The Alan B. Shepard Discovery Center

Environmental Assessment

March 2005

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NOTICE: 05-GSFC-01

National Environmental Policy Act (NEPA): Construction of Alan B. Shepard Discovery Center, Concord, New Hampshire

AGENCY: National Aeronautics and Space Administration (NASA)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: Pursuant to NEPA of 1969, as amended (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), and NASA Regulations (14 CFR Part 1216 Subpart 1216.3), NASA has made a FONSI with respect to the partial funding of the Alan B. Shepard Discovery Center in Concord, New Hampshire.

NASA proposes to provide partial funding for the construction of a 3,159 square-meter (34,000 square-foot) building, the Alan B. Shepard Discovery Center, and a 22,296 square-meter (240,000 square-foot) dedicated parking area. The Discovery Center would be an expansion of the Christa McAuliffe Planetarium in Concord, New Hampshire. In conference reports accompanying their Congressional appropriations, NASA was directed to provide $2.4 million for the construction of the Discovery Center. The total cost of the project is approximately $6.2 million. Additional sources of funding would be from state and private funds.

FOR FURTHER INFORMATION CONTACT: Ms. Beth Montgomery, NASA's Goddard Space Flight Center, Code 250, Greenbelt, MD 20771, Phone: 301-286-0469, Lizabeth.R.Montgomery@nasa.gov . The final Environmental Assessment (EA) that supports this FONSI may be reviewed at the Christa McAuliffe Planetarium, 2 Institute Drive, Concord, NH 03301. Copies of the final EA may be obtained by contacting Ms. Montgomery.

SUPPLEMENTAL INFORMATION:

NASA has reviewed the final EA prepared for the Alan B. Shepard Discovery Center and has determined that it represents an accurate and adequate analysis of the scope and level of associated environmental impacts. The EA is hereby incorporated by reference in this FONSI.

The Alan B. Shepard Discovery Center would be constructed as an addition to the Christa McAuliffe Planetarium. The addition of the Discovery Center would transform the Planetarium into a science center focused on astronomy, space flight, earth science, aviation, and exploration; and would be the only air and space museum in New England. The expanded facility would provide an indoor attraction for New Hampshire families and tourists where they would learn about New Hampshire heroes Ms. Christa McAuliffe and Mr. Alan Shepard. The Planetarium and Discovery Center would be a source of inspiration, patriotism, and pride for New Hampshire's young people, as they learn about New Hampshire's role in the United States and International Space Programs. The facility would be a tool for improving math, science, and

technology education in the State of New Hampshire, providing learning opportunities for school children, teachers, and student interns.

This EA addresses the proposed action and the no action alternative. The assessment considers the environmental impacts of the construction and operation of the building. The EA addresses the potential for environmental impacts upon air quality, noise, topography, geology, soils, water resources, ecological resources, cultural resources, land use, recreation, visual resources, socioeconomics, and health and safety.

The proposed action would result primarily in small, localized, short-term impacts to the environment. Anticipated impacts are associated with vegetation removal, excavation, and land disturbance that would occur during construction of the Discovery Center and parking area. Erosion control and revegetation practices would reduce impacts by ensuring that runoff and erosion from construction areas are minimized, and the site stabilized soon after construction is complete. No adverse impacts are anticipated during the operation of the Alan B. Shepard Discovery Center and parking area. No other matters of environmental concern were identified.

On the basis of the Alan B. Shepard Discovery Center final EA, NASA has determined that the environmental impacts associated with the partial funding for the construction of the Discovery Center will not individually or cumulatively have a significant impact on the quality of the human environment. Therefore, an environmental impact statement is not required.

for

Dr. Adena Williams Loston
Chief Education Officer
NASA Headquarters

4-27-05
Date

ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED CHRISTA MCAULIFFE PLANETARIUM EXPANSION PROJECT, CONCORD, MERRIMACK COUNTY, NEW HAMPSHIRE

Lead Agency: NASA,
Christa McAuliffe Planetarium

Proposed Action: The proposed action evaluated in this environmental assessment is the expansion of the Christa McAuliffe Planetarium. The expansion includes the construction an approximately 3,159-square-meter (34,000-square-foot), 2-story building addition (the Alan B. Shepard Discovery Center), and an approximately 22,296-square-meter (240,000-square-foot) dedicated parking area. The addition would transform the Planetarium into a science center focused on astronomy, space flight, earth science, aviation, and exploration; and be the only air and space museum in New England.

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Date: March 2, 2005

Abstract: The Christa McAuliffe Planetarium proposes to construct the Alan B. Shepard Discovery Center and a parking area as an expansion of the existing Christa McAuliffe Planetarium. The addition would transform the Planetarium into a science center focused on astronomy, space flight, earth science, aviation, and exploration; and be the only air and space museum in New England. The proposed addition and parking area would be located immediately south and southwest of the existing Planetarium. This environmental assessment evaluates the potential impacts of the proposed action, and the no-action alternative on air quality, noise, topography, geology, soils, water resources, ecological resources, cultural resources, land use, recreation, visual resources, socioeconomics, and health and safety. The proposed action would result primarily in small, localized, short-term impacts to the environment. The anticipated impacts are associated with vegetation removal, excavation, and land disturbance that would occur during construction. Erosion control and revegetation practices would reduce impacts by ensuring that runoff and erosion from construction areas are minimized, and the site is stabilized soon after construction is completed. No adverse impacts are anticipated during the operation of the Alan B. Shepard Discovery Center and parking area.

ACRONYMS

EA	Environmental Assessment
NHTI	New Hampshire Technical Institute
NAAQS	National Ambient Air Quality Standards
EPA	Environmental Protection Agency
dBA	decibels matched to the sensitivity of the ear
NOx	Nitrous Oxides
VOCs	Volatile Organic Compounds
SHPO	State Historic Preservation Office
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
CFR	Code of Federal Regulations
EO	Executive Order

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EXECUTIVE SUMMARY

ENVIRONMENTAL ASSESSMENT FOR PROPOSED CHRISTA MCAULIFFE PLANETARIUM EXPANSION PROJECT CONCORD, NEW HAMPSHIRE

The Christa McAuliffe Planetarium proposes to construct the Alan B. Shepard Discovery Center and a parking area as an expansion of the existing Christa McAuliffe Planetarium (Planetarium), located at the New Hampshire Technical Institute Campus in Concord, New Hampshire. NASA's action is to provide partial funding for this project in the amount of $2,400,000. The proposed action would transform the existing Planetarium into a science center focused on space, Earth science, and aviation. The expanded facility would provide an indoor attraction for New Hampshire families and tourists where they would learn about New Hampshire heroes Ms. Christa McAuliffe and Mr. Alan Shepard. The Planetarium and Discovery Center would be a source of inspiration, patriotism, and pride for New Hampshire's young people, as they learn about New Hampshire's role in the United States and International Space Programs. The facility would be a tool for improving math, science, and technology education in the State of New Hampshire, providing learning opportunities for school children, teachers, and student interns. The addition of the Discovery Center would result in an increase in the size of the existing Planetarium from a 1-story, 1,022-square-meter (11,000-square-foot) facility to a 2-story, 4,181-square-meter (45,000-square-foot) facility, with an increase in the total capacity to serve visitors from 225 to 600 per day. The expansion would provide several new additional facilities for education including a new theatre, an observatory, conference rooms, a program room, exhibition space, and an expanded NASA Educator Center; and other conveniences including a children's lunchroom, a café, and expanded gift shop. In addition, the dedicated parking area would provide approximately 150 parking spaces for visitors.

The proposed addition of the Alan B. Shepard Discovery Center and parking area would occur immediately south and southwest of the existing Planetarium. This environmental assessment evaluates the potential impacts of the proposed action, and the no-action alternative on air quality, noise, topography, geology, soils, water resources, ecological resources, cultural resources, land use, recreation, visual resources, socioeconomics, and health and safety. The proposed action would result primarily in small, localized, short-term impacts to the environment. Anticipated impacts are associated with vegetation removal, excavation, and land disturbance that would occur during construction of the Alan B. Shepard Discovery Center and parking area. Erosion control and revegetation practices would reduce impacts by ensuring that runoff and erosion from construction areas were minimized, and the site was stabilized soon after construction was complete. No adverse impacts are anticipated during the operation of the Alan B. Shepard Discovery Center and parking area.

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

The proposed action evaluated in this environmental assessment (EA) is the expansion of the Christa McAuliffe Planetarium (Planetarium). The expansion includes the construction an approximately 3,159-square-meter (34,000-square-foot), 2 story building addition (the Alan B. Shepard Discovery Center [Discovery Center]), and an approximately 22,296-square-meter (240,000-square-foot) dedicated parking area. The addition of the Discovery Center would transform the Planetarium into a science center focused on astronomy, space flight, earth science, aviation, and exploration; and be the only air and space museum in New England. The expanded facility would provide an indoor attraction for New Hampshire families and tourists where they would learn about New Hampshire heroes Ms. Christa McAuliffe and Mr. Alan Shepard. The Planetarium and Discovery Center would be a source of inspiration, patriotism, and pride for New Hampshire's young people, as they learn about New Hampshire's role in the United States and International Space Programs. The facility would be a tool for improving math, science, and technology education in the State of New Hampshire, providing learning opportunities for school children, teachers, and student interns. NASA's action is to provide partial funding for this project in the amount of $2,400,000.

The addition of the Discovery Center would result in an increase in the size of the existing Planetarium from a 1-story, 1,022-square-meter (11,000-square-foot) facility to a 2-story, 4,181-square-meter (45,000-square-foot) facility, with an increase in the total capacity to serve visitors from 225 to 600 per day. The expansion would include the addition of the following facility features:

- A multi-purpose theatre with 110 seats for movies, demonstrations, lectures, science plays, and special events;
- An observatory with telescopes and on-screen observation areas;
- Two conference rooms;
- A children's lunch room for field trips;
- A program room;
- An indoor/outdoor café open to the public;
- Increased space to display permanent and traveling interactive exhibits;
- An expanded gift shop;
- Expanded outdoor exhibits;
- An expanded NASA Educator Center; and
- A dedicated parking area with approximately 150 parking spaces for visitors and school busses.

The design of the Discovery Center and parking area was developed by Dignard Architectural Services in consultation with the State of New Hampshire Department of Transportation, Bureau of Public Works. A brochure describing the proposed Discovery Center and parking area is included in **Appendix A**.

This EA evaluates the impacts associated with the construction and operation of the Discovery Center and the dedicated parking area. Sources referenced in this document are presented in **Section 6.0**.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The proposed action is to construct and operate the Discovery Center and a dedicated parking area as an expansion to the existing Planetarium. The proposed action would occur immediately south and southwest of the existing Planetarium. A ***Locus Plan*** prepared by GZA is attached as **Figure 1**. A photograph of a model depicting the proposed expansion is included as **Figure 2**. The project area extends from the Planetarium building in a southwest direction generally along Fan Road. A series of Civil Engineering Design Development Drawings (***Progress Plans***), prepared by Dignard Architectural Services are attached as the following:

- **Figure C-1** – ***Existing Conditions Plan***;
- **Figure C-2** – ***Site Plan***;
- **Figure C-3** – ***Grading, Drainage, and Erosion Control Plan***; and
- **Figure C-4** – ***Utilities Plan***.

Note that GZA has modified **Figure C-2** – ***Site Plan*** (see GZA's modifications in green), based on information provided by the Planetarium and Dignard Architectural Services. The modification reflects the proposed relocation of the access roadway from the eastern to the western portion of the parking area. GZA's modifications of the ***Site Plan*** are approximate only.

The construction shall be overseen by the Bureau of Public Works and would follow all State and Local requirements for design and construction. A letter of certification from Mr. Jeffrey R. Shute, the Project Manager for the Bureau of Public Works, is included in **Appendix B**.

All construction shall meet the minimum construction standards of the New Hampshire Department of Transportation's standard specifications for road and bridge construction (latest edition); and shall comply with the rules and regulations of the Americans with Disabilities Act as published in the *Federal Register*, Vol. 56, No. 144, dated July 26, 1991.

2.2 ACTIONS CONSIDERED BUT ELIMINATED FROM ANALYSIS

The Planetarium considered alternatives to the construction of an addition to the existing Planetarium building to house the Discovery Center. These alternatives included reconstructing the Planetarium and Discovery Center at a different location within the New Hampshire Technical Institute (NHTI) Campus in Concord, New Hampshire or an alternate location in Durham, New Hampshire. The alternatives explored were not economically feasible.

2.3 NO ACTION ALTERNATIVE

No action is the only alternative considered in this EA. Inclusion of the No Action Alternative is prescribed by the Council on Environmental Quality guidelines implementing the National Environmental Policy Act. The No Action Alternative provides the benchmark against which the proposed actions are evaluated. Under the "No Action Alternative," the Discovery Center would not be built, the parking area would not be constructed, and the existing Planetarium would continue to operate. Taking no action would be the equivalent to maintaining the existing environment.

3.0 AFFECTED ENVIRONMENT

This section presents a general description of the Planetarium and the resources that could be affected by the proposed action and the no-action alternative. The project area is located immediately southwest of the Planetarium.

3.1 LOCATION, HISTORY AND CURRENT MISSION

The Planetarium is located at 2 Institute Drive in the central portion of Concord, Merrimack County, New Hampshire. The Planetarium is part of the 793,212-square-meter (196-acre) NHTI campus, and is located southeast of the intersection of Institute Drive and Fan Road, in the northwestern portion of the campus. Interstate Route 93 is located about 122 meters (400 feet) west of the Planetarium, and the Merrimack River is located about 427 meters (1,400 feet north) and east of the facility.

The Planetarium was erected in the memory of Ms. Christa McAuliffe, the first teacher in space. Ms. McAuliffe's presence in the space program helped boost public interest and curiosity, and through her participation she became an inspiration to the teaching profession. On January 28, 1986, her mission in space ended in tragedy when the space shuttle Challenger exploded; however, her mission as a teacher continues. The idea for a planetarium was suggested by Ms. Louise Wiley, a teacher from Northwood, New Hampshire, and was chosen from among many other ideas because it combined Ms. McAuliffe's dream of traveling through space with her dedication to teaching. In April 1988, the New Hampshire Legislature appropriated funds to build the Planetarium, and ground breaking took place on October 26, 1988. Construction was completed in approximately one year. On June 21, 1990, the Planetarium began its mission to educate, incite, and entertain learners of all ages in the sciences and humanities by actively engaging them in the exploration of astronomy and space science. Since then, nearly 30,000 school children each year, and thousands of others, have passed through the doors of the Planetarium.

3.2 CLIMATE, AIR QUALITY, AND NOISE

The region around the Planetarium is characterized by a humid continental climate. Precipitation is evenly distributed throughout the year, with no particular wet or dry season. Each of the four seasons varies greatly in their daily temperatures and weather patterns. Spring extends from about mid-March to mid-June, and has the most unpredictable weather patterns (ranging from snow to warm, sunny days). Summer extends from mid-June to late-September, and is characterized by warm, sunny days and cool, clear nights. The fall season starts in late September with mild, usually sunny days, and evening temperatures that begin to dip below freezing. Winter begins in late-October, with the first dusting of snow and extends through mid-March.

Coastal storms can be a serious weather hazard in southeastern New Hampshire, but decrease in importance northward. Such storms generate very strong winds and heavy rain or snow. Storms of tropical origin affect or threaten New Hampshire about once every two to three years. Thunderstorms occur 15 to 30 times per year. Ice storms occur in the winter, but are usually of short duration. Data for the area indicate that fewer than two tornadoes occur per year.

The State of New Hampshire Ambient Air Quality Standards are identical to the National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: sulfur dioxide, particulate matter, ozone, carbon monoxide, nitrogen dioxide, and lead. Merrimack County is currently designated as an attainment area for all criteria pollutants, except ozone.

The facility is serviced by a natural gas-fired boiler. Byproducts of boiler combustion are the only discharges to the atmosphere from the facility. There are no permitted air pollution sources at the Planetarium.

Currently, no quantitative noise-limit regulations exist for New Hampshire. United States Environmental Protection Agency (EPA) guidelines recommend a day-night weighted equivalent sound level of 55 dBA (decibels matched to the sensitivity of the ear), which is considered sufficient to protect the public from the effect of broadband environmental noise in typically quiet outdoor and residential areas. For protection against hearing loss in the general population from non-impulsive noise, the EPA guidelines recommend a day-night weighted average of 70 dBA or less per day over a 40-year period. No noise monitoring data are available in the proposed project area. The acoustic environmental around the NHTI campus is considered to be within the range of an average residential area to an area located proximate to highway auto traffic, with typical residual sound levels of ranging from approximately 40 to 50 dBA.

3.3 TOPOGRAPHY, GEOLOGY, AND SOILS

The Planetarium is located in a relatively flat flood plain area of the Merrimack River. Based on review of the following resources:

- United States Geological Survey Map of the area (Concord, New Hampshire, 1967, Photorevised 1985);
- A topographic map provided by the City of Concord; and
- **Figure C-1** - ***Existing Conditions Plan***.

The ground surface elevation at the Planetarium ranges from about 73 to 76 meters (240 to 250 feet) above the National Geodetic Vertical Datum of 1929, with topography sloping gently to the west.

Surficial geologic references for the area indicate that the Planetarium area is located within a fine-grained stratified drift aquifer, consisting of sorted sediments (principally clay to fine sand) deposited by melt water streams in a glacial lake environment. The saturated thickness of the stratified drift is estimated to be 12+/- meters (40+/- feet) thick. Soils in the area are described as Podunk fine sandy loam. These soils are generally moderately well drained fine sandy loams located in slight depressions, narrow trips next to terrace escarpments, and/or broad areas of nearly level flood plains. These soils are formed from water-deposited sediments derived from granites, schists, and gneiss.

A bedrock geological map of the Site area indicates that bedrock at the Site consists of Concord Granite, a late-Devonian two-mica granite that is the youngest member of the New Hampshire plutonic suite. No bedrock outcrops were observed at or in the immediate vicinity of the Planetarium.

3.4 WATER RESOURCES

There are no surface water bodies located at or immediately adjacent to the Planetarium in the project area. The nearest major surface water body is the Merrimack River, located approximately 427 meters (1,400 feet) north and east of the facility. Additional surface water bodies include Fort Eddy Pond (an abandoned oxbow channel of the Merrimack River), located about 305 meters (1,000 feet) southeast of the Planetarium, and Horseshoe Pond (an abandoned oxbow channel of the Merrimack River), located about 305 meters (1,000 feet) west of the Planetarium. No wetlands are located in the project area based on review of the United States Fish and Wildlife Service, National Wetlands Inventory Map of the area. In addition, visual observations by Mr. Jeffrey R. Shute, the Project Manager for the Bureau of Public Works, and Mr. Roger Dignard of Dignard Architectural Services did not indicate the presence of wetlands (i.e., the project area consists of lawn, landscape trees and shrubs, walkways, and grassy field).

Based upon topography and surface water bodies located in the area, groundwater at and near the Planetarium is anticipated to flow in a generally north-northeasterly direction towards the Merrimack River.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the project area (Community Panel Number 330110 0020 B - City of Concord, New Hampshire Panel 20 of 30, revised August 23, 1999) indicates that the project area is not located within a *"Special Flood Hazard Area Inundated by 100-Year Flood - Zones A through VE."* The project area is located within an area classified as *"Other Flood Areas - Zone X."* Zone X areas are defined by FEMA as *"Areas of 500-year flood; areas of 100-year flood with average depths of less than 0.305 meter (1 foot) or with drainage areas less than 2.6 square kilometers (1 square-mile); and areas protected by levees from 100-year flood."* The FIRM map of the project area does not indicate the specific flood designation for the project area (e.g., *area of 500-year flood, area of 100-year flood with average depths of less than 0.305 meters or 1 foot, or area protected by levees from 100-year flood*). Other Flood Areas – Zone X are considered by FEMA to be lower risk areas, with a minimal to moderate flood hazard.

Potable drinking water for the Planetarium is supplied by the municipal water system. Sanitary wastewater produced at the facility is discharged to the municipal sanitary sewer system. The City of Concord does not require wastewater discharge permits for relatively small additional daily volumes (less than 18,950 liters [5,000 gallons]) of sanitary wastewater to its collection and wastewater collection system. Storm water at the facility either infiltrates into the unpaved ground surface or is discharged via catch basins to the separate municipal storm sewer system. There are no City, State, or federal storm water permitting requirements for storm water discharged from public facilities.

3.5 ECOLOGICAL RESOURCES

No threatened, endangered, or rare species or rare natural communities have been identified in the immediate vicinity of the Planetarium. In addition, no federally listed plant species, or plant species proposed for listing, have been identified at the Site.

Information provided by the U.S. Department of the Interior Fish and Wildlife Service indicates that they have record of the federally threatened bald eagle (*Haliaeetus leucocephalus*) wintering along the Merrimack River near the proposed project area. Based on the project description and location, however, the Fish and Wildlife Service concluded that, "*...it appears that no impacts to federally-listed species will occur.*" A copy of the correspondence with the Fish and Wildlife Service is included in **Appendix C**.

