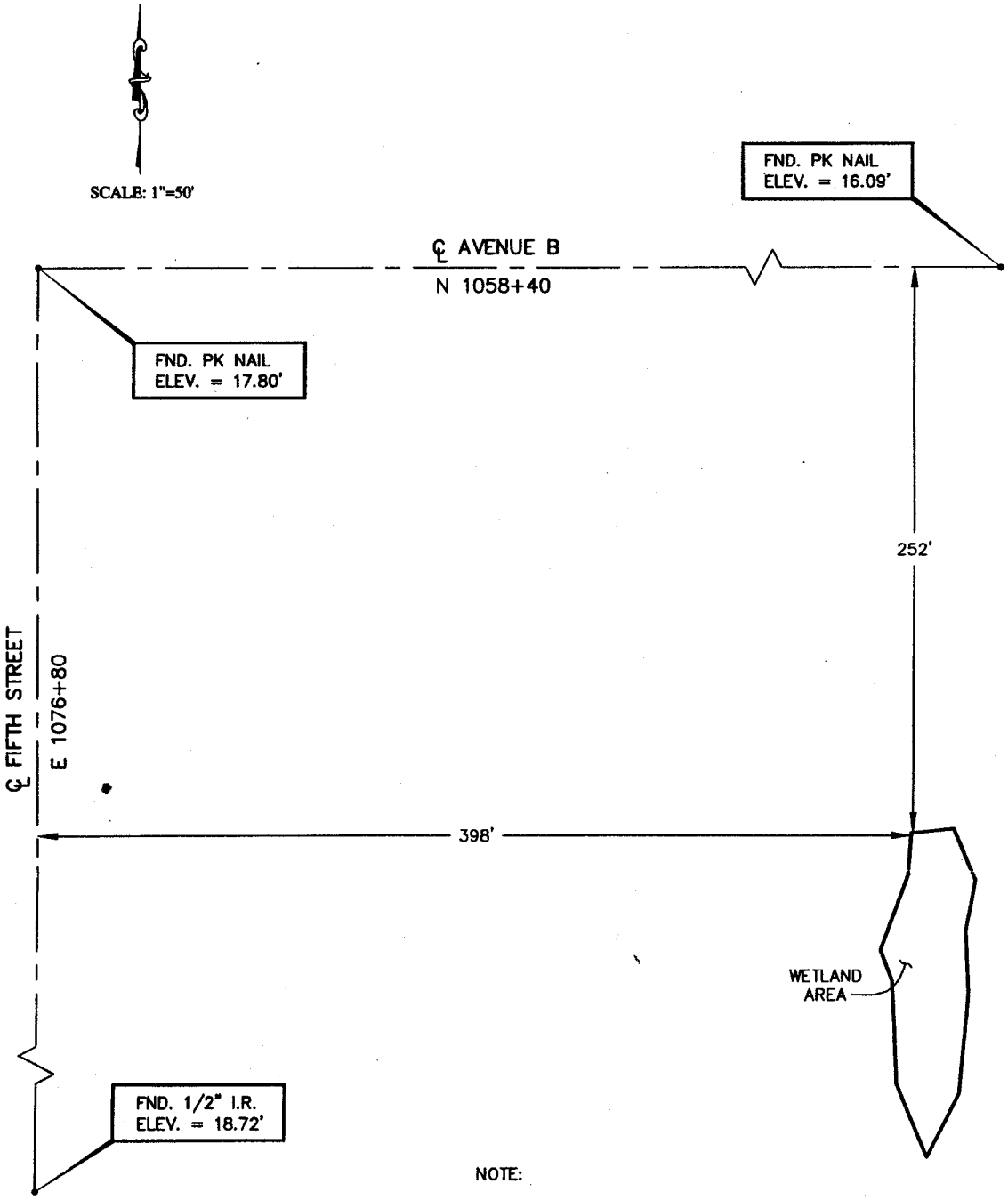

Scale: 1 inch = 2,000 feet

Source: United States Department of the Interior
National Wetlands Inventory Map
League City, Texas

N

Approximate Facility Boundaries

| Wetlands Map | NASA Johnson Space Center<br>BioAstronautics Facility<br>Houston, Texas |
|---|---|
| Date: 10/00 | |
| Figure 3-4 | |




NOTE:

1. HORIZONTAL CONTROL IS BASED ON THE CENTERLINE INTERSECTIONS OF FIFTH STREET AND AVENUE "B" N = 1058+40, E = 1076+80.

℄ FIFTH STREET = E 1076+80

℄ AVENUE "B" = N 1058+40

2. ELEVATIONS SHOWN HEREON ARE BASED ON A 1964 ADJUSTMENT. (TO CONVERT ELEVATIONS FROM 1964 ADJ. TO 1973 ADJ. FOR FLOOD PLANE ANALYSIS, SUBTRACT 2.048 FROM EACH ELEVATION SHOWN.

| AREA | |
|---|---|
| ACREAGE | SQUARE FEET |
| 0.095 | 4,148 |

STATE OF TEXAS
REGISTERED
MICHAEL D. WILSON
4821
PROFESSIONAL
LAND SURVEYOR

Michael D. Wilson
9-21-00

| | |
|---|---|
| Wetland Delineation Survey Map | NASA Johnson Space Center<br>BioAstronautics Facility<br>Houston, Texas |
| Date: 10/00 | |
| 1"=50' | |
| Figure 3-5 | |