Information provided by the New Hampshire Natural Heritage Bureau indicates that a floodplain forest has been identified north and west of the Site along the Merrimack River; however, the Planetarium and proposed expansion area are not located in an area identified as a floodplain forest. The New Hampshire Natural Heritage Bureau has also indicated that the Northern Leopard Frog (*Rana Pipiens*) has been observed southeast of the Site, along the Merrimack River. This species is not identified on state or federal lists, and is outside of the proposed expansion area.

Copies of correspondence with the U.S. Department of the Interior Fish and Wildlife Service and the New Hampshire Natural Heritage Bureau are included in **Appendix C**.

3.6 CULTURAL RESOURCES

An archaeological survey entitled, "*Phase I Archaeological Survey of the Proposed Christa McAuliffe Planetarium Expansion Project, Concord, New Hampshire*," was prepared for the Planetarium by Mr. Richard Will, Ph.D. of TRC Environmental, Inc. in Ellsworth, Maine, dated February 20, 2004. The survey concluded that:

> "*[The] Phase I archaeological survey of the proposed Christa McAuliffe Planetarium Expansion project did not produce any evidence for prehistoric cultural occupation nor activity in the area surveyed. The existence of a plow zone in the soccer field, as well as the scattering of small fragments of historic (19th and 20th century) artifacts, suggest the area of the proposed parking lot was a farm field historically. This historic activity is not significant. Specifically, the area referred to includes the approximate area proposed for building expansion, as well as the area proposed as a location for a parking lot (the soccer field). Periods of former stability as indicated by buried organic soil horizons, and alternating strata of fine to medium sand in the bottom of the trenches attest to the complex history of the nearby Merrimack River. As currently planned, no further archaeological investigations are recommended for this project.*"

A copy of the Phase I Archaeological Survey is included in **Appendix D**.

3.7 LAND USE, RECREATION, AND VISUAL RESOURCES

The Planetarium currently consists of a 1-story, 1,022-square-meter (11,000-square-foot) building with a total capacity of 225 visitors. The facility includes a 92-seat, domed theater for planetarium and astronomy shows; seven interactive exhibits in the lobby area; a gift shop; two outdoor exhibits; and one multi-purpose room used as an NASA Educator Resource Center (books, computers, videos, CD-ROMs) for children's workshops and is used as a school lunchroom.

The Planetarium is a visually appealing structure constructed of brick and glass. There is currently an extended walk to the entry from parking lots that are shared with NHTI college students and staff, with no dedicated parking for the Planetarium.

The Planetarium currently provides educational and recreational opportunities for about 60,000 visitors per year. Currently, about 40% of Planetarium visitors are school-age children, and about 60% are family groups.

3.8 SOCIOECONOMICS

The Planetarium employs about 14 full-time and 15 part-time employees, and currently has a limited work-study program conducted in conjunction with students from the NHTI campus.

The City of Concord is the third largest city in New Hampshire and had the fourth highest numeric growth. Concord has experienced population growth of 13% between 1990 and 2000. The civilian labor force in Concord was estimated at 23,579 in 2002, with an unemployment rate of 2.7%. The median annual household income for the City is $42,447. Families living below the poverty level include 6.2% of the population. The City contains 166 square kilometers (64 square miles) of land area and 8.3 square kilometers (3.2 square miles) of inland water area. The population density in Concord is 642.8 persons per square mile of land area.

4.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND NO-ACTION ALTERNATIVE

Impacts of the proposed actions (construction and operation of the Discovery Center and parking area) and the No-Action alternative are presented in this section. Consideration is give to impacts to air quality and noise; topography, geology, and soils; water resources; ecology; cultural resources; land use, recreation, and visual resources; socioeconomics; and health and safety. Direct effects (those effects caused by the action and occurring at the same time and place) and indirect effects (those effects caused by the action that occur later in time or at a distance) are considered in this section. Adverse impacts that cannot be avoided if the project is implemented, irreversible and irretrievable commitment of resources, and the relationship between short-term use and long term productivity are discussed in **Sections 4.3**, **4.4**, and **4.5**, respectively. Cumulative impacts are presented in **Section 4.6**.

4.1 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

As described in **Section 2.1**, the proposed action consists of the construction and operation of the Discovery Center and parking area as an expansion of the Planetarium. On the basis of the assessments provided in the following sections, the proposed action would not have any substantial adverse impacts on the environment.

4.1.1 Air Quality and Noise

Localized, short-term air quality impacts that could occur during project construction include the generation of fugitive dust and engine exhaust emissions. The potential impacts of these emissions on ambient air quality in the vicinity of the Planetarium would be minor, and would be limited to the duration of construction activities (approximately one year). No violations of applicable federal or State ambient air quality standards are expected.

Noise impacts would occur from the use of machinery and vehicles during excavation and construction. Construction would occur mostly during the weekday daytime hours; thus, much of the construction noise would be masked by background noises. Noise impacts associated with construction activities would be minor and of short duration.

Construction specifications would minimize air and noise impacts. Water and/or dust barriers would be used for dust suppression or to prevent the spread of fugitive dust beyond the work area. No burning of materials or debris would be permitted. All vehicles would be required to function properly (e.g., exhaust systems with no leaks). Low noise-emission equipment, as certified by the EPA, would be used to the maximum extent practicable.

Noise impacts during operation of the facility are expected to be minimal as the majority of activity occurs inside the building. Noise from motor vehicles during facility operation may increase noise levels up to 3 dB during normal operating hours based on the worst-case assumption of a doubling in the number of visitors to the facility as a result of the project.

Air quality impacts from the facility during operation would result from an increase in motor vehicle operations due to the anticipated increase in the number of visitors and from installation of a gas-fired boiler for space heating. Specific estimates of the number and origination of additional visitors has not been prepared. Therefore, air quality impacts from additional motor traffic have been evaluated based on a series of worst-case assumptions. Air quality impacts from the boiler have been estimated based on the required boiler capacity to be installed. Overall air quality impacts of the facility are expected to be minimal. The assumptions, methodology, and results of the evaluation of air quality impacts are provided in **Appendix E**.

The boiler capacity required for the project would be below the permit thresholds of Chapter Env-A 600 of the New Hampshire Code of Administrative rules. New Hampshire has no specific regulations or permit requirements for motor vehicle impacts of non-transportation projects. Therefore, no air quality permits or approvals are required for the project.

Section 176 of the Clean Air Act requires federal agencies to assure that their actions conform to applicable implementation plans for achieving and maintaining the NAAQS for criteria pollutants. General air conformity analysis is typically required for projects in the Concord area due to regional ozone noncompliance. The requirements of General Conformity do not apply to the proposed action for two reasons:

1. The maximum net increase in annual total direct and indirect emissions are estimated to be less than 2.34 metric tons (2.6 tons) per year of nitrous oxides (NOx) and 4.23 metric tons (4.7 tons) per year of volatile organic compounds (VOCs), and are below the de minimus level of 90 metric tons (100 tons) per year of NOx and 45 metric tons (50 tons) per year of VOCs that apply in the Concord marginal non-attainment area for ozone (see **Appendix E**); and
2. The action is not regionally significant (i.e., emissions would be less than 10% of the NOx and VOC emissions in the region).

The "No Action Alternative" would result in no additional air emissions or additional noise.

4.1.2 Topography, Geology, and Soils

The proposed action would have relatively minor effects on the topography of the project area. Such impacts would result from excavation and grading for the proposed building and parking area. The building and parking area would represent permanent changes to the topography of the project area and would occupy about 25,455 square meters (274,000 square feet).

Impacts to soils (e.g., erosion and soil compaction) would be limited to excavation and construction areas. The contractor would construct temporary erosion control measures to control erosion and prevent sediment contamination of downstream areas prior to any earth moving or grubbing activities. Erosion would be controlled through the use of silt fencing surrounding excavation and construction areas, when necessary. Following completion of construction, excavated areas would be graded to provide stable slopes, topsoil would be placed over all disturbed areas, and all disturbed areas would be seeded with lawn grass to stabilize soils. All disturbed areas not intended to be paved or otherwise treated shall receive 10 centimeters (4 inches) of loam, limestone, fertilizer, seed, and mulch.

Construction stages areas would be located on paved or gravel surfaces. By refueling construction equipment in these areas, the potential for impacts from fuel-handling spills would be minimized. Vehicles and other equipment would be required to be clean and properly operational (e.g., no fuel or hydraulic leaks and motors reasonably clean of excess grease) to prevent leaks. Fuel oil and petroleum storage tanks, if needed, would be surrounded by containment systems with sufficient capacity to contain any spills, leaks, and other releases. In the event of a spill or leak, response would be in accordance with established federal and State regulations.

As required by the federal *Construction General Permit for Construction Activities* and the State's *Site-Specific Alteration of Terrain Permit*, a comprehensive sediment and erosion control plan is required for the project.

The "No Action Alternative" would result in no changes to topography, or soils.

4.1.3 Water Resources

There are no surface water bodies, including no wetland areas, in the vicinity of the proposed construction area. Construction wastewater discharges would consist of storm water runoff from the area. The implementation of erosion control practices (e.g., silt fencing, regrading, and revegetation) would prevent substantial impacts to the municipal separate storm sewer system. A National Pollutant Discharge Elimination System permit for storm water (i.e., Construction General Permit for Large and Small Construction Activities) would be required, as land disturbance would be greater than 4,047 square meters (1 acre) during construction. The contractor would submit a Notice of Intent to the EPA and would prepare a Storm Water Pollution Prevention Plan for construction, in accordance with federal and/or State requirements. A Storm Water Pollution Prevention Plan (or Storm Water Management Plan) would not be required following construction of the new addition due to the nature of the facility (i.e., non-industrial).

The new addition would be connected to the existing municipal water service and municipal sanitary sewer system for the Planetarium. Storm water in the new parking area would be discharged to the municipal separate storm sewer system and controlled via an engineered storm water collection system (i.e., surface areas graded to direct flow to catch basins with discharge to the municipal storm sewer system). The increase in employee and visitor uses of these systems would not represent a substantial additional impact to municipal water and sanitary and/or storm sewer systems. Based on runoff calculations that consider average rainfall total for the area, the increased impervious surface area following construction would not result in a substantial increase in storm water discharges and/or a substantial impact to the surface waters or groundwater resources in the project area. Wastewater and storm water discharge permits would not be required for the facility due to the nature of the facility (i.e., non-industrial).

The proposed action would comply with Executive Order (EO) 11990 – Protection of Wetlands, which was enacted to *"avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative".*

Information provided by Mr. Jeffrey R. Shute, the Project Manager for the Bureau of Public Works, and Mr. Roger Dignard of Dignard Architectural Services, and review of the attached design plans indicate that fill would be required to bring the existing grade up to the proposed elevations. No wetlands would be filled as the result of this action.

Construction is not expected to affect groundwater resources (e.g., change in the depth of groundwater, alteration of groundwater flow direction, affect groundwater recharge, or impact groundwater quality). The potential for spills from fuel handling would be minimized through preventive actions, and establishment and implementation of appropriate spill response procedures.

The FEMA FIRM for the project area indicates that the project area is located within an area classified as *"Other Flood Areas - Zone X."* Zone X areas are defined by FEMA as *"Areas of 500-year flood; areas of 100-year flood with average depths of less than 0.305 meter (1 foot) or with drainage areas less than 2.6 square kilometers (1 square-mile); and areas protected by levees from 100-year flood."* The FIRM map of the project area does not indicate the specific flood designation for the project area. Other Flood Areas – Zone X are considered by FEMA to be lower risk areas, with a minimal to moderate flood hazard.

The final design and construction would comply with EO 11988 Floodplain Management, and 14 Code of Federal Regulations (CFR) Part 1216 Subpart 1216.2 – Floodplain and Wetlands Management, which were enacted to *"avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative" and to "to reduce the risk of flood loss, minimize the impact of floods on human health, safety and welfare, and to restore and preserve the natural and beneficial values served by floodplains."*

The design attempted to avoid the floodplain, however, there were no reasonable alternatives as the entire property and vicinity are designated as Zone X areas by FEMA.

The project has been designed to minimize floodplain risks. Information provided by Mr. Jeffrey R. Shute, the Project Manager for the Bureau of Public Works, and Mr. Roger Dignard of Dignard Architectural Services indicated that the project would be designed with a finished floor elevation at least 0.305 meters (1 foot) above the 100-year flood plain to reduce the risk of flooding. Flood insurance is available for Zone X areas but not required by federally regulated lenders. The City of Concord zoning ordinance regulates development in a flood plain, although State and federal projects are exempt from the City Code regulations. However, the design of the proposed building complies with the elevation required contained in the local zoning ordinance.

The construction and new addition would have no substantial impact on other areas in the flood plain.

The "No Action Alternative" would result in no changes to storm water discharges.

4.1.4 Ecological Resources

Direct impacts to ecological resources would be limited to excavation and construction areas. An area currently consisting of lawn, landscape trees and shrubs, walkways, and grassy field would be disturbed during the excavation and regarding for the proposed building addition and parking area. No tree-forested areas would be impacted. Total disturbance for this area would be about 25,455 square meters (274,000 square feet). Landscaped areas, including lawn area and a grassy field, would be cleared for the construction. (Land for the proposed parking area is currently used as a grassy field. Land for the building addition is currently used as lawn and walkways.) Impacts of construction activities on ecological resource areas are expected to be relatively minor because of the limited extent of disturbance of habitat.

Lawn grasses in the immediate project area would be trampled or removed during construction. Soil compaction from heavy equipment could destroy ground vegetation or damage tree roots by reducing soil aeration or altering soil structure. Dust and other particulates would be released during construction, but dust-control measures would minimize any associated impacts. Construction activities would be conducted over a relatively short period of time (one year), and impacts would occur in a limited area. Following construction, the areas proximate to the building addition and parking area would be graded and planted with lawn grasses.

Wildlife (i.e., seasonally nesting birds) in the immediate project vicinity would be disturbed during construction by noise and visual disturbances from equipment and construction personnel. These disturbances could cause short distance movements of wildlife (e.g., scare birds off their nests), or otherwise disrupt normal wildlife activities. However, because these disturbances would be temporary and would occur in a very limited area, their impacts are expected to be negligible.

The Planetarium and proposed expansion area are not located in an area identified as a floodplain forest. (As indicated in Section 3.5 Ecological Resources, information provided by the New Hampshire Natural Heritage Bureau indicates that a floodplain forest has been identified north and west of the Site along the Merrimack River; however, the Planetarium and proposed expansion area are not located in an area identified as a floodplain forest.) As such, construction activities would have no impact to the floodplain forest located north and west of the Site along the Merrimack River.

The "No Action Alternative" would result in no impact on ecological resources.

4.1.5 Cultural Resources

No impacts to cultural resources are expected from the building expansion and construction of the new parking area. The potential to discover archaeological resources is considered very low, based on the results of the archaeological survey conducted. If archaeological materials are encountered during construction, operations would cease in the immediate area of the discovery until the Planetarium gives permission to resume work.

No historic structures would be affected by the proposed project.

A verbal reply was only provided by the State Historic Preservation Office (SHPO) to our written inquiry to their office. The SHPO indicated that they reviewed the archaeological survey prepared for the project entitled, "*Phase I Archaeological Survey of the Proposed Christa McAuliffe Planetarium Expansion Project, Concord, New Hampshire*," dated February 20, 2004

and concur with the conclusions in the report. A copy of correspondence with the SHPO is included in **Appendix C**. A copy of the Phase I Archaeological Survey is included in **Appendix D**.

4.1.6 Land Use, Recreation, and Visual Resources

The proposed action would not result in any adverse impact to land use, recreation, and visual resources. The proposed action is consistent with other land use in the area and is considered important for the transformation of the Planetarium into a major science center.

There would be short-term impacts to visual resources resulting from excavation and construction. The glass, steel, and brick addition is a visually attractive addition to the existing Planetarium.

The "No Action Alternative" would result in no change in land use, recreation, and visual resources.

4.1.7 Socioeconomics

The proposed action would have limited but positive effect on the local economy. Construction activities would be confined to the NHTI campus. The proposed action would not result in any substantial socioeconomic impacts to the local populations, labor force, or economy. The proposed action is expected to require approximately up to about 170 construction workers over a period of one year.

The Planetarium currently employs about 14 full-time and/or part time employees. This number would increase to about 26 full-time and/or part-time employees upon completion of the expansion. In addition, the expansion would provide expanded opportunities for work-study associated with the NHTI campus.

The expansion project would result in an increase in the total capacity to serve visitors from 225 to 600 per day. The expansion project is anticipated to have a positive impact on low income and minority populations, given that the project would increase the accessibility of science and technology to low income and minority populations. Special education programs and exhibits would target low income, minority, and special needs groups.

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on its programs, policies, and activities on minority and low-income populations. No environmental justice impacts would be expected to either minority of low-income populations.

The "No Action Alternative" would result in no change in socioeconomics.

4.1.8 Transportation

Interstates Route 93 and 393 serve the Planetarium area. The facility is generally accessed from Interstate Route 93, Exit 15E in Concord. As indicated above, the expansion project would result in an increase in the total capacity to serve visitors from 225 to 600 per day; and an increase in employees from about 14 full-time and/or part time employees to about 26 full-time and/or part-time employees. Public transportation to the NHTI campus is available on

the City of Concord public transportation (bus) route. The increase in the number of visitors and employees utilizing the building addition would not affect area transportation corridors, and would not adversely impact local traffic, and/or the local public transportation system.

Existing parking is currently shared with the NHTI campus and the police academy, and is not adequate for current or proposed future needs. Construction of the proposed parking area would provide a dedicated parking area with approximately 150 parking spaces for Planetarium and Discovery Center visitors.

The "No Action Alternative" would result in no change in transportation.

4.1.9 Health and Safety

No health and safety issues are anticipated with the proposed action. The potential for serious injuries or fatalities to workers during construction are considered limited. The contractor would be responsible for complying with all Occupational Safety and Health Administration requirements and for instructing employees on accident prevention and safety.

No health and safety issues are anticipated during the operation of the Planetarium and the new addition.

The "No Action Alternative" would result in no change in health and safety.

4.1.10 Waste Generation and Treatment

The contractor shall legally remove and dispose of existing on-site structures, bituminous concrete, debris, and other on-site materials, which are not to be reused as part of the construction. In addition, all excavated materials would be placed within upland areas as fill material, or would be hauled off of the site and disposed of in accordance with local and State regulations.

No hazardous wastes are anticipated to be generated during operation of the Planetarium and the new addition.

The "No Action Alternative" would produce no construction wastes.

4.2 ENVIRONMENTAL IMPACTS OF THE NO-ACTION ALTERNATIVE

Under the "No Action Alternative," the Planetarium would not be expanded with the Discovery Center, the parking area would not be constructed, and the Planetarium would continue to operate the existing facility. Taking no action would be equivalent to maintaining the existing environment. The impacts associated with construction and operating the Discover Center and parking area would not occur.

4.3 ADVERSE EFFECTS THAT CANNOT BE AVOIDED IF THE PROJECT IS IMPLEMENTED

Construction and operation of the Discovery Center and parking area could results in only minor, temporary adverse environmental impacts associated with construction activities. The increase in impervious surfaces as a result of the proposed development would not result in cumulative

impacts. However, these would be eliminated, avoided, or further reduced through the implementation of good engineering practices. Those adverse impacts that cannot be eliminated or avoided are identified below.

Although no substantial air quality impacts are anticipated if the project is implemented, fugitive dust and engine exhaust emission would be produced during excavation and construction activities. Noise would also be produced by these activities. Air quality impacts and noise impacts associated with these activities would be short lived and limited to the immediate project surroundings. Operational noise impacts would be minor and have not effect outside the immediate vicinity of the area.

The proposed action would result is some minor ecological impacts that cannot be avoided. Construction would result in the clearing of up to about 25,455 square meters (274,000 square feet) of grassy landscaped areas. Some adverse impacts to wildlife that result from disturbance during construction cannot be avoided, but would be limited to the approximately one-year period of construction activities.

Despite the implementation of control measures, some unavoidable increases in soil erosion may result from excavation and construction activities, especially during heavy rains. These may include a temporary increase in turbidity and suspended solids discharged to the separate municipal storm sewer system.

4.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resources that would be committed irreversibly or irretrievable during implementation of the proposed action would include materials that could not be recovered or recycled, and materials or resources that would be consumed or reduced to irrecoverable forms. Use of fuel, oil, concrete, steel, bricks, glass, chemicals, and other materials during construction would constitute an irreversible and irretrievable commitment of those resources. The land occupied by the building expansion and parking lot would be unavailable for use (and thus committed) throughout the life of the project. Approximately 25,455 square meters (274,000 square feet) of landscaped area would be replaced by the proposed building expansion and parking area.

4.5 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVTIY

Most adverse impacts to the environment associated with the proposed action would be temporary (e.g., a slight increase in air emissions and erosion during construction).

4.6 CUMULATIVE IMPACTS

Cumulative impacts are those impacts to the environment that result from the incremental effect of the proposed project when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or persons undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. No substantial cumulative effects are anticipated for the proposed action.

The past and current mission at the Planetarium has resulted in localized minor adverse cumulative impacts and moderate to high widespread beneficial cumulative impacts to the area. The beneficial impacts to the area include increased accessibility of science and technology to New Hampshire families and tourists. The facility would be a tool for improving mathematics,

science, and technology education in the State of New Hampshire, providing learning opportunities for school children, teachers, and student interns with special opportunities targeted to low income, minority, and special needs groups.

The potential impact on ambient air quality from excavation and construction emissions (e.g., fugitive dust and engine exhaust emissions) would be negligible short-term increase in emissions from the Planetarium and within Merrimack County. However, emissions associated with the proposed action would be mostly confined to the immediate project areas since most emissions would be released near ground level. Emission rates would be low; thus, potential for cumulative impacts to ambient air quality would be minor.

Additional storm water runoff resulting from an increase in impervious surface area would be managed with proposed new and existing storm water collection systems. Accordingly, the potential for cumulative impacts to surface quarter quality would be insignificant.

The proposed action would include the placement of fill, and a permanent structure; however, the proposed action is not located within a special flood hazard area, as designated by FEMA. The proposed action is located in an area classified as a lower risk flood area with only a minimal to moderate flood hazard. The proposed action would not have a measurable impact on the floodplain; and the cumulative impact on the floodplain is considered negligible.

No wetlands are located in the project area, and no wetlands would be filled as the result of this action. The proposed action would have no cumulative impact on wetlands.

The Planetarium only employs about 14 full-time and 15 part-time employees, and represents only a minor but beneficial contribution to the socioeconomic conditions of the region. The proposed action would not contribute to cumulative socioeconomic impacts.

There are no other reasonably foreseeable future actions planned for the project area. As such, the incremental effect of this project is not anticipated to be combined with additional future impacts that would potentially result in a collectively substantial impact.

5.0 LIST OF PREPARERS

- Donna S. Juneau, Project Manager; GZA;
- Michael P. North, P.E., Associate Principal; GZA;
- Ronald A. Breton, P.E., Principal; GZA; and
- Steven R. Lamb, P.G., C.G.W.P., Project Reviewer; GZA.

6.0 REFERENCES

REPORTS

"*Phase I Environmental Site Assessment, Christa McAuliffe Planetarium, 2 Institute Drive, Concord, New Hampshire,*" prepared for Planetarium, by Miller Engineering & Testing, Inc., Manchester, New Hampshire, dated June 26, 2003.

"*Phase I Archaeological Survey of the Proposed Christa McAuliffe Planetarium Expansion Project, Concord, New Hampshire,*" prepared for the Planetarium by Richard Will, Ph.D. of TRC Environmental, Inc. in Ellsworth, Maine, dated February 20, 2004.

PLANS AND MAPS

Architectural Plans, entitled "*Christa McAuliffe Planetarium: Alan B. Sheppard Discovery Center, New Hampshire Technical Institute Campus, Concords, New Hampshire,*" the State of New Hampshire, Department of Transportation, Bureau of Public Works, Concord, New Hampshire, dated May 20, 2001. Figures A1-1 through A4-1.

Civil Engineering Plans, entitled "*Christa McAuliffe Planetarium: Alan B. Sheppard Discovery Center, New Hampshire Technical Institute Campus, Concords, New Hampshire,*" State of New Hampshire, Department of Transportation, Bureau of Public Works, Concord, New Hampshire, dated December 1, 2000. Figure C-1 – Existing Conditions Plan, Figure C-2 – Site Plan, Figure C-3 – Grading, Drainage & Erosion Control Plan, and Figure C-4 – Utilities Plan.

"*Administrative Division Plan, Christa McAuliffe Planetarium, New Hampshire Technical Institute, Fan Road – Concord, New Hampshire,*" prepared by T.F. Bernier, Inc., dated March 2002.

"*United States, Department of the Interior, Geological Survey, Concord Quadrangle, New Hampshire – Merrimack County, 7.5 Minute Series,*" dated 1967, photorevised 1985. Topographic, wetlands, land use, and public works information plan provided by the City of Concord, Engineering and Planning Department.

"*Flood Insurance Rate Map, City of Concord, New Hampshire, Merrimack County, Panel 20 of 30, Community Panel Number 330110 0020 B,*" dated August 23, 1999.

"*Bedrock Geologic Map of New Hampshire,*" prepared by the U.S. Geologic Survey, dated 1997.

"*Soil Survey Merrimack County New Hampshire,*" prepared by the U.S. Department of Agriculture, Soil Conservation Service, dated 1965.

"*Geology and Water Quality of Stratified-Drift Aquifers in the Upper Merrimack River Basin, South-Central New Hampshire,*" prepared by the U.S. Geological Survey, dated 1997.

CORRESPONDENCE

Correspondence from Jeffrey R. Shute, Project Manager, The State of New Hampshire, Department of Transportation, Bureau of Public Works, to Jeanne Gerulskis, Christa McAuliffe Planetarium, dated June 16, 2003.

Correspondence from Jeanne T. Gerulskis to Beth Montgomery and Carlos Lopez, R.A., NASA GSFC, dated July 17, 2003.

Correspondence from Michael J. Amaral, Endangered Species Specialist, United States Department of the Interior, Fish and Wildlife Service, to Donna Juneau, GZA GeoEnvironmental, Inc., dated April 26, 2004.

FIGURE 1

LOCUS PLAN

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APW, 05/05/2004, 14:33:41 | FILE: I:\04JOBS\04.0023675.00\CAD\LOCUS.DWG

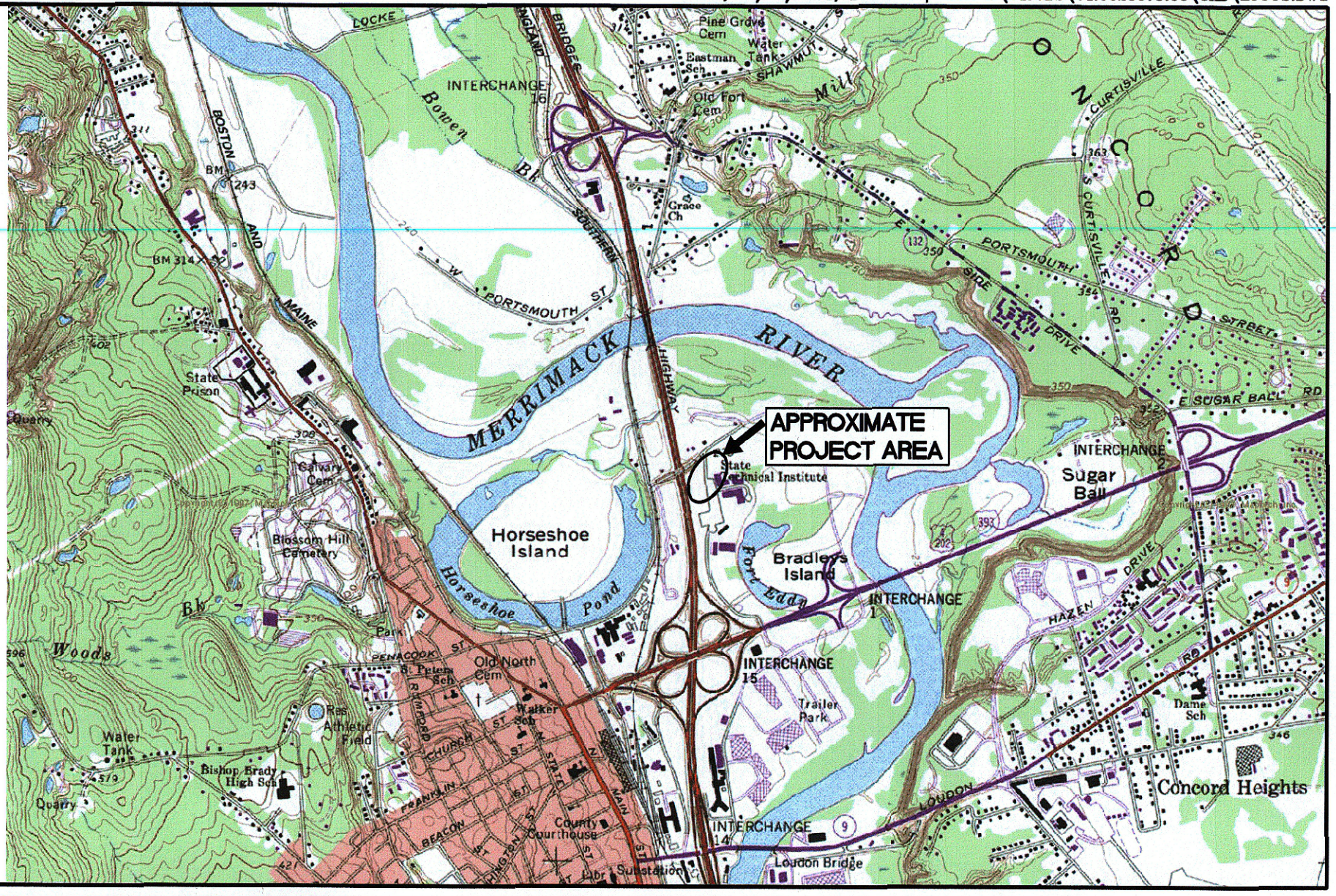

FIGURE No.: 1	PROJECT No.: 23675	NATIONAL ENVIRONMENTAL POLICY ACT ENVIRONMENTAL ASSESSMENT PROPOSED CHRISTA MCAULIFFE PLANETARIUM EXPANSION PROJECT CONCORD, NEW HAMPSHIRE	DES'D BY : D.S.J. CHK'D BY : R.A.B. APP'D BY : R.A.B. DRAWN BY: A.P.W. SCALE : 1"=2000' DATE : MAY 2004
		LOCUS PLAN	

GRAPHIC SCALE 2000' 0' 2000' 4000'

GZA GeoEnvironmental, Inc.
Engineers and Scientists
380 HARVEY ROAD
(603) 623-3600 MANCHESTER, NEW HAMPSHIRE 03103

FIGURE 2

PHOTOGRAPH OF A MODEL OF THE PROPOSED EXPANSION

The Alan B. Shepard Discovery Center

The Alan B. Shepard Discovery Center

A Planned Addition to the Christa McAuliffe Planetarium

The front of the planned Alan B. Shepard Discovery Center looking east. The existing Planetarium pyramid can been seen over the left portion of the addition. Directly in front of the glass doors, behind the rocket sculpture, is the Planetarium passenger drop off area. The doorway to the left of the glassed front wall will be used to welcome groups to the Planetarium. On top, to the right is the observatory with a clear viewing area to the south. The peaked roof covers the second floor exhibit area allowing light to spill down and illuminate both the second floor and a portion of the first floor. Parking will be in front of the addition providing easier access for Planetarium visitors.

CIVIL ENGINEERING DESIGN DEVELOPMENT DRAWINGS
(PROGRESS PLANS)

FIGURE C-1

EXISTING CONDITIONS PLAN

FIGURE C-2

SITE PLAN

FIGURE C-3

GRADING, DRAINAGE, AND EROSION CONTROL PLAN

FIGURE C-4

UTILITIES PLAN

APPENDIX A

BROCHURE – ALAN B. SHEPARD DISCOVER CENTER

CHECK OUT THE FUTURE

This model is of the
Christa McAuliffe Planetarium,
with its planned new
Alan Shepard Discovery Center.

The addition of the Discovery Center will transform the Christa McAuliffe Planetarium into a major science center. It will be the **only** air and space museum in New England!

Please take a look at the other side of this sheet to see what the future holds. With a fine blend of state, federal and private sector funding, this dazzling glass, steel and brick addition will put the Christa McAuliffe Planetarium on the map as:

- ★ An indoor attraction for New Hampshire **families** - a great place to bring the kids on a rainy summer or blustery winter day
- ★ A major **tourist destination** - people will come from all over the country to learn about New Hampshire heroes Christa McAuliffe and Alan Shepard, to explore the exhibits on space science, to peer through telescopes at the wonders of the sky
- ★ An **essential tool** in improving math, science and technology education in our state, with great facilities and learning opportunities for schoolchildren, teachers and student interns
- ★ A source of **inspiration**, patriotism and pride for our young people, as they learn about New Hampshire's role in the U.S. and International Space Programs

CHRISTA McAULIFFE PLANETARIUM

2 Institute Drive
Concord NH 03301
www.starhop.com

HELP US CREATE THIS FUTURE!

For more information, please contact
the Christa McAuliffe Planetarium,
e-mail inquiries to lynn@starhop.com.

SEAL OF THE STATE OF NEW HAMPSHIRE 1776

CHRISTA MCAULIFFE PLANETARIUM

	Today:	Future: *with the addition of the Alan Shepard Discovery Center*
SIZE	11,000-sq. ft. 1 floor 225 people total capacity	45,000 sq. ft. 2 floors with observatory on roof 600 people total capacity
FACILITY	92-seat domed theater with 4 different astronomy shows	Same size, upgraded equipment with more special effects
	No multi-purpose theater	Multi-purpose theater w/110 seats for movies, demos, lectures, science plays, special events
	7 permanent interactive exhibits in lobby area	2 floors of interactive exhibits (traveling & permanent) Central 40' high glassed-in area with suspended satellites Observatory w/telescopes upstairs, exhibit area downstairs with on-screen observation
	2 outdoor exhibits	3-5 outdoor exhibits with Rocket Garden
	1 Multi-purpose room for NASA Educator Resource Center (books, computers videos, CD-ROMs), kids' workshops, school lunches, etc.	5 Discovery Areas including: 1 expanded NASA Educator Center 2 conference Rooms 1 Children's lunch room (field trips) 1 Program Room
	Gift Shop; only open when Planetarium is open	Gift Shop 50% larger with 200% more usable display space open to public before/after hours
	No food concession	Indoor/outdoor Café open to public before/after hours
FOCUS	Planetarium show with exhibits to pass time while waiting 1.5-2 hour experience	Science museum with planetarium All day experience Astronomy, Space Flight and Exploration
OUTSIDE	Bricks and glass Long walk to entry from parking lots, shared w/ college students & staff No dedicated parking spaces	Steel, glass and bricks Covered entry with drop-off in front; separate public/school entry 120 dedicated parking spaces for visitors and school buses

v2 7.01

APPENDIX B

BUREAU OF PUBLIC WORKS – LETTER OF CERTIFICATION

CAROL A. MURRAY
COMMISSIONER

GILBERT S. ROGERS
ASSISTANT
COMMISSIONER

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PUBLIC WORKS

June 16, 2003

Jeanne Gerulskis
Executive Director
Christa McAuliffe Planetarium
2 Institute Drive
Concord, New Hampshire

RE: Alan Shepard Discovery Center
at The Christa McAuliffe Planetarium
Bureau of Public Works Project # 97839

Dear Jeanne;

As you requested, this letter is to certify that the Bureau of Public Works, acting as Construction Manager for the Planetarium, will follow all State and Local Requirements for design and construction of the Alan Shepard Discovery Center. We will also require all Consultants hired to design the project to follow the same.

Sincerely,

Jeffrey R. Shute
Project Manager
Bureau of Public Works
603/271-6662

JRS/jrs

cc: Roger Dignard, Dignard Architectural Services, 156 Joe English Rd., New Boston NH 03070

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JOHN O. MORTON BUILDING - 1 HAZEN DRIVE - P.O. BOX 483 - CONCORD, N.H. 03302-0483
TELEPHONE: 603-271-3516 - FAX: 603-271-3515 - TTD ACCESS: - RELAY NH 1-800-735-2964 - WWW.NHDOT.COM

APPENDIX C

CORRESPONDENCE WITH STATE AND FEDERAL AGENCIES

GZA
GeoEnvironmental, Inc.

Engineers and
Scientists

March 30, 2004
File No. 04.0023675.00

Mr. Michael Amaral, Endangered Species Specialist
U.S. Fish and Wildlife Service
70 Commercial Street
Concord, New Hampshire 03301
Fax: 223-0104

380 Harvey Road
Manchester
New Hampshire
03103-3347
603-623-3600
FAX 603-624-9463
http://www.gza.net

Re: Environmental Assessment
Proposed Christa McAuliffe Planetarium Addition
Institute Drive
Concord, New Hampshire:

Dear Mr. Amaral:

GZA GeoEnvironmental, Inc. (GZA) has been retained to prepare an Environmental Assessment of a proposed addition to the Christa McAuliffe Planetarium. The proposed addition includes the construction of a 34,223-square-foot building addition and associated parking area. To be eligible for NASA funding for the proposed construction project, an Environmental Assessment must be completed. The purpose of the Environmental Assessment is to identify the environmental impact(s) of the proposed construction, and to determine if further study is warranted.

Accordingly, GZA respectfully requests the U.S. Fish and Wildlife Service to review its files pertaining to the presence of the endangered and/or threatened species in the vicinity of the proposed Christa McAuliffe Planetarium addition, and provide us with information regarding the presence of endangered or threatened species in the area. I have enclosed a copy of the U.S.G.S. map of the area identifying the location of the Christa McAuliffe Planetarium and the proposed addition. Additional detailed plans have also been included for your reference.

Please do not hesitate to contact me should you have any questions. Thank you for your attention to this matter.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Donna Juneau

Donna Juneau
Project Manager

An Equal Opportunity Employer M/F/V/H

Memo

RECEIVED
APR 0 6 2004

NH NATURAL HERITAGE BUREAU

To: Ms Donna Juneau, GZA GeoEnvironmental Inc
380 Harvey Road
Manchester NH 03103-3347

From: Sara Cairns, NH Natural Heritage Bureau

Date: 4/2/2004

Re: Review by NH Natural Heritage Bureau of request dated 3/30/2004
NHB File ID: 3418
Project type: Building construction, parking area

Town: Concord
Location: Christa McAuliffe Planetorium, 2 Institute Drive

cc: Michael Marchand, Michael Amaral

I have searched our database for records of rare species and exemplary natural communities near the area identified in your request, with the following results. A species not listed by the state or the federal govenment as Threatened (T) or Endangered (E) has either been identified as a species of special concern in NH (W), or is rare enough in the state to be tracked by NH Heritage even though it has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

Natural Community	State	Federal	Notes
SNE Floodplain Forest	-	-	Threats are primarily changes to the hydrology of the river, land conversion and fragmentation, introduction of invasive species, and increased input of nutrients and pollutants.

Vertebrate species	State	Federal	Notes
Bald Eagle (*Haliaeetus leucocephalus*)	E	T	Contact Michael Marchand, NH Fish & Game Dept, at (603) 271-3016 and Michael Amaral, US Fish & Wildlife Service, at (603) 223-2541. NH F&G has legal authority over animals in New Hampshire. Federally-listed species are also under the jurisdiction of the US Fish & Wildlife Service.
Northern Leopard Frog (*Rana pipiens*)	-	-	Contact Michael Marchand, NH Fish & Game Dept, at (603) 271-3016. NH F&G has legal authority over animals in New Hampshire.

Note: This letter does not constitute a review by NH Fish & Game, and although it is cc'd to Fish & Game you will not automatically receive such a review. You must contact Michael Marchand at (603) 271-3016 to request one.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. For some purposes, including legal requirements for state wetland permits, the fact that no species of concern are known to be present is sufficient. However, an on-site survey would provide better information on what species and communities are indeed present.

Department of Resources and Economic Development
Division of Forests and Lands
(603) 271-3623 fax: 271-6488

DRED/NHB
PO Box 1856
Concord NH 03302-1856

New Hampshire Natural Heritage Bureau - Community Record

SNE Floodplain Forest (Silver Maple/Wood Nettle-Ostrich Fern Floodplain Forest²Silver Maple/False Nettle-Wood Reed-Sedge Floodplain Forest)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Not ranked (need more information)
State:	Not listed	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Excellent quality, condition and lanscape context ('A' on a scale of A-D).

Comments on Rank: This rank could be lowered based on regional criteria.

Detailed Description: Four forest patches were observed. Tech Island: Acer saccharinum dominated the canopy cover with some Populus deltoides within the releve. Boehmaria cylindrica and Onoclea sensibilis shared herb dominance with various graminoids. The entire island is a complex of large, old silver maple floodplain forest with a variety of canopy species, and various, patchy floodplain herbs and grasses. Concord Dump: The Acer saccharinum dominant canopy overhung a fairly species poor herb layer with little to no subcanopy coverage. Sandy soils and flood debris were deposited throughout the floodplain, with grass and Boehmaria cylindrica patches scattered throughout. Tech: This site had a closed Acer saccharinum canopy with little to no subcanopy or shrub layer. Boehmaria cylindrica, Matteuccia struthiopteris, and Onoclea sensibilis dominate the understory, with lesser coverage of Arisaema stewardsonii, Impatiens capensis, Cinna arundinacea, and other herbs and graminoids. SPNHF: Acer saccharinum floodp lain forest patches of medium-low size and quality, due to the heavy trail use and extensive edges. Carya ovata, Quercus rubra, and Fraxinus pensylvanica share canopy space with silver maple, with Toxicodendron radicans, Celastrus orbiculatus, and Berberis vulgaris in the subcanopy/shrub layer, and Onoclea sensibilis, Matteuccia struthiopteris, Boehmaria cylindrica, Dactylis glomeratus, Carex gynandra, and Eupatorium maculatum in the understory.

General Area: Tech Island: Good levee and slough channel development created a range of microtopographic variation. Soils ranged from coarse sand on levees to silty very fine sandy loams in floodplain terraces. Huge piles of flood debris, with dead trunks and railroad ties, sit in low areas, indicating periodic flood deposition. Concord Dump: The upstream end of this forest is framed by an old landfill. Old road beds, as well as the slopes framing the floodplain had considerable old dumping. Access p oints have considerable garbage. Edges were characterized by grassy openings, Toxicodendron radicans, and a recently used home-less structure near the upstream end. This floodplain had 1-4' deep slough channels throughout with a moderate size, stagnant pool in the deepest channel. Silty and very fine sandy loams had mottling throughout the soil column, with varying root depths. Tech: This floodplain complex is framed by parking lots of the Technical Institute, and a trail invites hiking travel through the center of the floodplain. Disturbance seems to be encouraging the growth of vines and invasive species near the edge of the floodplain patch. A shallow emergent marsh with associated standing-water vernal pool at the downstream end of the patch adds to the diversity of this floodplain complex. Soils indicate very active deposition periodically (yearly?): silty, sandy soils, distinct layering of buried organic material, extensive mottling, no soil horizon development. SPNHF: A steep forested bl uff frames the land side of this floodplain/marsh complex, with extensive trails, old fields, and some timber plantation areas within and around the floodplain as well. Easy

access for hikers may increase trampling, off-trail dumping, etc. at this site.

Location

Survey Site Name: TECHNICAL INSTITUTE ISLAND RESERVE
Conservation Land: Conservation Center

County:	Merrimack	USGS quad(s)	Concord (4307125)
Town(s):	Concord	Lat, Long:	431334N, 0713113W
Size:	132 acres	Elevation:	220'

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: From Exit 15 on Rte 93N in Concord take Rte 4/202 west. Take first exit, turn left at stop sign. After ca. 1 mile the forest is between this road and the river.

Dates documented

First observation: 1997-07-02 Last observation: 1997-07-21

Bechtel, Doug. 1997. Field survey to Concord Dump Merrimack on July 28.

Bechtel, Doug and Dan Sperduto. 1998. Floodplain Forest Natural Communities Along Major Rivers in New Hampshire. Prepared by The New Hampshire Natural Heritage Inventory Program (Concord NH) for the Environmental Protection Agency 58 pp. + Appendices.

Floodplain Forests

Floodplain forests are diverse natural communities that experience seasonal floods; natural disturbances that often deposit rich soil but also physically remove shrubs and other low-growing plants. Along major rivers, these forests are typically dominated by silver maple trees, widely-spaced with trunks composed of many tall upward arching limbs. A scarcity of shrubs and a forest floor lush with ferns and herbs contributes to an open atmosphere. Sugar maple tends to be more prominent on major river floodplains near the White Mountains.

Along minor rivers, red maple (*Acer rubrum*) is usually the dominant tree in floodplain forests. Shrubs and vines tend to be denser than on major river floodplains and impart a jungle-like appearance. Less commonly, trees other than red maple dominate a minor river floodplain, including swamp white oak (*Quercus bicolor*), sycamore (*Platanus occidentalis*), balsam fir (*Abies balsamea*), and river birch (*Betula nigra*), a rare species in New Hampshire.

Differences in flood frequency, duration, and intensity are the most important factors that determine differences in floodplain forest vegetation. These factors are in turn controlled by physical attributes of the river and its floodplain such as water volume, channel shape, and slope of the river bed. Streams and minor rivers occur on steeper slopes and floodwaters rush by with great energy, disturbing riverbanks along the way. However, they do not flood with the volume or duration of major rivers. Major rivers descend into the valley bottoms where floodwaters spread out, slow down and deposit nutrient-rich sediments in broad expansive plains. Floodplains that are more frequently and intensely disturbed by river currents cannot support trees. The more disturbed the river habitat, the less vegetation there will be.

Species found in floodplain forests are adapted to the dynamic conditions found along the river. Herbaceous species tend to spread by rhizome, grow in perennial rooted clumps or have high numbers of wind- or water-dispersed seeds. The deep, loamy nature of floodplain soils provide excellent growing conditions for trees and other plants.

Characteristic and rare* plant species:

American elm (*Ulmus americana*)
black cherry (*Prunus serotina*)
bladdernut (*Staphylea trifolia*)*
blue-joint (*Calamagrostis canadensis*)
eastern meadow-sweet (*Spiraea alba*)
grass-leaved goldenrod (*Euthamia graminifolia*)
green dragon (*Arisaema dracontium*)*
hackberry (*Celtis occidentalis*)*
musclewood (*Carpinus caroliniana* var. *virginiana*)
ostrich fern (*Matteuccia struthiopteris* var. *pensylvanica*)
red maple (*Acer rubrum*)
river birch (*Betula nigra*)*
rough goldenrod (*Solidago rugosa*)
sensitive fern (*Onoclea sensibilis*)
silver maple (*Acer saccharinum*)
spotted Joe-pye-weed (*Eupatorium maculatum*)
swamp white oak (*Quercus bicolor*)

Illustration by L.V. Seeboyer, c. 1997. DRED, SPNHF. Adapted from Good Forestry in the Granite State

New Hampshire Natural Heritage Bureau - Animal Record

Bald Eagle

Haliaeetus leucocephalus

Legal Status

Federal: Listed Threatened
State: Listed Endangered

Conservation Status

Global: Apparently secure but with cause for concern
State: Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 1993: SIGHTINGS NEAR HANNAH DUSTIN PARKING AREA, BUT NO DEFINED ROOST OR PERCH SITE. PERCHING ON EAST SIDE OF SEWALLS FALLS DAM AREA. PERCHING NEAR HORSESHORE POND. PERCHING BOTH SIDES FROM BRIDGE STREET TO MANCHESTER STREET. PERCHING ON EAST SIDE OF THE RIVER NEAR BLUE SEAL FEEDS. NO PERCHING IN LAST FEW YEARS NEAR GARVINS FALLS DAM. BOW POWER PLANT: ON RIVER ROAD ON WEST SIDE OF RIVER, POSSIBLE ROOSTING JUST NORTH OF LIQUOR STORE. PERCHING IN HOOKSETT ON BOTH SIDES OF RIVER JUST NORTH OF ROUTE 3 BRIDGE. 1991: THE MOST ACTIVE LOCATIONS ARE SEWALLS FALLS, WETLANDS NEAR I-393, BOW POWER PLANT, AND HOOKSETT BOAT RAMP. LOCATION OF EAGLES DEPENDS ON AVAILABILITY OF OPEN WATER AND OTHER FACTORS.

General Area:

Location

Survey Site Name: MERRIMACK RIVER AT CONCORD
Conservation Land:

County: Merrimack
Town(s): Concord, Pembroke, Bow, Allenstown
Size:

USGS quad(s) Concord (4307125)
Lat, Long: 431329N, 0713132W
Elevation: 190'

Precision: Within 1.5 miles of the area indicated on the map (location information is vague or uncertain).

Directions: VARIOUS LOCATIONS ALONG BOTH BANKS OF THE MERRIMACK RIVER, FROM SEWALLS'S FALLS SOUTH TO HOOKSETT.

Dates documented

First observation: 198?
Last observation: 1993

Deluca, Diane. Audubon Society of New Hampshire. 1993. Results of Annual Eagle Wintering Surveys.

The U.S. Fish & Wildlife Service has jurisdiction over Federally listed species. Please contact them at 400 Ralph Pill Marketplace, 22 Bridge St., Concord NH 03301 or at (603) 225-1411.

New Hampshire Natural Heritage Bureau - Animal Record

Northern Leopard Frog

Rana pipiens

Legal Status

Federal: Not listed
State: Not listed

Conservation Status

Global: Demonstrably widespread, abundant, and secure
State: Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2003: 1 adult seen (Obs_id 2003.0047). 2000: 1 adult seen (Obs_id 2000.0008).

General Area: 2003: Riverbank (Obs_id 2003.0047). 2000: Found in a window well at the SPNHF conservation center on 8/4 (Obs_id 2000.0008).

Comments: 2000: Observer noted, "I haven't seen one in a long time. I thought you might be interested. Sorry about the quality of the photos, we only had a point and shoot camera available. They suffice for a positive ID though. Keep on herpin'" (Obs_id 2000.0008).

Location

Survey Site Name: MERRIMACK RIVER FLOODPLAIN
Conservation Land: Conservation Center

County: Merrimack
Town(s): Concord
Size:

USGS quad(s) Concord (4307125)
Lat, Long: 431320N, 0713126W
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2003: Across from the boat ramp at the NH Tech on Ft Eddy Road (Obs_id 2003.0047). 2000: SPNHF Conservation Center (Obs_id 2000.0008).

Dates documented

First observation: 2000-08-04 Last observation: 2003-07-06

Interactive Wildlife Web Page. 2003. Northern Leopard Frog observed by MIKE MARCHAND on 7/6/2003 at MERRIMACK FLOODPLAIN, as reported by RAARP (obs_id=2003.0047).

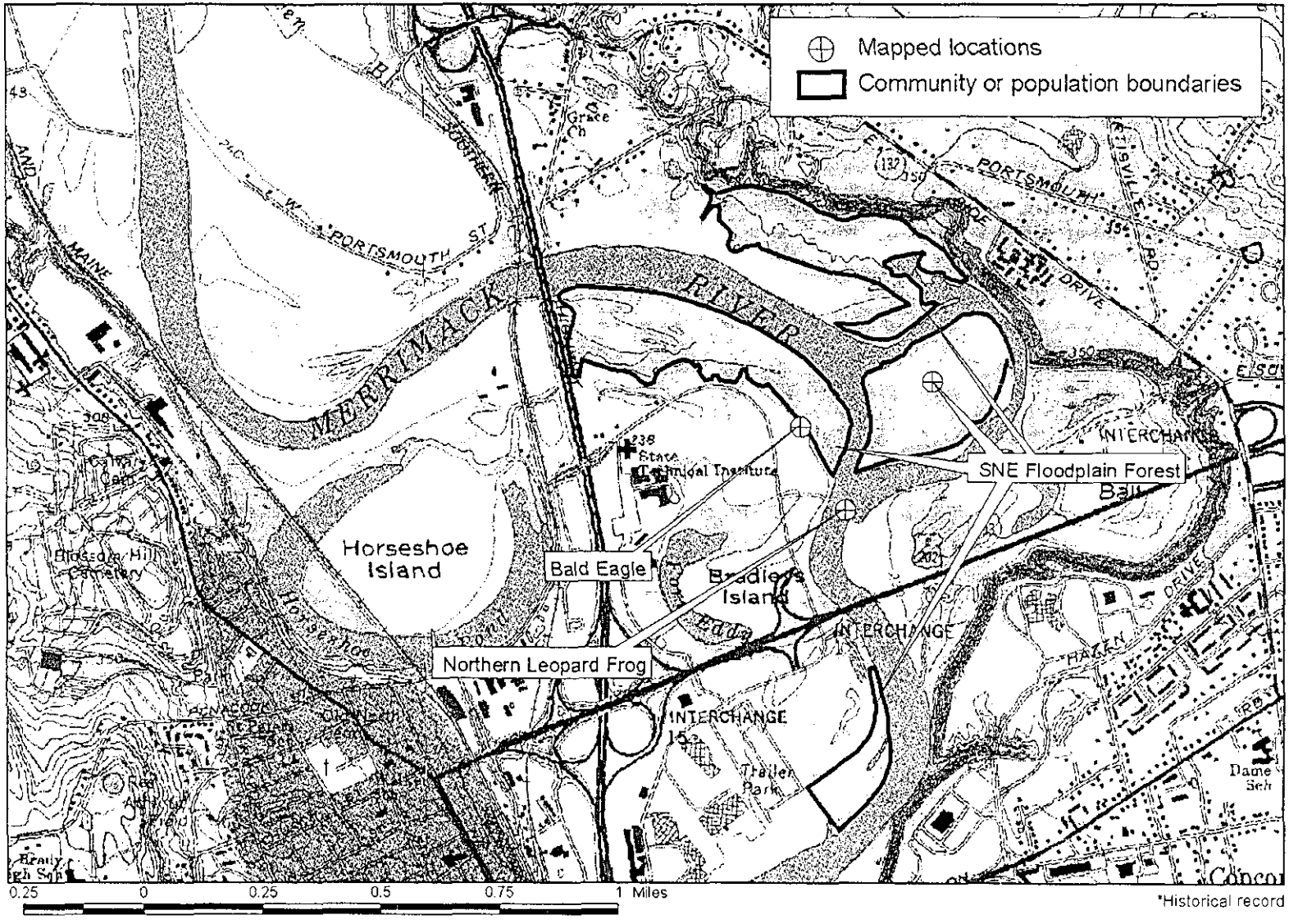
The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 2 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

NH Natural Heritage Bureau

NHB: 3418

Known locations of rare species and exemplary natural communities

Note: Mapped locations are not always exact. Occurrences that are not in the vicinity of the project are not shown.



*Historical record

02 Apr 2004

NH NATURAL HERITAGE BUREAU

Basic information about NH Natural Heritage Bureau environmental reviews*:

What is in our database: Locations where rare species (plants and animals) or exemplary natural communities have been observed. We keep records on: federally listed species; species state-listed as Threatened or Endangered; species judged by experts to be at risk of becoming Threatened in New Hampshire, and natural communities that are of a rare type and/or are sufficiently large and undisturbed to be considered exemplary.

We do not attempt to map the full habitat required to support a rare species. Therefore, areas around a mapped point may be equally or more important than the point itself.

What we report in a review: For all plants and natural communities in our database, we report any recently observed record (seen in the last 20-30 years) that in our judgment, based primarily on proximity and local hydrology, *could* be affected by the project. We may also include older records so that if a field survey is done, the surveyor could be alert for all species once documented in the area. For animals, we simply report all recent records within one mile of the project and cc the report to NH Fish & Game, which has legal responsibility for animals in New Hampshire.

What to do when a review reports rare species or exemplary natural communities near a project:

- For animals, the applicant should request an evaluation from the NH Fish & Game Department.
- For plants and natural communities, the applicant and/or the agency that required the review should evaluate the project for possible impacts, using the specific location and other information provided by NH Natural Heritage.

We are not a regulatory agency and our staff have ecological, not engineering, expertise. We provide information on known occurrences of rare species or exemplary natural communities near a project, but it is not our role to say whether the project will or will not impact those occurrences, or to require changes to a proposed project.

An expert who is familiar with the details of the project can usually quickly determine that most "hits" that we report are not at risk, e.g., if there will be no construction nearby and no water flows from the project in their direction.

When expert review indicates that there *are* concerns with a plant or natural community occurrence, we encourage you to call us at (603) 261-3623 to see if more information about the species or natural community is available. We have no funding for field visits or for extensive consultation with our ecologists, but we may have more site-specific information in our hard-copy files, and we can usually provide some ecological advice.

*This document is being sent *once* to each person who gets a positive response for an environmental review.

New Hampshire
Fish and Game Department

11 Hazen Drive, Concord, NH 03301-6500
Headquarters: (603) 271-3421
Web site: www.wildlife.state.nh.us

TDD Access: Relay NH 1-800-735-2964
Fax (603) 271-1438
E-mail: info@wildlife.state.nh.us

Lee E. Perry
Executive Director

RECEIVED
MAY 26 2004

5/25/2004

Donna Juneau
GZA GeoEnvironmental, Inc.
380 Harvey Road
Manchester NH 03103-3347

Dear Ms. Donna Juneau:

The New Hampshire Fish and Game Department has reviewed the information provided by the NH Natural Heritage Bureau on sensitive species for the proposed new building construction and parking area at the Christa McAuliffe Planetarium, Concord. Their records show that the following species occur near your project site: bald eagle (*Haliaeetus leucocephalus*) and Northern Leopard Frog (*Rana pipiens*). Bald eagles use the Merrimack River during the winter months and during migrating. As long as no large trees (> 12 " dbh) are removed, eagles should not be impacted by the proposed work. Leopard frogs are not state-listed as endangered or threatened. However, they are considered rare in New Hampshire and are tracked by NH Fish & Game. This species is associated with floodplain forests and has been seen east of the proposed site. Limiting the new construction to the area near the existing Planetarium and other disturbed areas near I-93, impacts to this species should be reduced. If the scope of this job changes please let me know.

Please contact me if you require any further assistance.

Sincerely,

Michael Marchand
Nongame & Endangered Wildlife Program

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087

RE: Environmental Assessment
Christa McAuliffe Planetarium Addition
Concord, NH

April 26, 2004

RECEIVED
APR 28 2004

Donna Juneau
GZA GeoEnvironmental, Inc.
380 Harvey Road
Manchester, NH 03103-3347

Dear Ms. Juneau:

I have reviewed your request for information on endangered and threatened species and their habitats for the above-referenced project. My comments are provided in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543).

I have searched our database and found record of the federally-threatened bald eagle (*Haliaeetus leucocephalus*) wintering along the Merrimack River near the proposed project area. Based on the project description and location, it appears that no impacts to federally-listed species will occur. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered.

Thank you for your cooperation and please contact me at 603-223-2541, extension 23, if we can be of further assistance.

Sincerely yours,

Michael J. Amaral

Michael J. Amaral
Endangered Species Specialist
New England Field Office

GZA
GeoEnvironmental, Inc.

Engineers and Scientists

March 30, 2004
File No. 04.0023675.00

Ms. Edna Fieghner
State Historic Preservation Office
19 Pillsbury Street
Concord, New Hampshire 03302

Re: Environmental Assessment
Proposed Christa McAuliffe Planetarium Addition Institute Drive
Concord, New Hampshire

380 Harvey Road
Manchester
New Hampshire
03103-3347
603-623-3600
FAX 603-624-9463
http://www.gza.net

Dear Ms. Feighner:

GZA GeoEnvironmental, Inc. (GZA) has been retained to prepare an Environmental Assessment of a proposed addition to the Christa McAuliffe Planetarium. The proposed addition includes the construction of a 34,223-square-foot building addition and associated parking area. To be eligible for NASA funding for the proposed construction project, an Environmental Assessment must be completed. The purpose of the Environmental Assessment is to identify the environmental impact(s) of the proposed construction, and to determine if further study is warranted.

Accordingly, GZA respectfully requests the State Historic Preservation Office review its files pertaining to the presence of properties of architectural, historical, archaeological, engineering, or cultural significance in the vicinity of the proposed Christa McAuliffe Planetarium addition, and provide us with information regarding the presence of such properties if identified in the area. I have enclosed a copy of the U.S.G.S. map of the area identifying the location of the Christa McAuliffe Planetarium and the proposed addition. Additional detailed plans have also been included for your reference.

Please do not hesitate to contact me should you have any questions. Thank you for your attention to this matter.

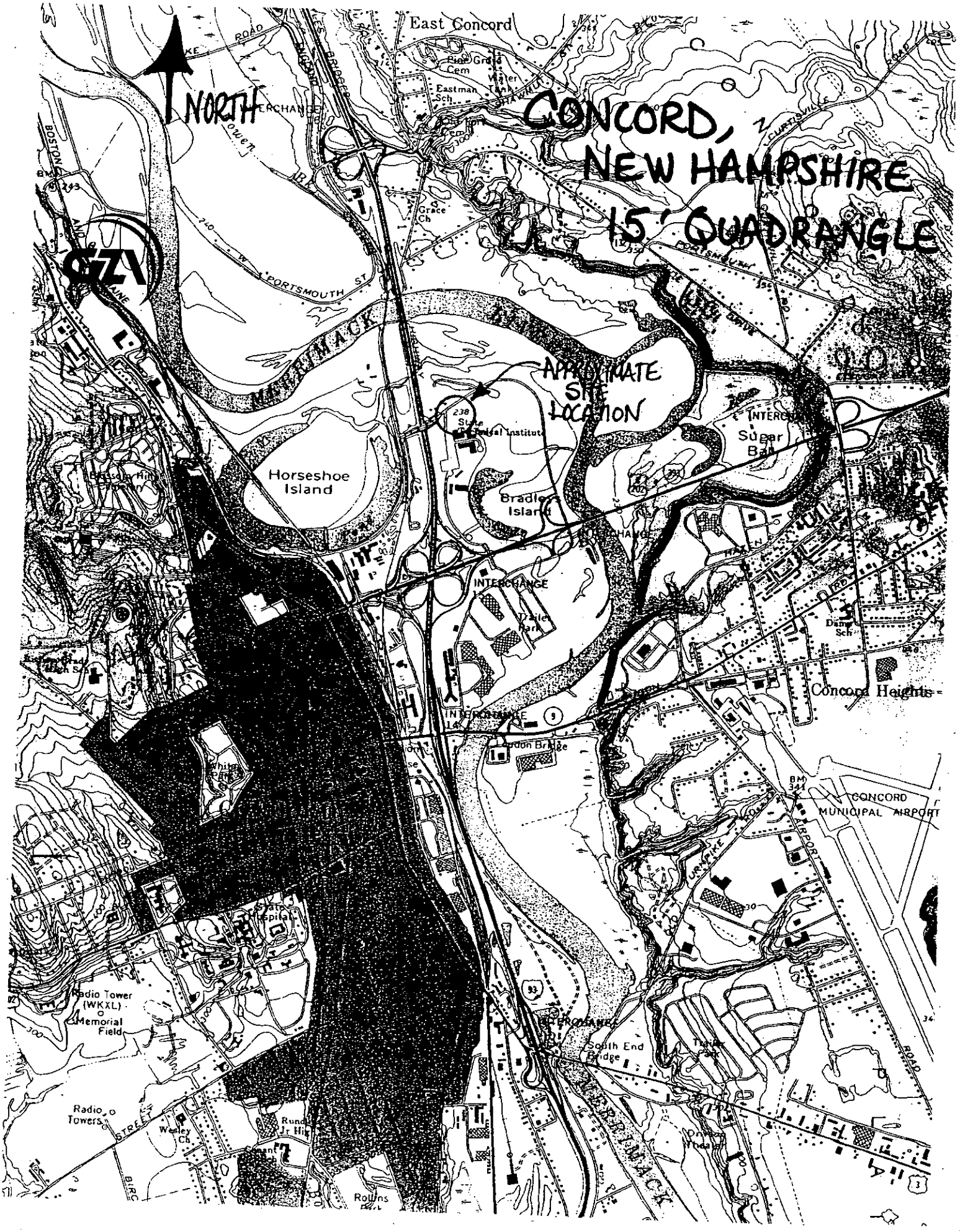
Very truly yours,

GZA GEOENVIRONMENTAL, INC.

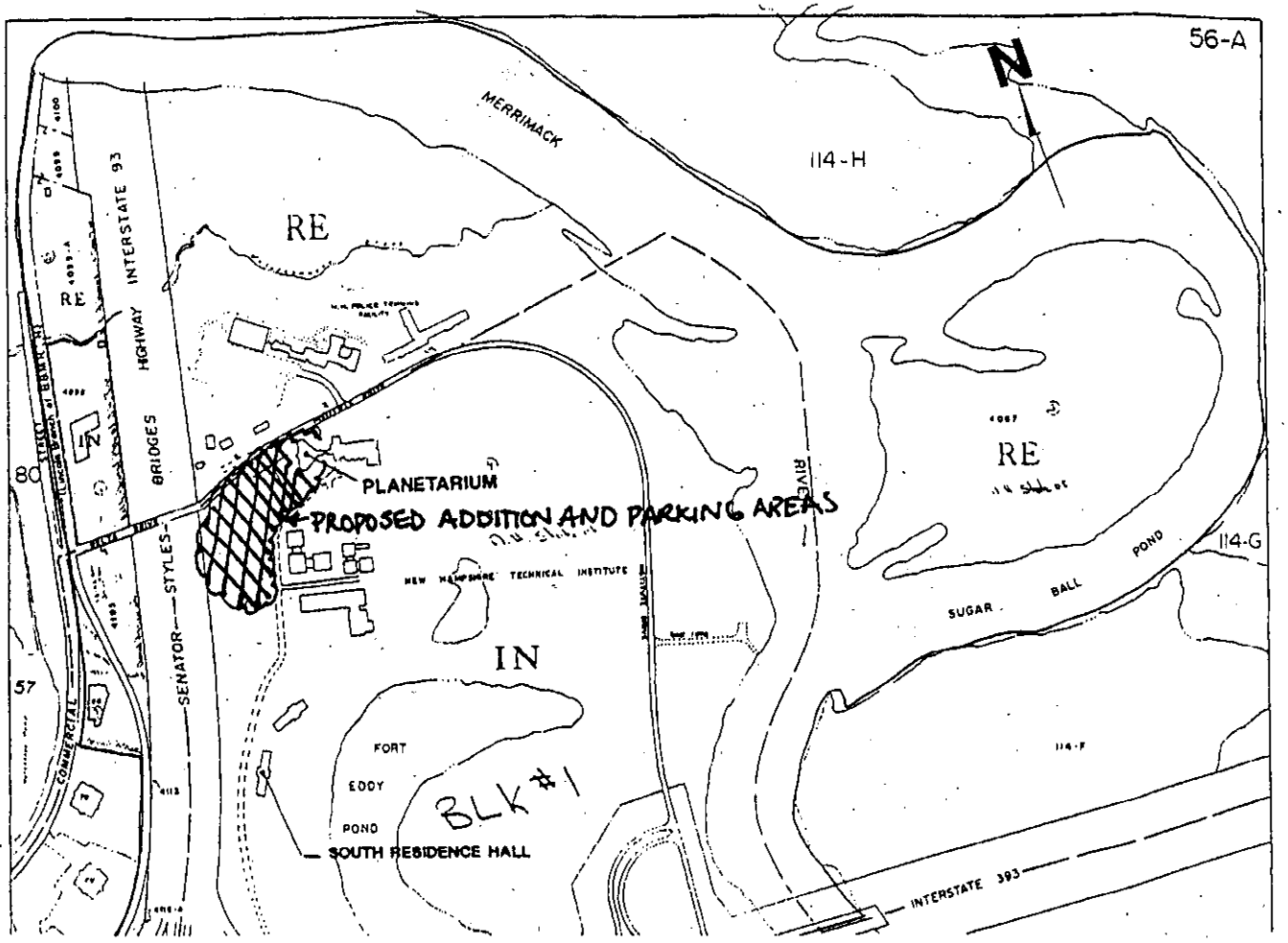
Donna S. Juneau

Donna S. Juneau
Project Manager

An Equal Opportunity Employer M/F/V/H



NORTH
CONCORD, NEW HAMPSHIRE 15' QUADRANGLE
APPROXIMATE SITE LOCATION
East Concord
Horseshoe Island
Bradley Island
Sugar Ball
Concord Heights
CONCORD MUNICIPAL AIRPORT
Radio Tower (WKXL)
Memorial Field
Radio Towers
Wesley Ch
Rollins
South End Bridge
Eastman Sch
Grace Ch
Trailer Park
Loudon Bridge
INTERCHANGE
PORTSMOUTH ST
MERRIMACK



MILLER ENGINEERING & TESTING, INC.

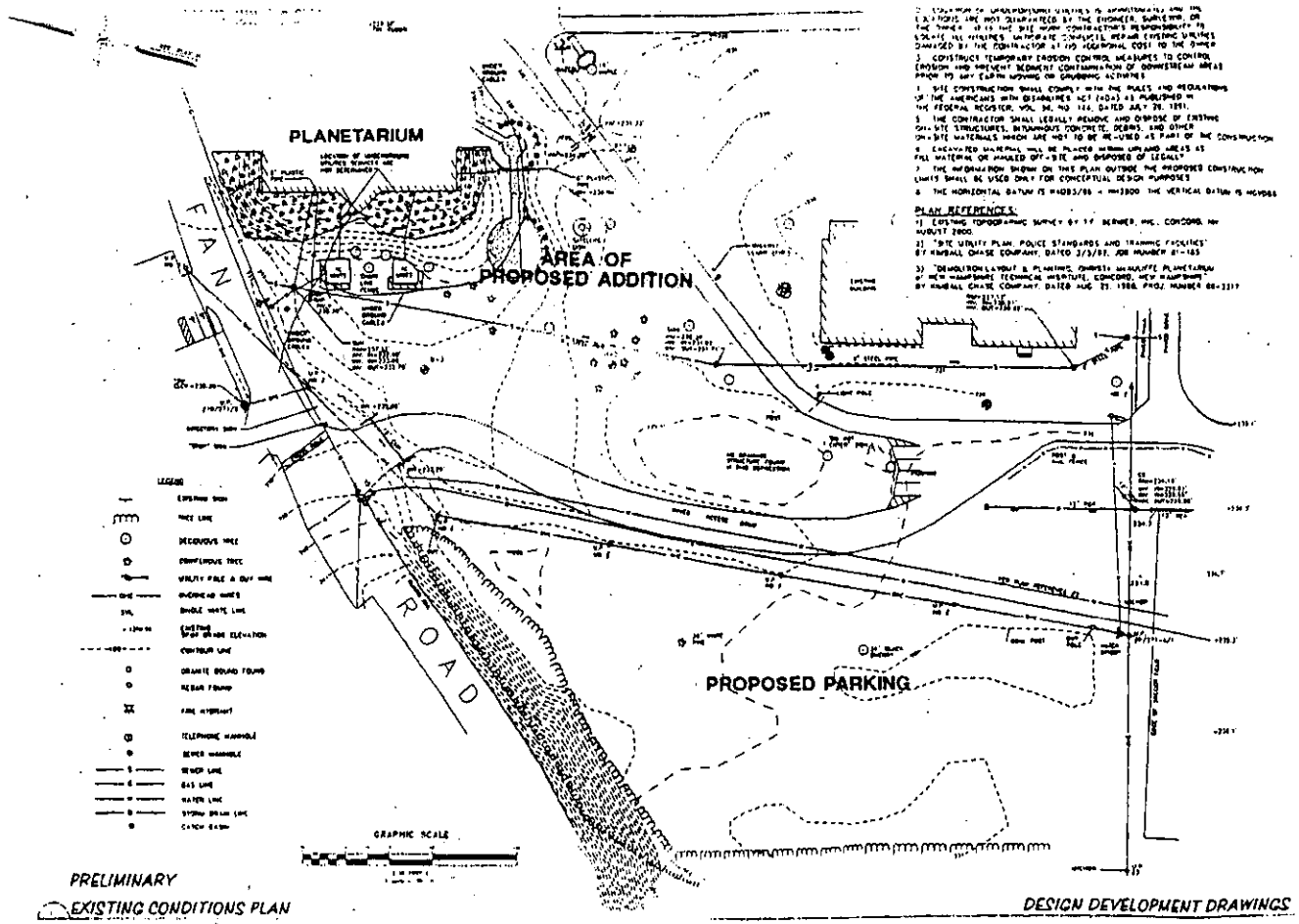
PROJECT: CHRISTA MCAULIFFE PLANETARIUM
CONCORD, NH

PROJECT NO.: 03.200.NH

DATE: JUNE 2003

Lot Layout Plan

FIGURE NO. 2



MILLER ENGINEERING & TESTING, INC.
100 SHEFFIELD ROAD - PO BOX 4936
MANCHESTER, NEW HAMPSHIRE 03108
TEL (603) 668-4016 // FAX (603) 668-8641
EMAIL EMORS@MILLERENGANDTESTING.COM

PROJECT: CHRISTA MCAULIFFE PLANETARIUM
CONCORD, NH
PROJECT NO.: 03.200.NH
DATE: JUNE 2003

General Site Plan

FIGURE NO. 3

Skip Navigation Links

The Alan B. Shepard Discovery Center

What's Up! | Calendar of Events | Show Times | Show Descriptions | Super Stellar Fridays | Public Visits | Gift Shop | Educator Resources | Scouting Workshops | Links | Directions | Space Camp | Event Pictures | Main Page

The Alan B. Shepard Discovery Center

A Planned Addition to the Christa McAuliffe Planetarium

The front of the planned Alan B. Shepard Discovery Center looking east. The existing Planetarium pyramid can been seen over the left portion of the addition. Directly in front of the glass doors, behind the rocket sculpture, is the Planetarium passenger drop off area. The doorway to the left of the glassed front wall will be used to welcome groups to the Planetarium. On top, to the right is the observatory with a clear viewing area to the south. The peaked roof covers the second floor exhibit area allowing light to spill down and illuminate both the second floor and a portion of the first floor. Parking will be in front of the addition providing easier access for Planetarium visitors.

HOME

APPENDIX D

PHASE I ARCHAEOLOGICAL SURVEY

TRC

Customer-Focused Solutions

Phase I Archaeological Survey of the Proposed Christa McAuliffe Planetarium Expansion Project, Concord, New Hampshire

Prepared by

Richard Will, Ph.D.
TRC
71 Oak Street
Ellsworth, Maine 04605

February 20, 2004

Project Background

In early 2003, TRC/Archaeological Research Consultants, Inc. (TRC/ARC) made a proposal to conduct a Phase I archaeological survey for a planned expansion of the Christa McAuliffe Planetarium, which is located on the campus of the New Hampshire Technical Institute (NHTI) in Concord, New Hampshire (Figure 1). The building expansion and new parking lot as proposed will impact a total area of approximately 8000 m^2. The Phase I scope of work included a complete walkover inspection of the proposed building expansion and parking lot along with subsurface testing in the grassy lawn area that the building expansion and a proposed parking lot will cover and disturb soils.

The project area lies on the floodplain, or "intervale" of the Merrimack River in Concord, New Hampshire. The course of the Merrimack River has shifted across the floodplain through time, creating a series of old channels and oxbow lakes, as well as depositing alluvial soils. The project area is located near one of these oxbow lakes called Fort Eddy, and several previously identified prehistoric and historic sites are nearby (including 27MR1, 27MR82, 27MR84, and 27MR85)(Kenyon 1986). Previous archaeological testing on the NHTI campus revealed the presence of artifacts dating to the Middle Woodland period (750-1150 BP), as well as human remains, probably those of a Native American inhabitant of the area from the Protohistoric period (Hemmings 1994).

Fieldwork was conducted on September 10-12 and 17, 2003. The field crew consisted of Dr. Richard Will, Dawn Damboise, John Marron, and Robert Proctor, with Dr. Will as principle investigator and field supervisor. Weather conditions during fieldwork were very conducive to fieldwork (clear and sunny with temperatures in the 70s).

This report documents the results of the Phase I archaeological survey of the Christa McAuliffe Planetarium Expansion project. After a brief overview of the physical environment of the project area and the methods used to conduct the survey, the results of surface inspection and subsurface testing are provided.

Project Environment

The Christa McAuliffe Planetarium Expansion project will begin at the southwestern edge of the current building, covering an area of approximately 900 m^2 and impacting what is now a sloping grassy lawn with a few small trees and shrubs (Figure 2). The parking lot will be located across a campus road to the west of the current building, in an area now used as a soccer field. The field covers an area of approximately 6000 m^2, and a triangular region of approximately 1000 m^2 just

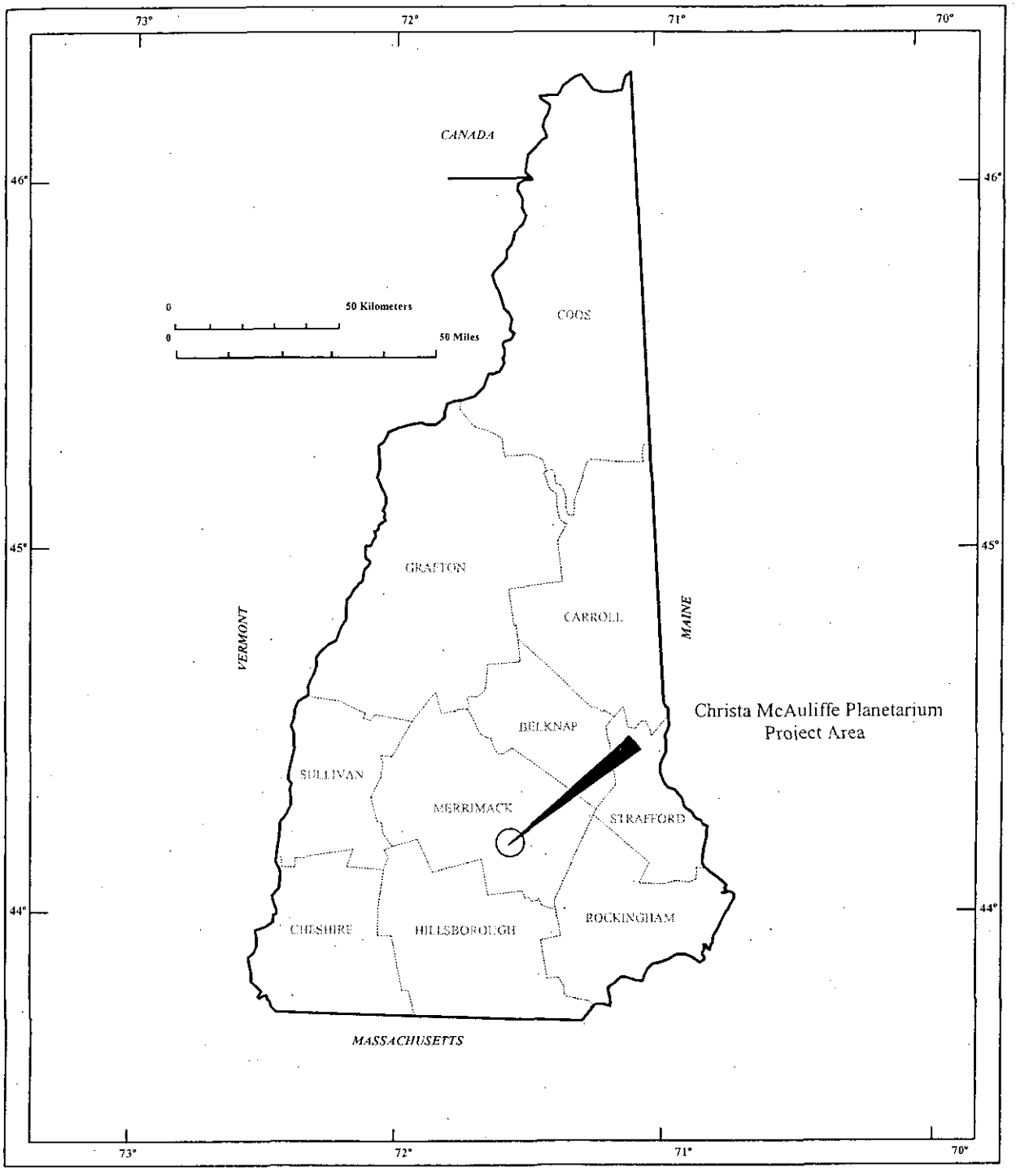


Figure 1. Map of New Hampshire showing the location of the Christa McAuliffe Planetarium Phase I archaeological survey project area.

north of the field was also tested. A line of white pines and a chain link fence that separates the campus property from the Interstate 93 right of way marks the western border of the field. A line of large shade trees (approximately 15 m apart) lies along the eastern edge of the field, between the field and the campus road. The northernmost tree in this line appears to have been removed, and a large hole left by its removal is filled in with ground tree stump debris.

The area adjacent to the existing building showed evidence of previous disturbance in the form of building construction and landscaping, and an electrical transmission line was encountered in the trench excavated in this area. The soccer field and adjacent area are level and show no obvious evidence of disturbance on the surface.

Field Methods

Phase I fieldwork began with a complete walkover of the area to be impacted by the expansion and parking lot. Following the walkover, a grid of 45 .5 m X .5 m testholes in five transects of nine testholes each on 10 m intervals was laid out over the soccer field, with transects oriented to magnetic north. Testholes were orientated on a north/south axis and all sediment excavated from them was screened through 6.4 mm (1/4") hardware cloth to facilitate the recovery of small artifacts, such as stone flakes, bone, and aboriginal pottery that might otherwise be missed without screening. A soil description and profile was recorded for each testhole excavated on a standardized form and a map with the location of testholes was made using a tape and compass. Testholes were numbered sequentially along each transect starting at the northern end of the transect, and transects were numbered consecutively starting with the westernmost and moving east. Figure 2 indicates both the location of testholes and the surrounding topography of each area tested. A record of each of these testholes is included in Appendix I.

Three trenches were excavated using a backhoe to reveal deep stratigraphy. Two of the trenches were excavated in a level grassy area just north of the soccer field, with one trench oriented north to south, and one east to west. A third "trench" (actually a square area of approximately 2 m X 2 m X .5 m deep) was excavated using a backhoe at the base of sloping grassy lawn just southwest of the existing planetarium building. Digital photographs were taken to document the project area.

Results of Phase I Archaeological Testing

The Phase I survey consisted of a surface inspection and systematic subsurface testing designed to locate evidence for human occupation in the form of artifacts. The surface inspection entailed a walkover inspection of the proposed building expansion and parking lot areas. The

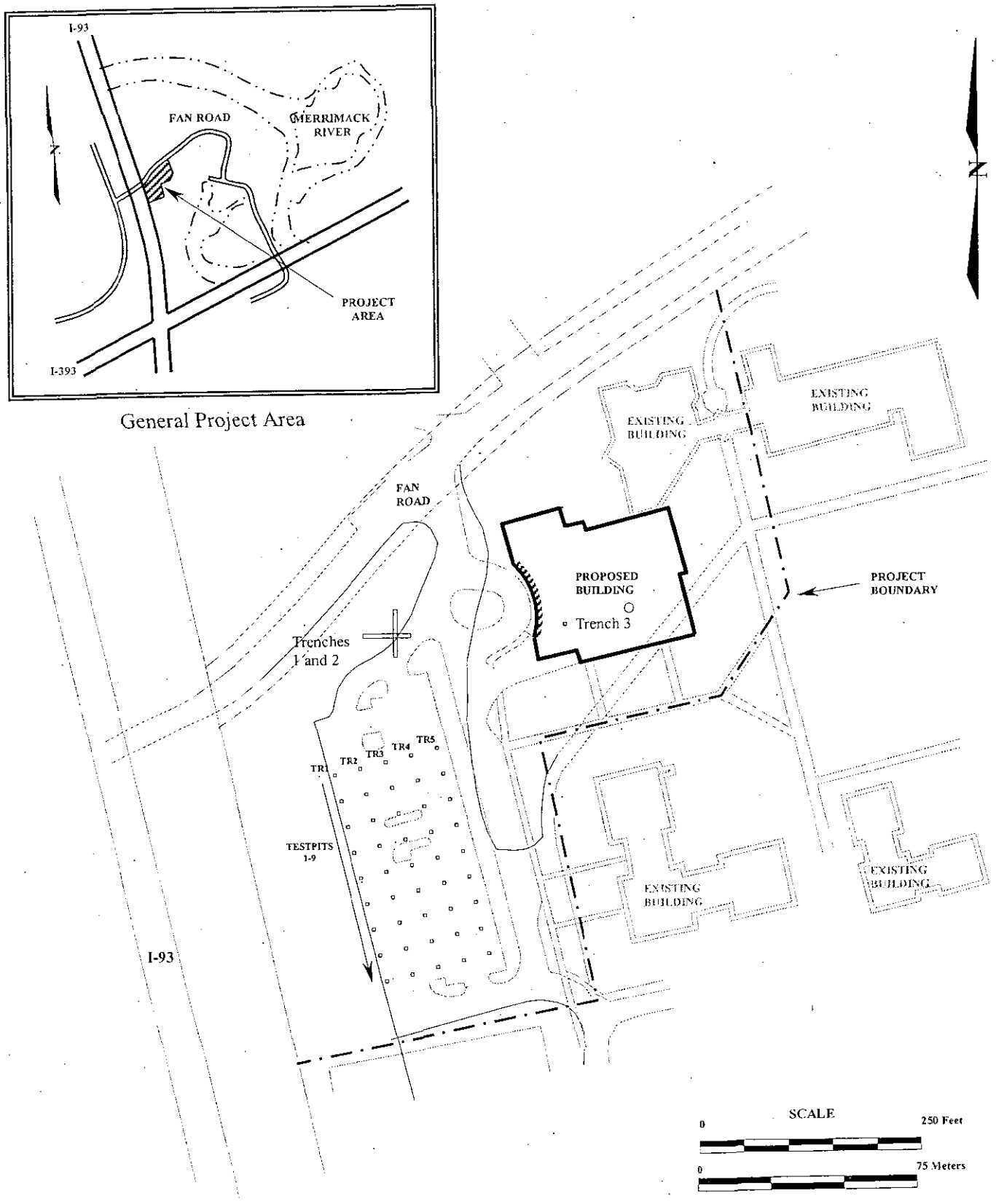


Figure 2. Map of project area showing the location of archaeological testholes and backhoe sampling trenches.

building expansion area showed evidence of historic activity in the form of building construction and landscaping, while the soccer field showed little evidence of historic activity (aside from clearing) on the surface.

Testholes. Subsurface testing of the soccer field was accomplished using 50 cm^2 shovel testholes spaced at 10 m intervals (Plate 1). The 45 50 cm^2 testholes that composed transects 1 through 5 were excavated by hand using shovel and trowel, and all soils were screened for artifacts. One testhole (Testhole 1 on Transect 5) was not excavated since it was placed in the center of what appeared to be a large hole filled with tree stump debris.

Testholes were excavated to an average depth of 58 centimeters below surface (cm bs). The stratigraphy revealed by the testholes in these transects varied across the field. In general, a shallow root mat lay over a brown to dark brown fine silty loam Ap (plowzone) horizon of 10-50 cm thickness. The Ap horizon was thickest along the western edge of the area, becoming thinner to the east. Below the Ap a light yellow-brown to orange-brown B horizon was noted. In many of the testholes in the western portion of the field, a series of alternating brown and yellow-brown soil horizons occurred.

Testholes along Transect 1, which was placed closest to Interstate 93, exhibited a sequence of buried organic-rich soil horizons beginning about 30 cm bs (Plate 2). None of these horizons contained archaeological materials and there age is unknown. Such features are typical alluvial deposits where flooding has preserved characteristics of buried O soil horizons (for example, Will et al. 1996; Moore and Will 2002)

Testholes placed along transects further to the east did not always contain evidence for previously buried surfaces. It is hypothesized that these near-surface sediments were scalped during leveling of the area to create the soccer field.

No prehistoric artifacts were recovered from the testholes placed along transects 1 through 5. A scattering of historic artifacts, primarily dating to the 19th and 20th centuries, was found (Table 1). All historic artifacts were recovered from 0-20 cm bs, and were noted in the field but not kept.

Trenches 1 and 2. Trenches were mechanically excavated at the northern end of the project area so as to not disrupt use of the soccer field. The purpose of their excavation was to examine more deeply buried alluvial deposits than might otherwise be exposed shoveling by hand (Plate 3).

Trench 1 was oriented East-West, was approximately 15 m long, and was excavated to a depth of approximately 1.5 m. Trench 2 was oriented perpendicular to Trench 1 (North-South), crossing Trench 1 at roughly the 2/3 (10 m) point of the East-West trench. This trench was also approximately 1 m wide, 15 m long, and 1.5 m deep.

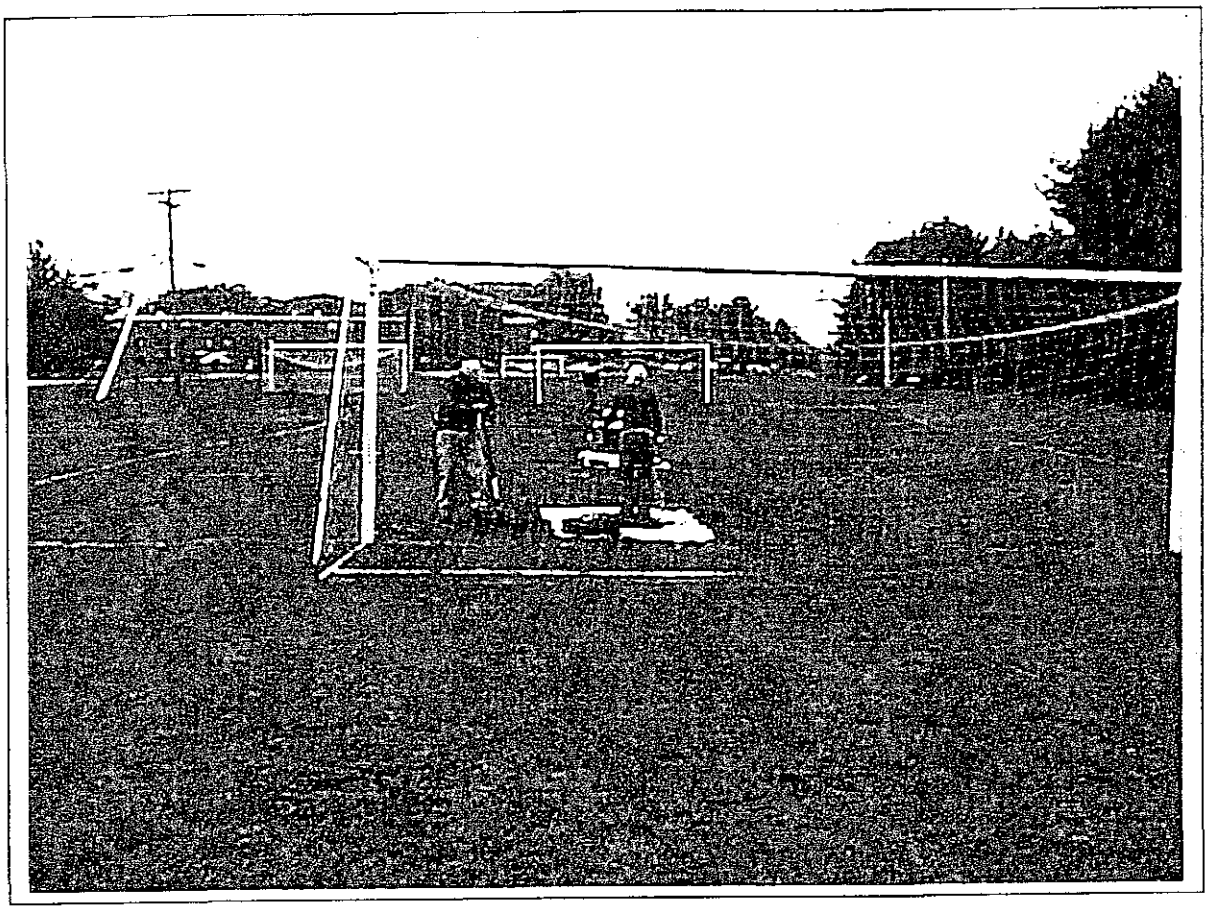


Plate 1. Work in progress in the proposed area of the new planetarium parking lot.

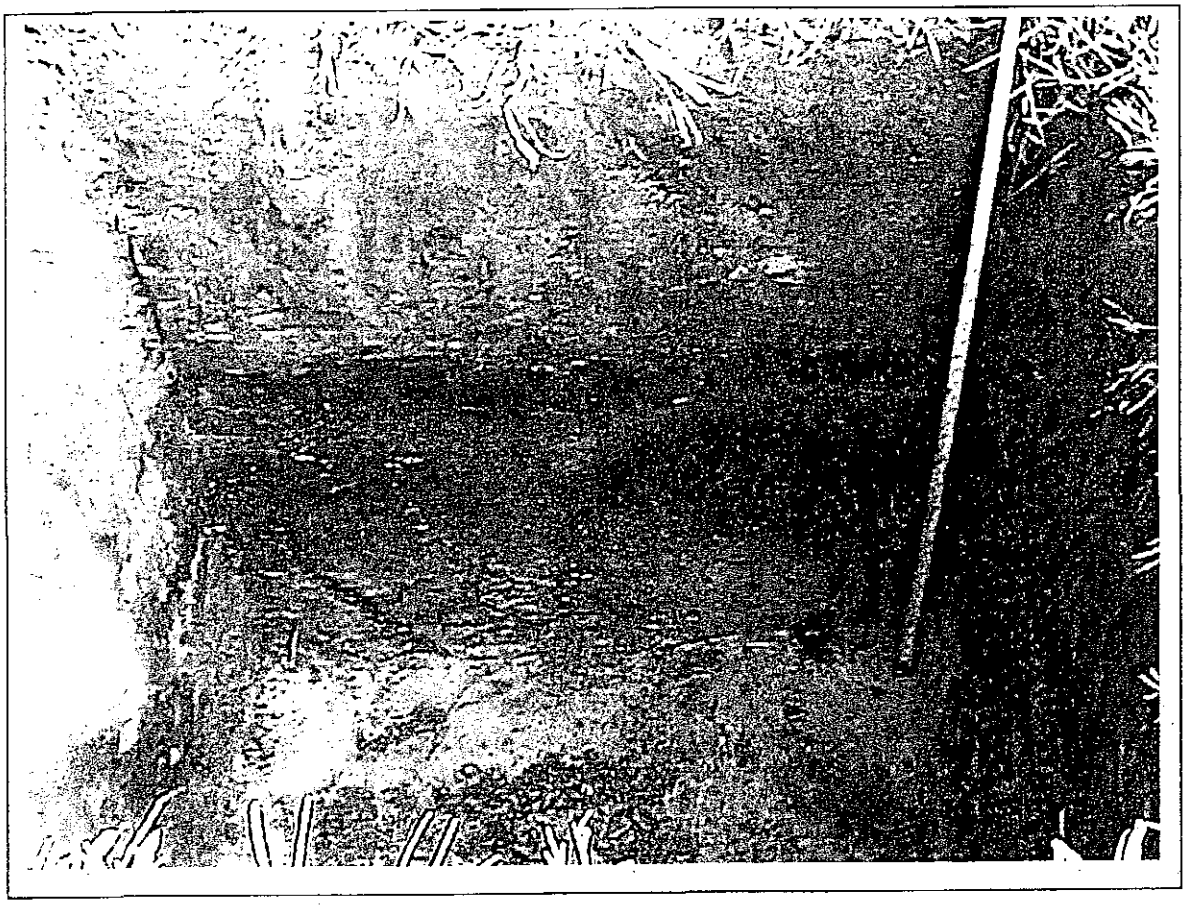


Figure 2. Excavation of testhole 4 along transect 1 showing probable buried soil horizons. Depth is 50 cm below surface.

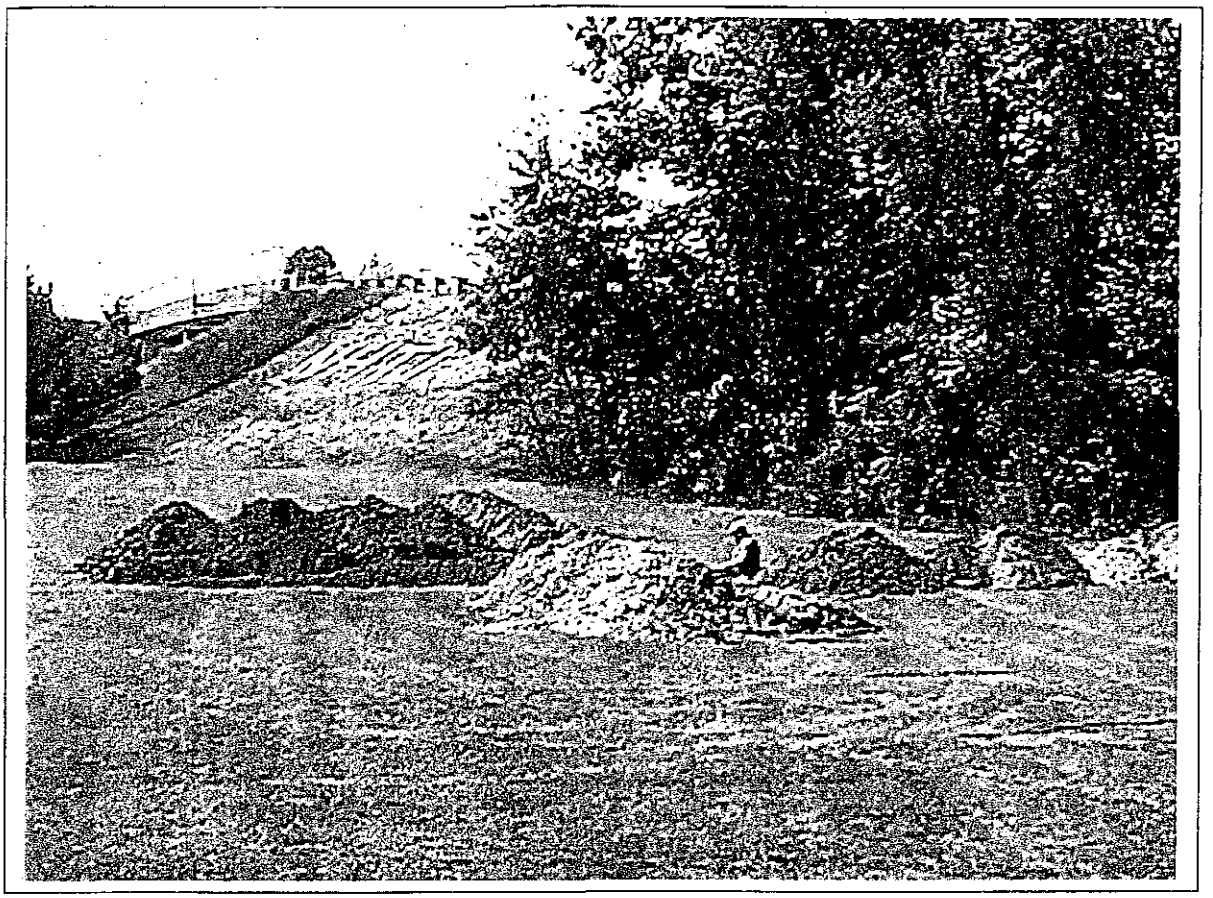


Plate 3. Trench excavation showing Mr. John Marron recording soil profiles.

Table 1. Location of historic artifacts.

Transect	Testhole	Artifacts
1	2	brick, refined earthenware
1	3	brick
1	4	brick
1	6	Rockingham (yellow ware)
1	7	coal, glass, brick, refined earthenware
2	1	nail
2	2	nail, refined earthenware
2	6	refined earthenware
2	9	glass, bottle neck, refined earthenware
3	1	cut nail, brown beer bottle glass, refined earthenware
3	3	brick
3	4	clear glass
3	5	Rockingham (yellow ware), refined earthenware
3	6	square nail, lead glazed redware, clear glass
3	7	brick, whiteware
3	8	clear glass screw top bottle, square nail, blue on white refined earthenware, slag
3	9	brick, clear glass, whiteware
4	1	refined earthenware
4	9	brown beer bottle glass
5	6	clear glass
5	7	clear glass, wire nail
5	8	brown glass

The stratigraphy in trenches 1 and 2 was similar and fairly uniform along the length of both trenches (see Plate 4). It consisted of a thin root mat overlaying a 20-25 cm thick Ap (plowzone) of brown fine silty loam. This transitioned abruptly into a yellowish brown B soil that extended to 80-100 cm bs. A patchy lens of darker brown soil appears at approximately 100 cm bs, and may represent a buried surface. A thin (2-3 cm thick) band of rust concretions and orange-stained gravel appears in the profile of trench 2, but was not noted in the profile of Trench 1. Below 100 cm bs, deposits alternate between fine and medium coarse sand layers that range in color from pale brown to yellow or light yellowish-brown (Munsell: 10YR 4/4, 10 YR 6/4).

No artifacts or cultural features were noted in the excavated trench fill or wall profiles.

Trench 3. This approximately 2 m X 2 m trench was mechanically excavated by a backhoe in the area of the proposed building expansion. Excavation was halted when caution tape indicating a buried electrical transmission line was noted at approximately .5 m depth. The profile of the trench wall indicated that the area was completely disturbed by previous excavation and building activities, and no intact soils were noted. No artifacts were noted from the rocky trench fill.

Plate 4. South wall of portion of trench after troweling surface smooth. Depth is 1.5 m.

Summary and Recommendations

Phase I archaeological survey of the proposed Christa McAuliffe Planetarium Expansion project did not produce any evidence for prehistoric cultural occupation nor activity in the area surveyed. The existence of a plowzone in the soccer field, as well as the scattering of small fragments of historic (19th - 20th century) artifacts suggest that the area of the proposed parking lot was a farm field historically. This historic activity is not significant. Specifically, the areas referred to include the approximate area proposed for building expansion, as well as the area proposed as a location for a parking lot (the soccer field). Periods of former stability as indicated by buried organic soil horizons, and alternating strata of fine to medium sand in the bottom of the trenches attest to the complex history of the nearby Merrimack River. As currently planned, no further archaeological investigations are recommended for this project.

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Hemmings, E. Thomas
1994 Beneath the Concord Intervale: Geoarchaeological testing in the Merrimack River Floodplain at New Hampshire Technical Institute, Northeast Geoarchaeology.

Kenyon, Victoria
1986 Prehistoric Archaeological Resources; Concord, New Hampshire, New Hampshire Historical Society.

Moore, E., and R. Will
2002 Report on Phase I Archaeological Survey of the Bar Mills Project (FERC No. 2194), York County, Maine. Report on file with the Maine Historic Preservation Commission, Augusta.

Will, R., J. A. Clark, E. Moore, and others
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Appendix I: Testhole Records

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Sewer field

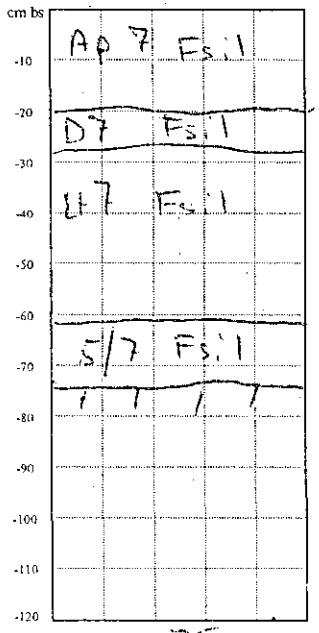
Date Sept 10, 03

Page 1 of 3

TR 1 TH 1

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☐ Histories



Max. depth 75 cm bs

Recorder(s) RW

# of Bags Collected ∅

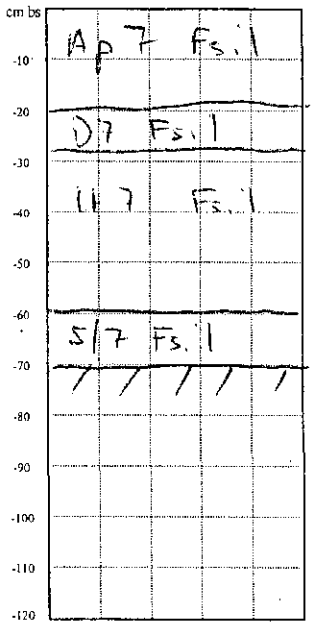
Material	Depth

Notes:

TR 1 TH 2

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☑ Historics



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected ∅

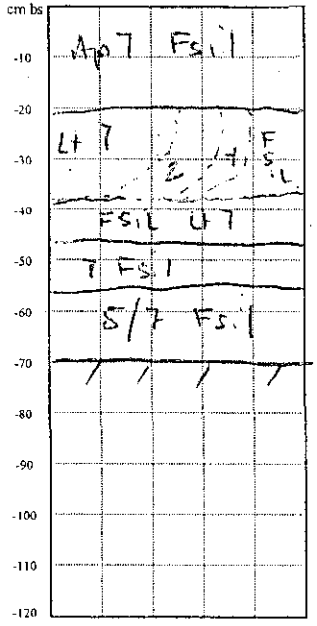
Material	Depth
brick/ceramic	0-20

Notes: 1 brick frag
1 frag refined earthenware

TR 1 TH 3

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☑ Historics



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected ∅

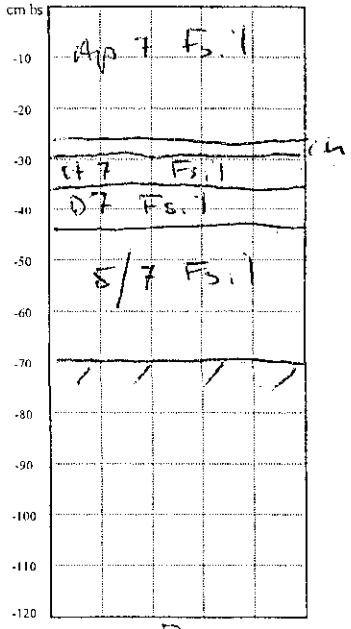
Material	Depth
brick	0-20

Notes:
1 small frag

TR 1 TH 4

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☐ Histories



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected ∅

Material	Depth
brick	0-20

Notes: 1 small frag

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Soccer field

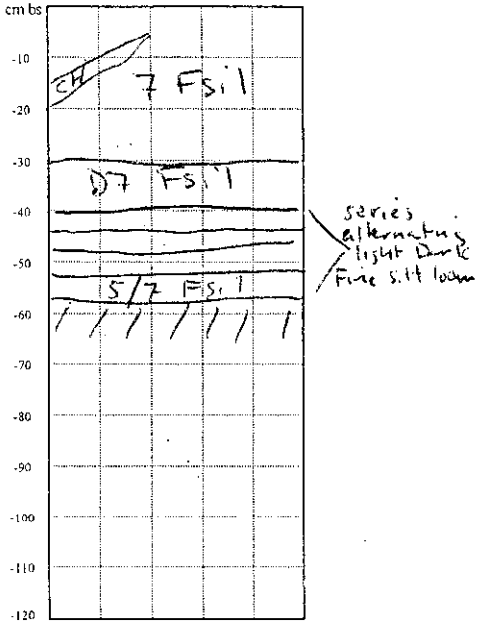
Date Sept 10, 03

Page 2 of 3

TR 1 TH 5

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 58 cm bs

Recorder(s) RW

# of Bags Collected Ø

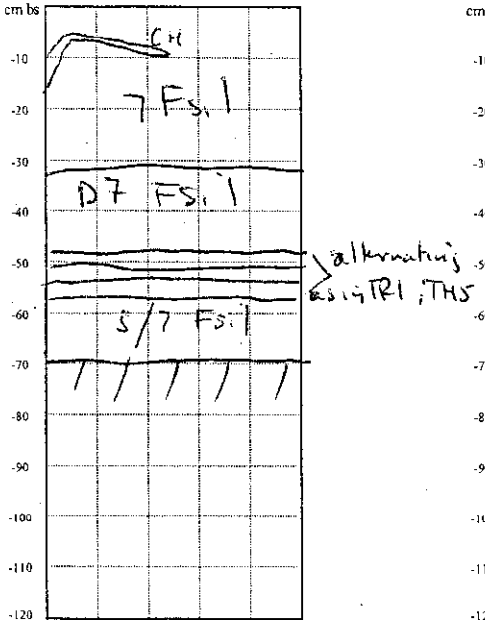
Material	Depth

Notes:

TR 1 TH 6

Wall: (N) E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected Ø

Material	Depth
ceramic	0-20

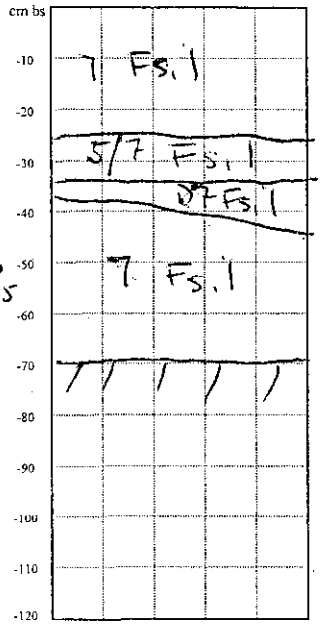
Notes:

Rockingham early mid 19th century

TR 1 TH 7

Wall: (N) E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected Ø

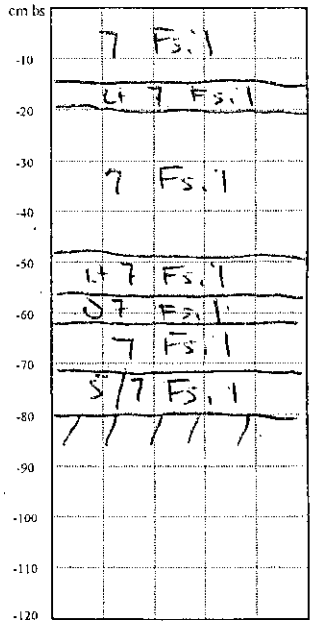
Material	Depth
coal (i)	0-20
glass (i)	0-20
textile (i)	0-20
refined earthen ware (i)	0-20

Notes:

TR 1 TH 8

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 80 cm bs

Recorder(s) RW

# of Bags Collected Ø

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 - brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Beaver Field

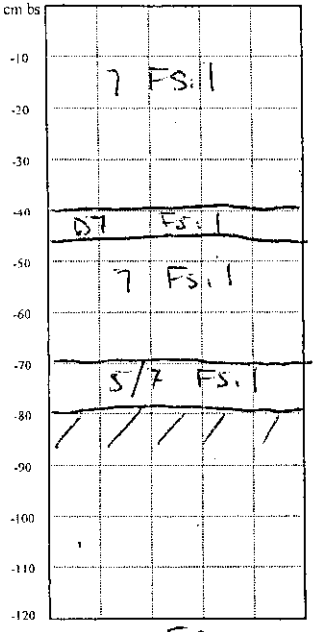
Date Sept 10, 03

Page 3 of 3

TR 1 TH 9

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☐ Historics



Max. depth 80 cm bs

Recorder(s) RW

# of Bags Collected Ø

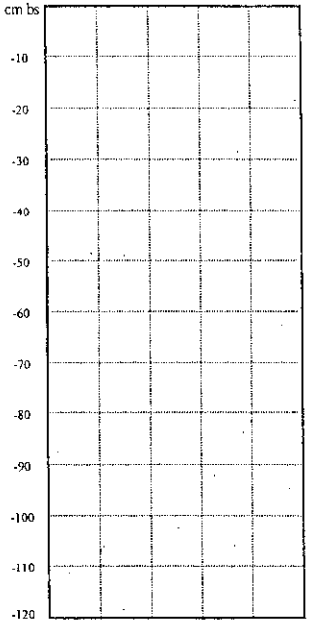
Material	Depth

Notes:

TR____ TH____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

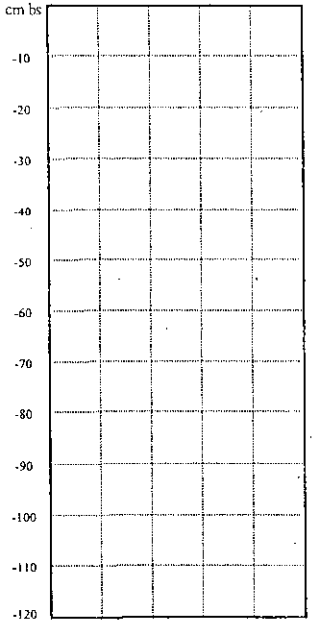
Material	Depth

Notes:

TR____ TH____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

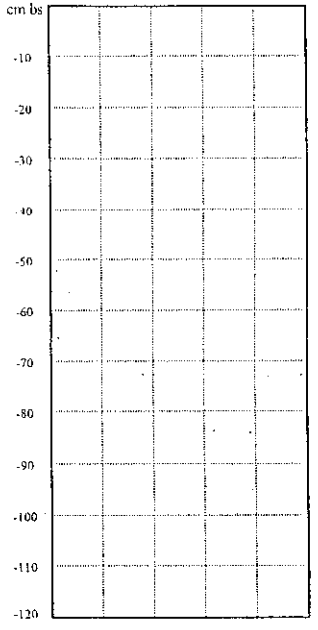
Material	Depth

Notes:

TR____ TH____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Date Sept 11 03

Page 1 of 3

Area: Soccer field

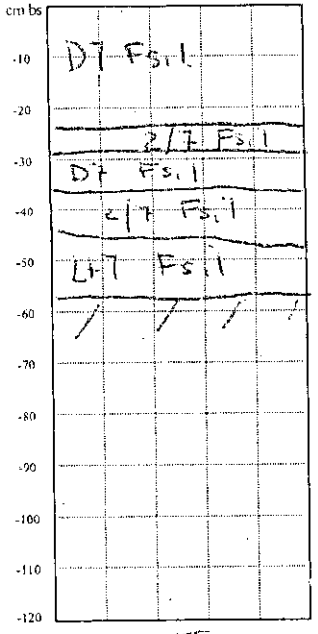
TR 2 TH 1

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☑ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

D7 Fsil
2/7 Fsil
D7 Fsil
2/7 Fsil
Lt7 Fsil



Max. depth 58 cm bs

Recorder(s) RW

# of Bags Collected Ø

Material	Depth
nail (1)	0-20

Notes: lots of worm holes to 45cm

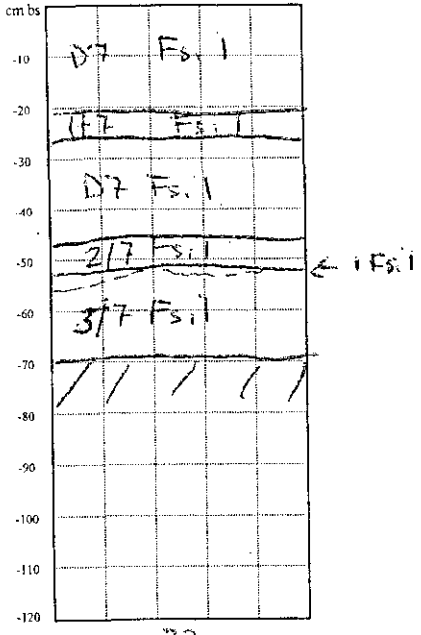
TR 2 TH 2

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☑ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

D7 Fsil
Lt7 Fsil
D7 Fsil
2/7 Fsil ← 1 Fsil
3/7 Fsil



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected Ø

Material	Depth
nail (1)	0-20
retained [illegible] (1)	0-20

Notes: maybe albic at base of old O.

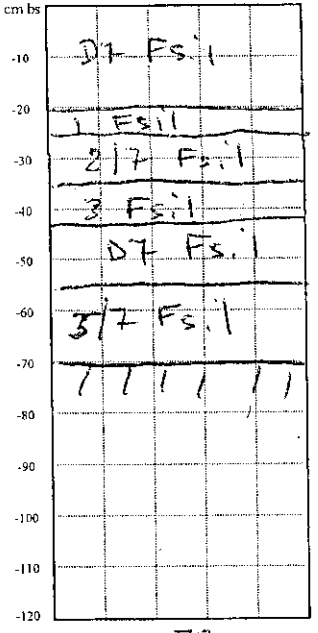
TR 2 TH 3

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

D7 Fsil
1 Fsil
2/7 Fsil
3 Fsil
D7 Fsil
3/7 Fsil



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected Ø

Material	Depth

Notes:

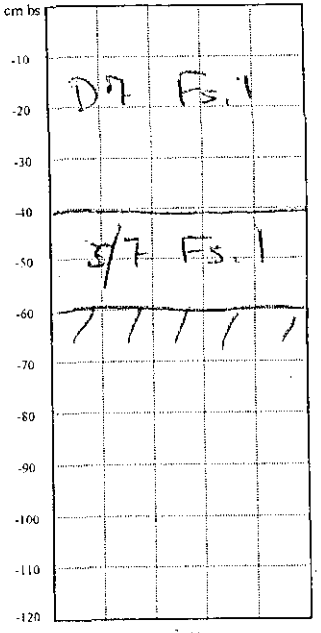
TR 2 TH 4

Wall: (N) E S W

- ☐ Positive prehistoric
- ☑ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

D7 Fsil
3/7 Fsil



Max. depth 60 cm bs

Recorder(s) RW

# of Bags Collected Ø

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: soccer field

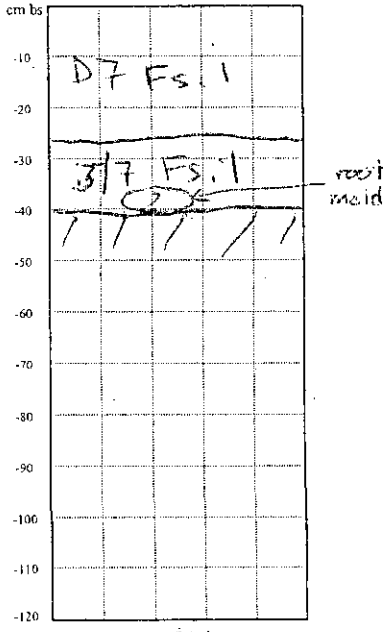
Date Sept 11

Page 2 of 3

TR 2 TH 5

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 40 cm bs

Recorder(s) RW

# of Bags Collected Ø

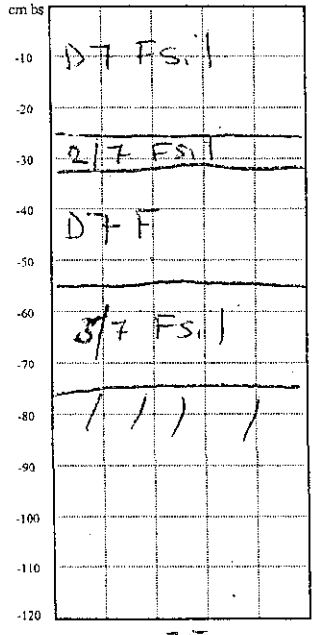
Material	Depth

Notes: very compact had to chip out 32-40 cm

TR 2 TH 6

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 75 cm bs

Recorder(s) RW

# of Bags Collected Ø

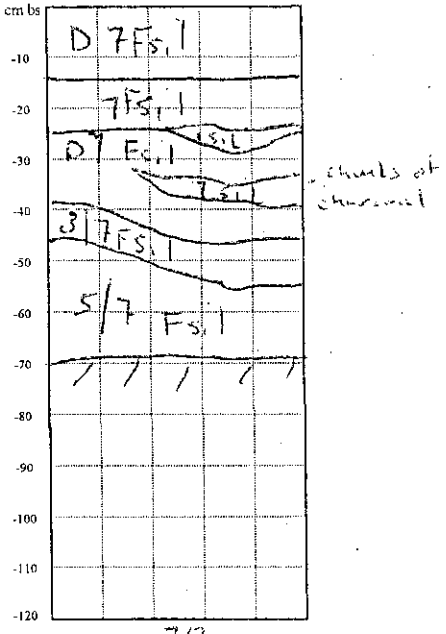
Material	Depth
refined (1) [illegible]	0-20

Notes:

TR 2 TH 7

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected Ø

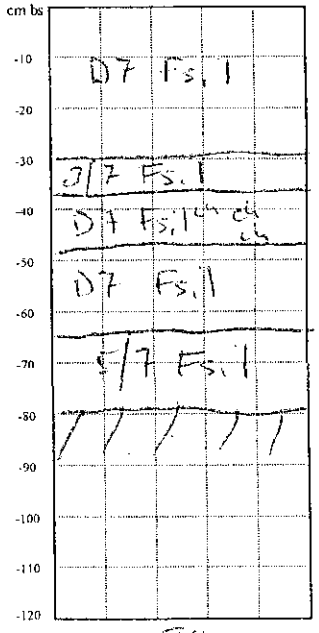
Material	Depth

Notes:

TR 2 TH 8

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 80 cm bs

Recorder(s) RW

# of Bags Collected Ø

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Sassar field

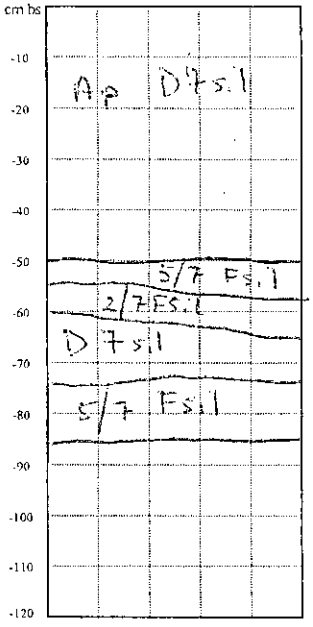
Date_____

Page _____ of_____

TR 2 TH 9

Wall: (N) E S W

☐ Positive prehistoric
☐ Negative prehistoric
☑ Historics



Max. depth 85 cm bs

Recorder(s) RW

# of Bags Collected Ø

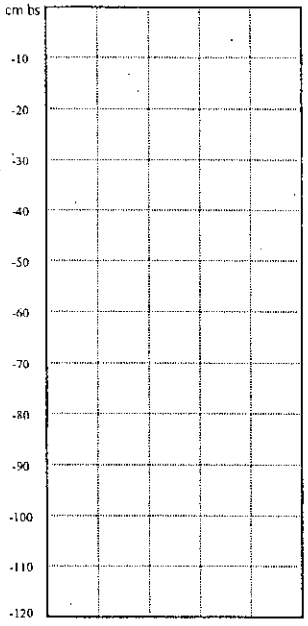
Material	Depth
Refined (3) earthenware	0 - 20
Stoneware bottle (1)	
Clear glass (1)	

Notes:

TR_____TH_____

Wall: N E S W

☐ Positive prehistoric
☐ Negative prehistoric
☐ Historics



Max. depth _____cm bs

Recorder(s) _____

# of Bags Collected_____

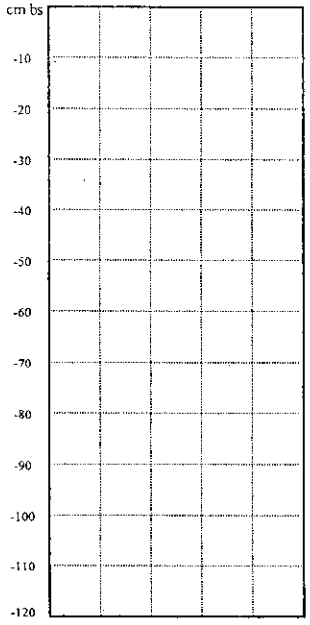
Material	Depth

Notes:

TR_____TH_____

Wall: N E S W

☐ Positive prehistoric
☐ Negative prehistoric
☐ Historics



Max. depth _____cm bs

Recorder(s) _____

# of Bags Collected_____

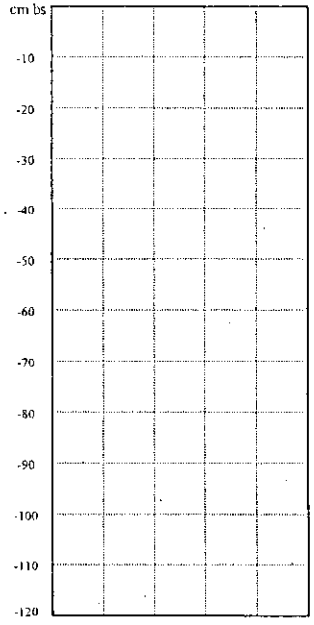
Material	Depth

Notes:

TR_____TH_____

Wall: N E S W

☐ Positive prehistoric
☐ Negative prehistoric
☐ Historics



Max. depth _____cm bs

Recorder(s) _____

# of Bags Collected_____

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: [illegible]

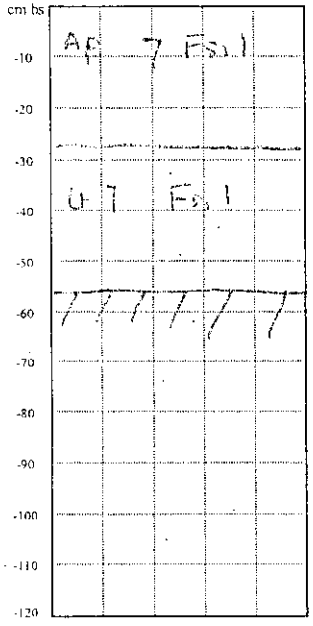
Date [illegible]

Page 1 of 3

TR 3 TH 1

Wall: N E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 55 cm bs

Recorder(s) RW

# of Bags Collected 0

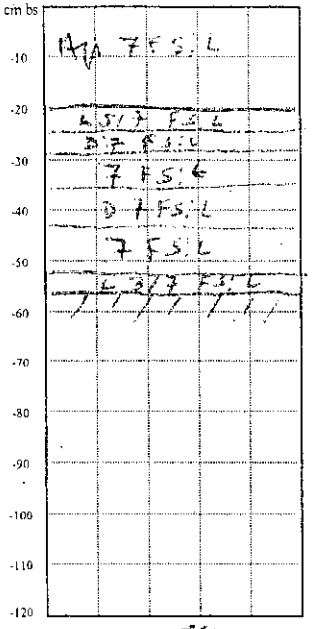
Material	Depth
cut nails (1)	0-20
beer glass (1)	0-20
refuse disturbance (1)	0-20

Notes:

TR 3 TH 2

Wall: N E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 58 cm bs

Recorder(s) J.M.

# of Bags Collected 0

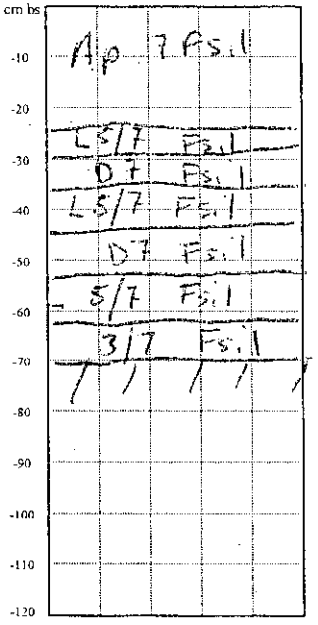
Material	Depth
None	

Notes:

TR 3 TH 3

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected 6

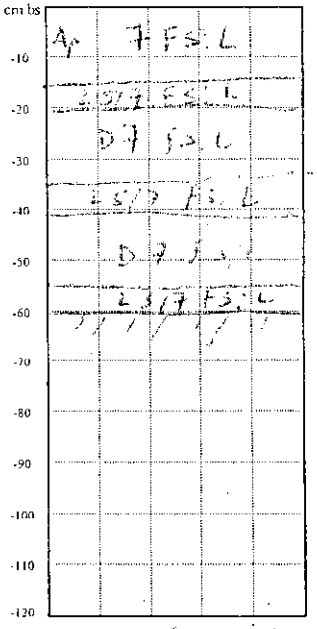
Material	Depth
brick (1)	0-20

Notes: small frag

TR 3 TH 4

Wall: N E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☒ Historics



Max. depth 60 cm bs

Recorder(s) RW

# of Bags Collected 0

Material	Depth
clear glass (1)	0-20

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ – disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Soccer Field

Date 9/12/03

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TR 3 TH 5

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☒ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

Ap 7 FS:L
L 7 FS:L w/
L 5/7 FS:L
L 5/7 FS:L
D 1/7 FS:L
L 5/7 FS:L
D 7 FS:L
L 3/7 FS:L

Max. depth 75 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
refined EW	(1) 0-20
Roofing ham	(3) 0-20

Notes:

TR 3 TH 6

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☒ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

Ap 7 FS:L
L 7 FS:L w/
L 5/7 FS:L
L 5/7 FS:L
7 FS:L
D 1/7 FS:L
7 FS:L w/ L 5/7 FS:L
L 3/7 FS:L

Max. depth 75 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
Sq. Nail (2)	0-20
LGRW (2)	0-20
Clear Glass (1)	0-20

Notes:

TR 3 TH 7

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☒ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

Ap 7 FS:L
L 7 FS:L w/
L 5/7 FS:L
D 7 FS:L
L 7 FS:L
D 1/7 FS:L
L 5/7 FS:L

Max. depth 55 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
Brick (1)	0-20
White ware (1)	0-20

Notes:

TR 3 TH 8

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☒ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

Ap 7 FS:L
L 7 FS:L w/
L 5/7 FS:L
L 5/7 FS:L w/ patchy D 1/7 FS:L
D 1/7 FS:L w/ patches of L 5/7 FS:L
L 5/7 FS:L w/ 3/7 FS:L

Max. depth 65 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
Clear glass, Lotti cap, Screw cap (4)	0-20
Sq. Nail (2)	0-20
Blue ware (1)	0-20
Slag (1)	0-20

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Soccer Field

Date: 9/12/03

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TR 3 **TH** 9

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics

cm bs	
-10	Ap 7 FS:L
-20	L7 FS:L w/
-30	L5/7 F 3/7 FS:L small gravel
-40	L 5/7 FS:L
-50	D 1/7 FS:L
-60	D 7 FS:L
-70	L5/7 FS:L
-80	
-90	
-100	
-110	
-120	

Max. depth 75 **cm bs**

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
Brick (3)	0-20
Clear Glass (2)	0-20
Wire (1)	0-20

Notes:

TR ____ **TH** ____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

Max. depth ____ **cm bs**

Recorder(s) ____

# of Bags Collected ____

Material	Depth

Notes:

TR ____ **TH** ____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

Max. depth ____ **cm bs**

Recorder(s) ____

# of Bags Collected ____

Material	Depth

Notes:

TR ____ **TH** ____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

Max. depth ____ **cm bs**

Recorder(s) ____

# of Bags Collected ____

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ – disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Soccer Field

Date 9/12/03

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TR 4 TH 3

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

D7 Fsil

5/7 Fsil

Max. depth 50 cm bs

Recorder(s) RW

# of Bags Collected

Material	Depth

Notes:

TR 4 TH 1

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

7 Fsil

5/7 Fsil

Max. depth 50 cm bs

Recorder(s) RW

# of Bags Collected

Material	Depth
refined earthen were 1	0-20

Notes: some charcoal at base of Ap

TR 4 TH 2

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

7 FSiL

7 w/ 5/7 FSiL

L 5/7 FSiL

Max. depth 25 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
None	

Notes:

TR 4 TH 4

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

7 FSiL

7 w/ 5/7 FSiL, charcoal

D7 FSiL w/ char coal

7 w/ 3/7 FSiL

L 5/7 w/ 3/7 FSiL

Max. depth 55 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
None	

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Space Field

Date 9/12/03

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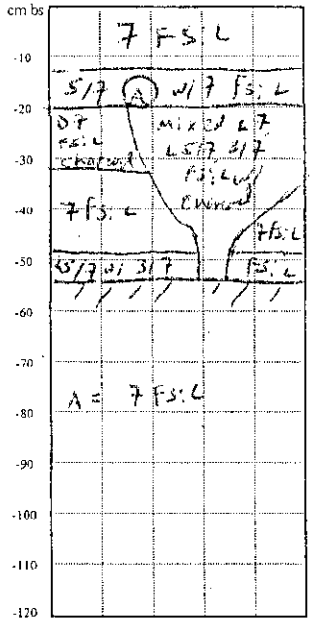
TR 4 TH 5

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☐ Historics



Max. depth 52 cm bs

Recorder(s) JM

# of Bags Collected 0

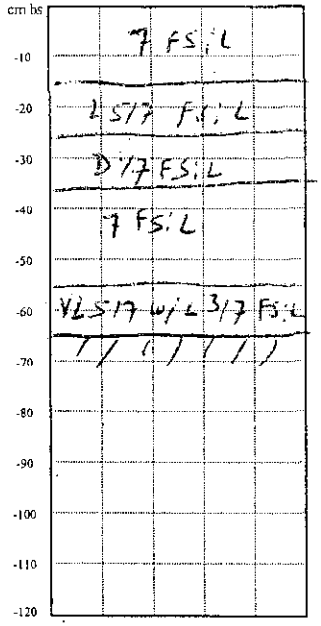
Material	Depth
None	

Notes:

TR 4 TH 6

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☐ Historics



Max. depth 65 cm bs

Recorder(s) JM

# of Bags Collected 0

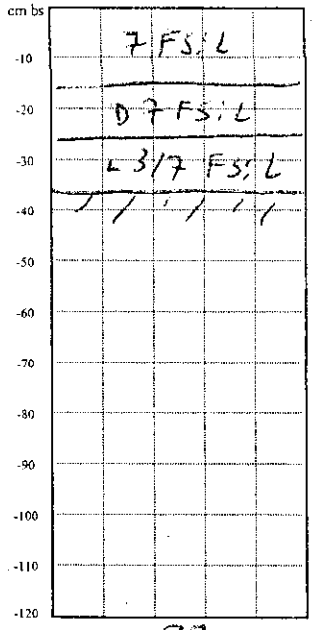
Material	Depth
None	

Notes:

TR 4 TH 7

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☐ Historics



Max. depth 37 cm bs

Recorder(s) JM

# of Bags Collected 0

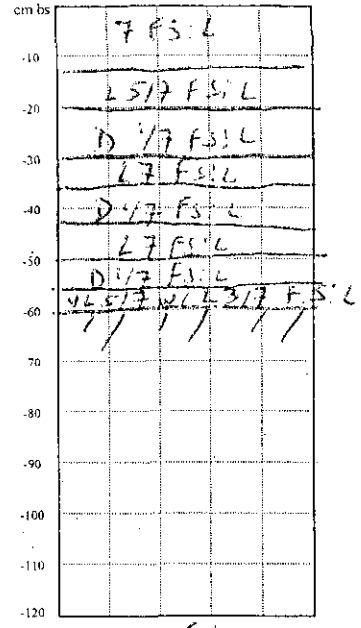
Material	Depth
None	

Notes:

TR 4 TH 8

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☐ Historics



Max. depth 60 cm bs

Recorder(s) JM

# of Bags Collected 0

Material	Depth
None	

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Soccer Field

Date 9/12/03

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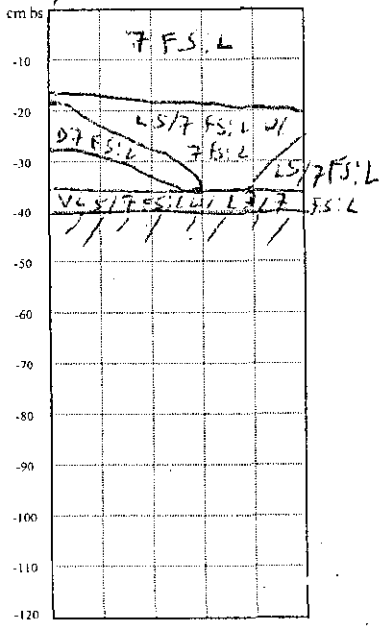
TR 4 TH 9

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☒ Historics



Max. depth 40 cm bs

Recorder(s) JS

# of Bags Collected Ø

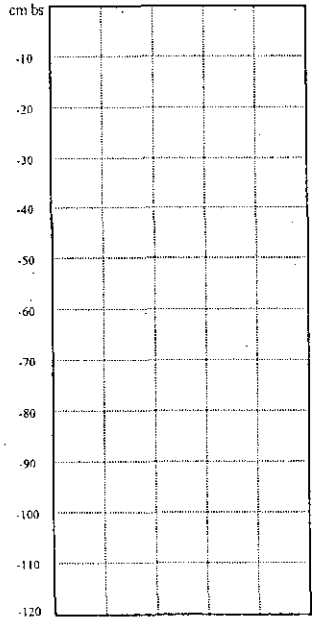
Material	Depth
Brown Gritty (Soccer Fig Hill)	(1) 0-20

Notes:

TR____ TH____

Wall: N E S W

☐ Positive prehistoric
☐ Negative prehistoric
☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

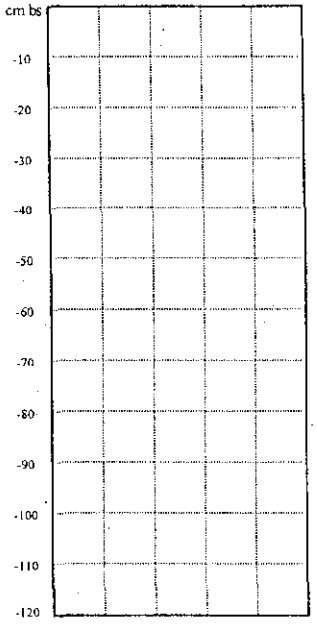
Material	Depth

Notes:

TR____ TH____

Wall: N E S W

☐ Positive prehistoric
☐ Negative prehistoric
☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

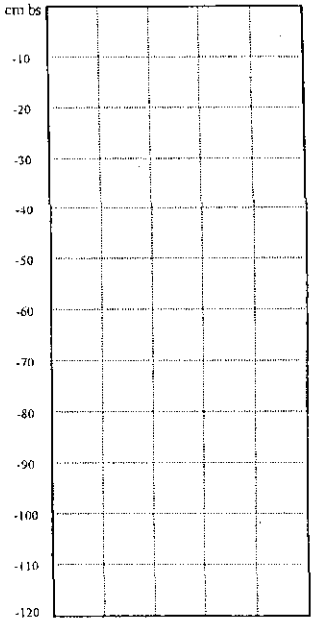
Material	Depth

Notes:

TR____ TH____

Wall: N E S W

☐ Positive prehistoric
☐ Negative prehistoric
☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ – disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Soccer field

Date Sept 10 03

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TR 5 TH 1

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Histories

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

Not Excavated

Max. depth _____ cm bs

Recorder(s) _____

# of Bags Collected _____

Material	Depth

Notes: In center of large area filled with tree stump debris

TR 5 TH 2

Wall: N E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Histories

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

7 FSL

L 3/7 FSL

Max. depth 20 cm bs

Recorder(s) JM

# of Bags Collected 0

Material	Depth
None	

Notes:

TR 5 TH 3

Wall: N E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Histories

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

7 FSL

L 3/7 FSL

Max. depth 25 cm bs

Recorder(s) JM

# of Bags Collected 0

Material	Depth
None	

Notes:

TR 5 TH 4

Wall: N E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Histories

cm bs: -10, -20, -30, -40, -50, -60, -70, -80, -90, -100, -110, -120

D7 SL

7 SL

Max. depth 70 cm bs

Recorder(s) RW

# of Bags Collected 0

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Sixier Field

Date 9/17/03

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TR 5 TH 5

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☐ Historics

cm bs	
	7 FS:L
10	Mixed L7 + L3/7 FS:L
-20	
-30	L 3/7 FS:L
-40	
-50	
-60	
-70	
-80	
-90	
-100	
-110	
-120	

Max. depth 35 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
None	

Notes: 70cm tree 1.5m NW of testhole, roots in testhole

TR 5 TH 6

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☒ Historics

cm bs	
	7 FS:L
-10	D 1/7 FS:L
-20	L7 FS:L
-30	L 3/7 FS:L
-40	
-50	
-60	
-70	
-80	
-90	
-100	
-110	
-120	

Max. depth 35 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
Clear glass (1)	0 -20

Notes:

TR 5 TH 7

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☒ Historics

cm bs	
	7 FS:L
-10	L7 FS:L w/ 3/7 + 3/7
-20	VL7 FS:L
-30	D7 FS:L w/ charcoal
-40	L 3/7 FS:L
-50	
-60	
-70	
-80	
-90	
-100	
-110	
-120	

Max. depth 35 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
clear glass (1)	0 -20
wire nail (1)	0 -20

Notes: gravel in Ap

TR 5 TH 8

Wall: (N) E S W

☐ Positive prehistoric
☒ Negative prehistoric
☒ Historics

cm bs	
	7 FS:L
-10	L7 w L3/7 FS:L
-20	VL7 w/ 3/7 FS:L
-30	D 1/7 FS:L
-40	D7 FS:L w/ charcoal
-50	L 3/7 FS:L
-60	
-70	
-80	
-90	
-100	
-110	
-120	

Max. depth 40 cm bs

Recorder(s) JM

# of Bags Collected Ø

Material	Depth
brown glass (1)	0 -20

Notes: gravel in Ap

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ - disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

PROJECT: Phase I Survey of the Christa McAuliffe Planetarium Expansion Project

Subsurface Testhole Record

Area: Soccer Field

Date 9/17/03

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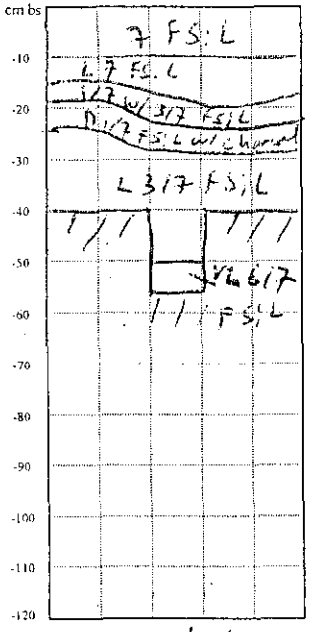
TR 5 TH 9

Wall: (N) E S W

- ☐ Positive prehistoric
- ☒ Negative prehistoric
- ☐ Historics



Max. depth 40/55 cm bs

Recorder(s) JM

# of Bags Collected 6

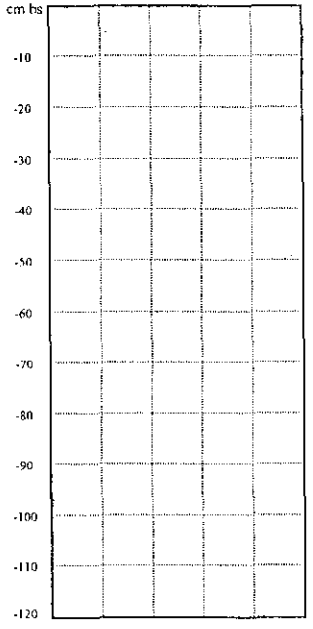
Material	Depth
None	

Notes: gravel to 20 cm bs

TR____ TH____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

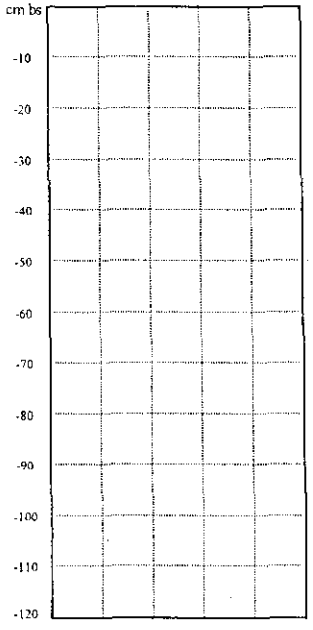
Material	Depth

Notes:

TR____ TH____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

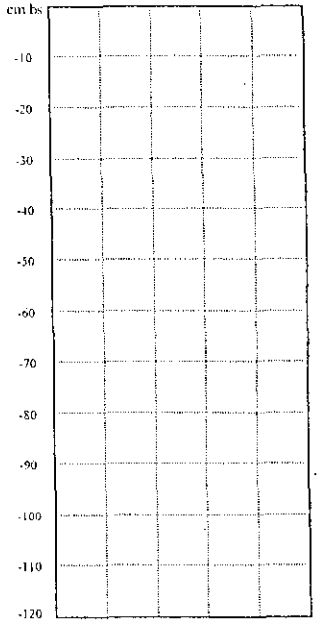
Material	Depth

Notes:

TR____ TH____

Wall: N E S W

- ☐ Positive prehistoric
- ☐ Negative prehistoric
- ☐ Historics



Max. depth ____ cm bs

Recorder(s) ____

# of Bags Collected ____

Material	Depth

Notes:

Soil Texture Key: S – sand Si – silt Cl – clay L – loam
VF – very fine F – fine M – medium C – coarse

Inclusions: Gr – gravel Cb – cobbles Pb – pebbles Bf – bedrock fragments
Cnc – concretions Ch – charcoal ● – roots ▨ – disturbance (specify)

Soil Color Key: 1 – gray 2 – black 3 – orange 4 – red 5 – yellow 6 – olive 7 – brown
Lt – light D – dark Mx – mixed

APPENDIX E

SUPPORTING CALCULATIONS FOR AIR QUALITY IMPACTS

Christa McAuliffe Planetarium Expansion
Environmental Assessment
Supporting Calculations for Air Quality Impacts

IMPACTS FROM MOBILE SOURCES

This is analysis is based on conservative worst-case assumptions, as listed below, using current national average emission factors.

1. All visitors arrive in individual vehicles
2. All vehicles are light duty trucks.
3. Number of visitors will double from 60,000 per year to 120,000 per year, an increase of 60,000 per year.
4. Average trip length is 60 miles based on a one-way trip length of 30 miles.

HC	3.51 gm/mi	x	60,000 vis/yr	÷	3.0 vis/veh	x	60 mi/veh	=	4,212,000 gm/yr
		÷	453.6 gm/lb	=	9,286 lb/yr	=	**4.64 tons/yr**		
CO	27.70 gm/mi	x	60,000 vis/yr	÷	3.0 vis/veh	x	60 mi/veh	=	33,240,000 gm/yr
		÷	453.6 gm/lb	=	73,280 lb/yr	=	**36.64 tons/yr**		
NO_X	1.81 gm/mi	x	60,000 vis/yr	÷	3.0 vis/veh	x	60 mi/veh	=	2,172,000 gm/yr
		÷	453.6 gm/lb	=	4,788 lb/yr	=	**2.39 tons/yr**		

IMPACTS FROM HEATING EQUIPMENT

The new addition will require an installed natural gas space heating capacity of 2,499,000 BTU/hr. Assume that worst-case duty cycle for space heating is 25 percent of capacity.

Gas usage	2,449,000 BTU/hr	÷	1,012 BTU/scf	x	8,760 hr/yr	x	25%	÷	1,000,000
		=	5.30 MMscf/yr						
VOC	5.5 lb/MMscf	x	5.30 MMscf/yr	÷	2,000 lb/ton	=	**0.01 tons/yr**		
CO	40 lb/MMscf	x	5.30 MMscf/yr	÷	2,000 lb/ton	=	**0.11 tons/yr**		
NO_X	94 lb/MMscf	x	5.30 MMscf/yr	÷	2,000 lb/ton	=	**0.25 tons/yr**		

TOTAL IMPACTS DURING OPERATION

VOC	4.64 tons/yr	+	0.01 tons/yr	=	**4.66 tons/yr**
CO	36.64 tons/yr	+	0.11 tons/yr	=	**36.75 tons/yr**
NO_X	2.39 tons/yr	+	0.25 tons/yr	=	**2.64 tons/yr**